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The use of multimodality imaging in the diagnosis and management of spontaneous coronary artery dissection and intramural haematoma

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Short title: Spontaneous coronary artery dissection

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Disclosures:

There are no conflicts of interest related to this case report for any of the authors
A 42-year-old woman developed sudden onset severe central chest pain. Risk factors included smoking, hypertension, morbid obesity and a family history of coronary artery disease. A 12-lead electrocardiogram demonstrated anterior ST segment elevation, prompting immediate transfer to our tertiary cardiac centre. Coronary angiography revealed diffuse concentric and smooth stenosis in the mid segment of the left anterior descending artery (LAD) (Figures 1A and 1B - arrows). The remainder of her coronary anatomy appeared angiographically normal. Intracoronary nitroglycerine administration had no effect on the angiographic appearance of the mid LAD. Spontaneous coronary dissection (SCAD) was suspected and the lesion was interrogated with Optical Coherence Tomography (OCT) technology (ILUMIEN™ OPTIS™ PCI Optimization System / Dragonfly™ OPTIS™ Imaging Catheter, Abbott Cardiovascular). This revealed an intramural hematoma filling a circumferential false lumen and compressing the true lumen of the artery (Figure 1C, Video S1). It was also confirmed the angiographically normal appearance of the artery distal (Figure 1D) and proximal (Figure 1E) to the stenosed (dissected) segment of the mid LAD, with clear depiction circumferentially of the intima, media and adventitia. The OCT recording was not suggestive of a definite entry point of the dissection (endothelial and intimal discontinuity). Disruption of a vasa vasorum causing haemorrhage into the tunica media could be a possible mechanism for SCAD and intramural haematoma formation. A conservative strategy was adopted as there was Thrombolysis In Myocardial Infarction (TIMI) grade 3 flow in the distal LAD, symptoms had improved, and ST segment elevation in the meantime had resolved. A CT coronary angiography (CTCA) eight weeks later showed resorption of the intramural haematoma and good patency of the artery (Figure 1F - curved multiplanar reformatted view of LAD). Nine months following the acute presentation the patient remains asymptomatic.

Differentiating SCAD from atherosclerotic plaque rupture with the use of coronary angiography alone is often challenging. Intracoronary imaging provides diagnostic clarity.
OCT has far superior spatial resolution than Intravascular Ultrasound (IVUS) and it can better identify localised fenestrations or ‘“entry tears’’ in the intima [1,2]. Intracoronary imaging is also useful to guide percutaneous coronary intervention (stenting) in patients with SCAD, where this is deemed to be necessary [2-4]. The use of CTCA is not currently recommended for the diagnosis of SCAD, however CTCA can be very helpful, in follow up, as in this case [1,2].

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**Figure 1.** Use of imaging in spontaneous coronary artery dissection

(A) Invasive coronary angiography (ICA), LAO cranial view showing stenosis in the mid segment of LAD (white arrow). (B) ICA, LAO caudal view (spider) showing again the stenosis
in the mid segment of LAD (white arrow). (C) OCT, cross-sectional visualization of mid LAD, showing a circumferential false lumen which compresses the true lumen of the artery. (D) OCT, cross-sectional visualization of distal LAD, showing normal coronary artery lumen. (E) OCT, cross-sectional visualization of proximal LAD, showing normal coronary artery lumen. (F) Cardiac CT angiogram, curved multiplanar reformatted view of a left anterior descending coronary artery showing absorption of the intramural haematoma in the mid LAD segment and good patency of the artery. FL: false lumen, TL: true lumen

**Supplementary data**

**Video S1** OCT run (54mm) demonstrating cross-sectional and longitudinal visualization of LAD.