Case report: intravascular ultrasound sonography-guided re-entry technique in crushed stent

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Background
Stent thrombosis (ST) is a rare, but potentially fatal complication. Procedural problems, such as stent under-dimension/under-expansion or dual antiplatelet drug resistance may result into ST. These conditions are more frequent during primary percutaneous coronary intervention for ST-elevation myocardial infarction (STEMI).

Case summary
A 60-year-old male patient presented to our hospital with an inferior STEMI. In the emergency department, a dual antiplatelet therapy was administered with ticagrelor 180 mg and aspirin 250 mg IV. During the observation, the patient experienced a ventricular fibrillation. Urgent coronary angiography showed an occlusion of the proximal right coronary artery. Thrombus aspiration was performed followed by implantation of one drug-eluting stent. After 45 min early ST occurred and was treated by immediate thrombus aspiration and post-dilatation. Intravascular ultrasound sonography (IVUS) showed severe strut malapposition due to a partial crush after post-dilatation. Since it was not possible to directly insert the first guidewire in the stent lumen, the IVUS probe was placed between the vessel wall and the crushed stent to guide the manoeuvre.

Discussion
Crushed stent is a rare complication, being caused by an incorrect passage of the guidewire between the stent’s struts and the vessel wall in case of severe underexpansion. In this case, an IVUS-guided re-entry could be an option to gain the stent true lumen and avoid a second stent implantation.

Keywords
Case report • STEMI • Crushed stent • IVUS

Introduction
ST-segment elevation myocardial infarction (STEMI) is a medical emergency that requires primary percutaneous coronary intervention (pPCI). In this setting stent thrombosis (ST) is a rare but potentially fatal complication, with a higher occurrence rate compared with PCI in stable coronary artery disease. 1 It is mainly due to intraprocedural issues (such as under-dimensioned/under-expanded stenting) or resistance to dual antiplatelet therapy combined with the unfavourable setting of vasospasm and high thrombus burden.

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Case presentation

A 60-year-old male with a background of hypertension, smoking, and no known drug allergies, was admitted in our hospital with an inferior STEMI. He remained haemodynamically stable (Killip 1) with normal blood pressure (140/80 mmHg) and heart rate without need of drug support. In the emergency department, heparin 3000 IU, ticagrelor 180 mg, and aspirin 250 mg were administered. While preparing him for urgent coronary angiography (CA), he experienced a ventricular adrenergic condition was probably the initial stimulus of ST. Moreover, because of the vomit, the first ticagrelor loading dose was probably worthless, and together these two variables may have contributed to ST. Furthermore, because of this severe stent malapposition, the guidewire in the second procedure passed between the stent struts and the vessel wall before entering the stent in its middle portion, thus leading to its partial crush during the subsequent post-dilatation (as shown in Figure 1A the stent is compressed at 3 o’clock).

In these cases, IVUS-guided re-entry could be an option because the guidewire (ideally hydrophilic) can be seen ‘in live view’ along its course and the passage in the stent lumen can be detected quite easily. Moreover, the IVUS probe actually fills the space in between the stent and the vessel wall, thus facilitating the correct passage of the wire. In our patient, this technique avoided the implantation of a second ‘stent in stent’ thus reducing the future risk of restenosis and thrombosis. The main limitation of this technique lies in the deliverability of the IVUS probe, a problem that could be partially be overcome using specific devices (such as Eagle Eye Short Tip, Philips Volcano). However, in this particular case, this trouble was avoided because the ‘partial crush’ of the stent with a 3.75 mm balloon created enough space to easily deliver the probe.

Despite the high procedural volume of our centre [with more than 1000 PCI/year (250 primary PCI) with an IVUS rate use of about 15% and 90 chronic total occlusion (CTO) PCI/year both antegrade or retrograde], this was the first with such a complication, stressing the added value in interventional cardiology practice of a deep knowledge of CTO techniques even in non-CTO setting.

Conclusion

Stent thrombosis following STEMI PCI is an important issue due a multifactorial aetiology. Crushed stent is a rare
complication in this setting, in some cases IVUS-guided re-entry could be an option to solve the situation avoiding a second stent implantation.

### Lead author biography

Dr Mario Iannaccone acquired his medical degree at ‘Second University of Neaples’, and Specialization in Cardiology at the University of Turin. He had some period of fellowship in Strasbourg and in Stockholm at Karolinska Institute. Actually, he is an interventional cardiology working in Turin (Italy) in San Giovanni Bosco hospital (head of the Cath Lab Dr. Roberto Garbo), principal field of interest is percutaneous coronary intervention, IVUS, rotational atherectomy, and CTO PCI.

### 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:** The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

**Conflict of interest:** none declared.

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