



Contribution of optical coherence tomography imaging in management of iatrogenic coronary dissection



Nicolas Barber-Chamoux^{a,*}, Géraud Souteyrand^{a,b}, Nicolas Combaret^{a,b}, Edgar Ouedraogo^a, Jean René Lusson^a, Pascal Motreff^{a,b}

^a Department of Cardiology, Gabriel Montpied University Hospital, Clermont-Ferrand, France

^b ISIT, CaVITI, CNRS (UMR-6284), Auvergne University, Clermont-Ferrand, France

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ABSTRACT

Iatrogenic coronary dissection is a rare but potentially serious complication of coronary angiography and angioplasty. Treatment with angioplasty guided only by angiography is often difficult. Optical coherence tomography imaging seems to be an interesting technique to lead the management of iatrogenic coronary dissection. Diagnosis can be made by optical coherence tomography; it can also eliminate differential diagnosis. Furthermore, this technique can guide safely the endovascular treatment.

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1. Background

Iatrogenic coronary dissections are a rare but potentially serious complication of coronary arteriography and coronary angioplasty. Dissections might be complicated by myocardial infarction and its short-term (rhythm disorders, cardiogenic shock) and long-term consequences (chronic heart failure, residual angina pectoris). In literature, the more described iatrogenic dissections concern left main coronary artery. Left main coronary iatrogenic dissections complicate 0.07% of angiography and angioplasty procedures [1,2], with 3% of in hospital death and 39% of major adverse cardiac events at 5 years [1].

There are several types of dissections identified and they might be difficult to recognize in angiography. They are classified from A to F, to differentiate minor intimal detachment in the lumen (A), intimal flap (B), extraluminal contrast stagnation (C), spiral dissection (D), persistent filling defect (E) or at last coronary occlusion with no-reflow (F). The risk of acute occlusion depends directly on the dissection's type, from 0% for the A type to 70% for the F type [3]. In minor dissections with non-flow-limiting, spontaneous evolution is frequently good [4].

In general, iatrogenic dissections frequently occur after balloon dilatation or after stent implantation, the dilatation inducing a mural hematoma or an iatrogenic dissection, with variable extension. Guiding catheter might be traumatic too, affecting the coronary ostium, in

particular after high-pressure iodine injection. Mechanism is frequently the formation of an entry site through intima. Some catheters are more aggressive and they are mostly involved in this kind of dissections. More rarely, guide wire might induce dissection. Dissections are often difficult to predict even if they appear preferentially in complex procedures, on very pathological arteries. They are more frequent at the distal edge of the stent than at the proximal edge and more at the level of fibrocalcific or lipid rich plaque than near fibrous plaque [5].

Prognosis of this complication has been improved by the use of stents. This complication might immediately engage patient prognosis, explaining that the results of stenting in left main coronary artery dissections are equivalent to emergency bypass surgery results [1]. Indeed, these dissections might often be treated by immediate stent implantation, while keeping the guide wire in the true lumen. In other circumstances, physicians cannot be sure of the dissection diagnosis or of the guide wire positioning in true lumen. A stent implantation with guide wire in the false lumen exposes to definitive artery occlusion [6]. It seems that an endocoronary imaging could be helpful; in particular, optical coherence tomography (OCT) could help manage this complication.

In cardiology department of Clermont-Ferrand University Hospital, of 5473 coronary angiographies performed from 01/01/2012 to 12/31/2012, with angioplasty performed if necessary, we detected 22 iatrogenic dissections in angiography, including dissections related to catheter tip and to angioplasty. We want to show, through 4 cases, the contribution of OCT imaging in management of iatrogenic dissections. To realize these endocoronary imaging examinations, we used C7-XR™ OCT Intravascular Imaging System (St. Jude Medical, Minnesota, USA).

* Corresponding author at: Department of Cardiology, CHU Clermont-Ferrand, 58 rue Montalembert, 63000 Clermont-Ferrand, France. Tel.: +33 473751457, fax: +33 473751934.

E-mail address: nbarber-chamoux@chu-clermontferrand.fr (N. Barber-Chamoux).

2. Patient 1

A 54-year-old man is treated with angioplasty of left circumflex artery (LCA) for a myocardial infarction with ST-elevation (STEMI) and then we decided to treat a chronic total occlusion of left anterior descending (LAD) artery. Angioplasty of LAD artery is completed by the implantation of a 3×30 mm drug eluting stent (Resolute Integrity, Medtronic, USA). A myocardial tomoscintigraphy, realized 1 month later for angina pectoris recurrence, shows an apical ischemia. Coronary angiography does not show any evolution on LCA stenting, but there is a previously unnoticed dissection at distal edge of the stent (Fig. 1A).

With OCT imaging, we can see that the dissection begins immediately after the edge of the stent with a plaque rupture inducing stenosis (Fig. 1A'). OCT also shows stent underexpansion caused by fibrocalcific plaques. During the same procedure, the sizing on OCT imaging engine reveals that dissection extends over more than 40 mm (with a 54 mm pullback). The lumen diameter varies from 3.1 mm to 1.9 mm (Fig. 1A'). So we optimize the angioplasty with 3×38 mm and 2.5×18 mm stents implantation. Then, the procedure is completed with post dilatation of the proximal stent. Final acquisitions show a good result of stent apposition (Fig. 1B') with a non-compressive distal edge dissection (Fig. 1B) for a diameter less than 2 mm. The one-year follow-up does not show any angina recurrence.

3. Patient 2

A 72-year-old man was admitted for a lateral non-STEMI. During an early coronary angiography, we implanted 2 bare metal stents on an athero-thrombotic stenosis located on the second marginal circumflex artery. We also discovered severe stenoses on mid segment of right coronary artery (RCA) and on posterolateral branch (Fig. 2A). Programmed

angioplasty is realized 2 weeks later by right radial approach. LCA circulates without delay. The posterolateral artery stenosis is treated with the implantation of a 2.75×24 mm bare metal stent after balloon predilatation. Then, we directly treat mid RCA stenosis with a 3×18 mm bare metal stent. The procedure is complicated by an occlusion instantly after the stent implantation (Fig. 2B). On angiography, the occlusion sits on the end of the proximal segment of RCA. The mechanism of the no-reflow is not clear, so we decide to remove the guide wire to reduce the thrombotic risk.

After using a new guide wire, we realize an OCT imaging that will reveal, besides proximal calcific plaques (Fig. 2.3), the presence of an iatrogenic dissection at RCA proximal segment (Fig. 2.1) due to catheter tip (Amplatz Left-Right (ALR)). The guide wire is in the true lumen (Fig. 2.2) and there is not any aortic extension of dissection. We treat this dissection by a new bare metal stent implantation (3.5×20 mm) with a good angiographic result (Fig. 2C). The OCT imaging confirms that the stent covers the dissection. An 18-months follow-up is done without any symptom and negative dobutamine stress echographies.

4. Patient 3

A 63-year-old man complains of exertional angina pectoris that began 6 months ago. Myocardial tomoscintigraphy is clearly positive on inferior and infero-lateral segments. Coronary angiography, done by right radial approach, shows proximal calcific plaques. The LAD artery and the LCA present almost 2 separate ostia. The LCA presents a stenosis involving the bifurcation with the marginal branch. The RCA has two sub-occlusive stenoses with contralateral anastomoses irrigating the distal branches. We restore a TIMI-3 flow after the implantation of 2 drug eluting stents with a good final angiographic result.

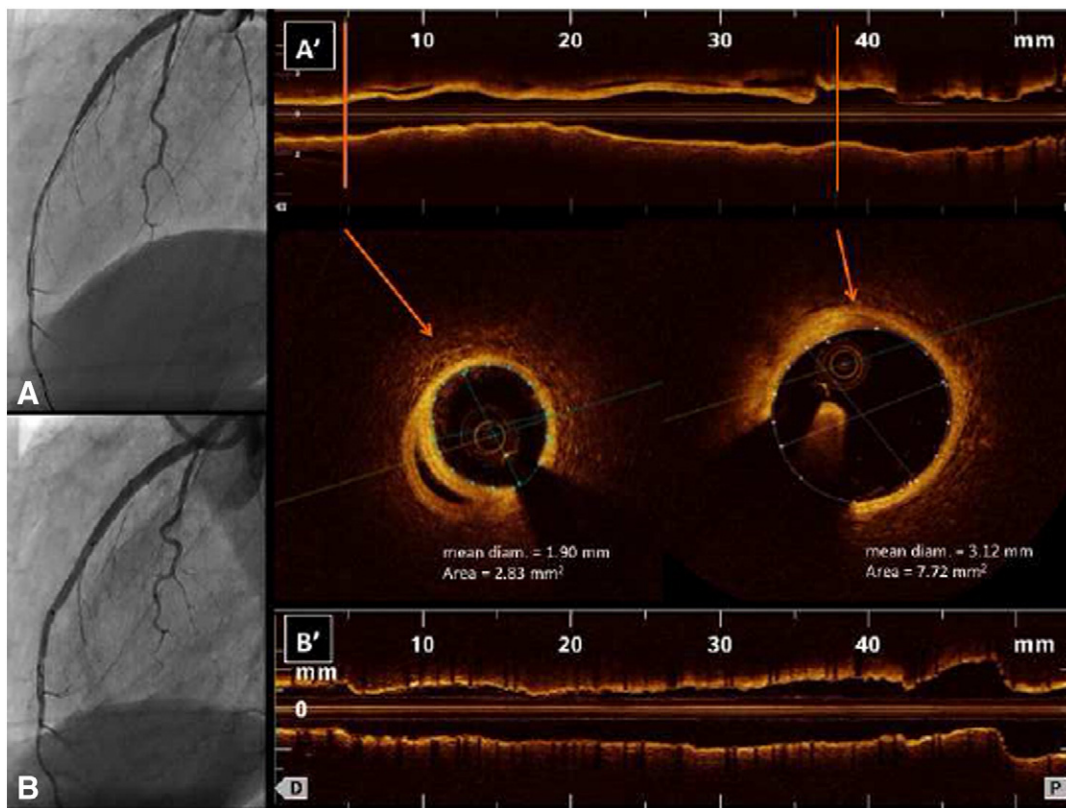


Fig. 1. Patient 1 illustrations. A: Baseline angiography of LAD showing a spiral dissection beginning after distal edge of stent. A': Baseline OCT pullback revealing a plaque rupture (38–44 mm) after the stent (44–54 mm), followed by dissection (0–38 mm) and evolution of diameter on different sites. B: final angiography after stent implantation and postdilatation showing the persistent dissection after the stents. B': Final OCT pullback showing stent apposition.

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