

OPTICAL COHERENCE TOMOGRAPHY AND CORONARY ANGIOGRAPHY AS COMPLEMENT IN THERAPEUTIC DECISIONS

TOMOGRAFÍA DE COHERENCIA ÓPTICA Y ANGIOGRAFÍA CORONARIA COMO COMPLEMENTO EN DECISIONES TERAPÉUTICAS

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ABSTRACT

Optical coherence tomography is an intracoronary diagnostic technique of high resolution, and its arrival has allowed a better diagnosis for the treatment of vascular diseases. The development of new systems for this tomography, which prevent artery occlusion, allows this technique to have greater utility and become standard practice in the hemodynamic laboratories for the characterization of coronary atherosclerotic plaque and for evaluating the inserted stent. The case of a patient that during an acute coronary syndrome with ST segment elevation was treated with thrombolytics and

no signs of reperfusion were achieved is presented. Coronary angiography showed no significant stenosis regarding infarct topography, so an optical coherence tomography was performed and an image compatible with neointimal proliferation and thrombus within the previously inserted stent in the circumflex artery was diagnosed, which corresponded with ECG changes. It was decided to apply percutaneous treatment with drug-eluting stent implantation. Optical coherence tomography allowed diagnosing and treating a dubious angiographic image.

Key words: Tomography, Optical coherence; Coronary angiography; Coronary disease; Diagnostic techniques, Cardiovascular

RESUMEN

La tomografía de coherencia óptica es una técnica de diagnóstico intracoronario con una alta resolución, su advenimiento ha permitido llevar a cabo un mejor diagnóstico para el tratamiento de las afecciones vascula-

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res. El desarrollo de nuevos sistemas de esta tomografía, que evitan la oclusión de la arteria, favorece que esta técnica tenga mayor utilidad y se convierta en práctica habitual en los laboratorios de hemodinámica, para la caracterización de la placa aterosclerótica coronaria y la evaluación del *stent* implantado. Se presenta un paciente que en el curso de un síndrome coronario agudo con elevación del segmento ST, fue tratado con trombolíticos y no se lograron signos de reperfusión. La coronariografía realizada no demostró estenosis significativa en relación con la topografía del infarto, por lo que se realizó tomografía de coherencia óptica y

se diagnosticó una imagen compatible con proliferación neointimal y presencia de trombo dentro del *stent* previamente implantado en la arteria circunfleja, que se correspondía con los cambios del electrocardiograma. Se decidió aplicar tratamiento percutáneo con implantación de *stent* fármaco-activo. La tomografía de coherencia óptica permitió diagnosticar y tratar una imagen angiográfica dudosa.

Palabras clave: Tomografía de coherencia óptica, Angiografía coronaria, Enfermedad coronaria, Técnicas de diagnóstico cardiovascular

INTRODUCTION

Coronary angiography is the gold standard for the diagnosis of coronary artery disease, but the majority of acute coronary syndromes with ST segment elevation occur in no significant vulnerable plaques. Coronary artery occlusion is caused by the formation of thrombotic material and sometimes coronary angiography may underestimate the degree of occlusion.

The use of optical coherence tomography (OCT), analogous to intravascular ultrasound, was started more than 17 years ago and has now developed a second generation that allows high speed withdrawals without occluding the coronary artery²⁻⁴. TCO has showed high sensitivity and specificity with respect to histology for classifying different types of atherosclerotic plaques and diagnosing complications^{5,6}.

CASE REPORT

58-year-old male with dyslipidemia and smoking as known risk factors, and history of systemic arterial hypertension, peripheral arterial disease and ischemic heart disease in the form of an old myocardial infarction (2002 and 2006), which had been treated by percutaneous coronary intervention and conventional stent implantation in the proximal circumflex (Cx), posterior interventricular of Cx and the first diagonal arteries. This time he goes to the emergency room for chest pain accompanied by autonomic symptoms, which was interpreted as an acute coronary syndrome (ACS) with ST segment elevation (D_I, D_{II}, D_{III} and aVF) and was treated with aspirin, clopidogrel and fibrinolysis (TNK). However, the symptoms persisted and he was transferred to the Interventional Cardiology Unit for percutaneous coronary intervention.

Physical examination noted: respiratory rate of 25 per minute, heart rate of 100 beats per minute and blood pressure of 150/90 mmHg.

Additional tests showed:

- Erythrocytes: 6112000 mm³
- Hemoglobin: 16 gr/100ml
- Hematocrit: 49%
- WBC: 15,500 mm³
- Platelets 250.000/mm³
- Prothrombin Ac: 98%
- Activated partial thromboplastin time: 29 seconds
- Fibrinogen: 445 mg / dl
- Glucose: 97 mg / dl
- Urea: 29 mg / dl
- Na: 143 mEq / L
- K: 4.2 meq / L
- Troponin T: 1.47
- Normal chest radiograph.



Figure 1. Coronary angiography with non-significant stenosis (arrow) at the proximal segment of circumflex artery.

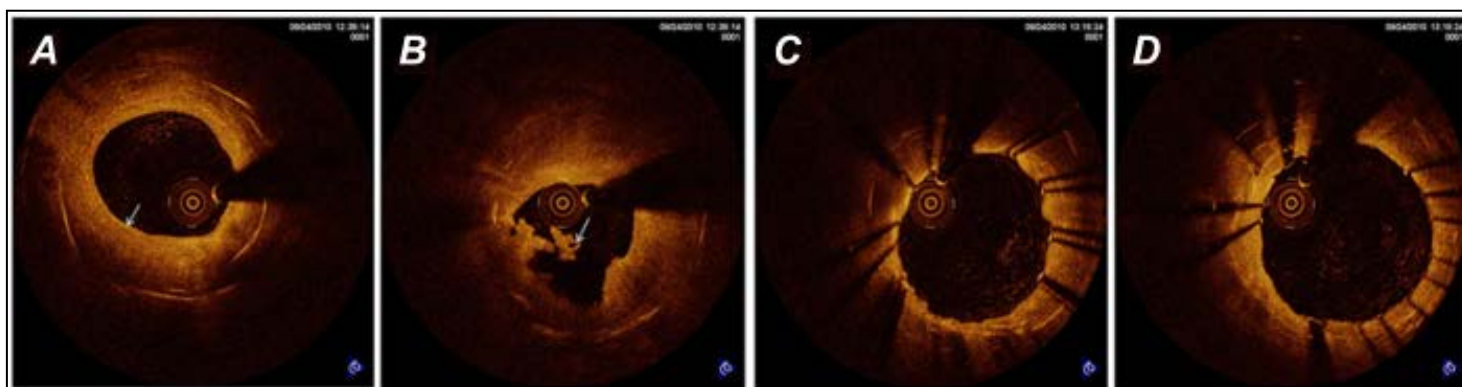


Figure 2. OCT. **A.** High-reflectivity and homogeneous edges image (arrow) corresponding to smooth muscle proliferation. **B.** Image with low reflectivity and diffuse edges which corresponds with a lipid-rich plaque and thrombotic content. **C.** Image obtained after percutaneous procedure that shows optimal device expansion at the area corresponding to the previous stent. **D.** Region where there was the lipid-rich plaque with thrombotic content.

Coronary angiography was performed via right radial artery according to the standard procedure and a no significant intrastent in the proximal segment of the Cx was observed (Figure 1), as well as a no significant stenosis in the proximal segment of the left anterior descending artery; the rest of the stents were patent without neointimal proliferation. The other vessels had no significant irregularities. The left ventricle was not dilated, and showed diaphragmatic and posterobasal hypokinesis, and an ejection fraction of 0.42.



Figure 3. Circumflex coronary artery after stent implantation (arrow).

The Cx artery was interpreted to be responsible for the infarct and a second-generation OCT was performed. The catheter was advanced until distal area to the stent, which showed high reflectivity images and homogeneous edges, which corresponded to neointimal proliferation in the previously implanted stent (Figure 2A). With the withdrawal of the catheter another image of low reflectivity with diffuse edges and thrombotic content in a more proximal area of the circumflex artery was observed (Figure 2B).

An acute coronary syndrome with ST segment elevation in inferolateral side was diagnosed and an Endeavor 3,5 x 24 mm drug-eluting stent was implanted, from the Cx origin, partially overlapping the previously implanted stent, and then covering the area occupied by the thrombus. A good angiographic result was observed (Figure 3) and with OCT the correct apposition of the struts of the implanted stent (Figure 2C) and the resolution of the thrombus were corroborated (Figure 2D).

DISCUSSION

The development of techniques for percutaneous coronary intervention has resulted in better patient outcomes. Second generation OCT has evolved to make its use easier without transient occlusion of the coronary artery⁷. The development of this technique has allowed a better assessment of the stent and the lesion to treat.

Gonzalo *et al.*⁸ observed, using TCO, that after stent implantation, tissue prolapse was seen in 97.5% of cases, stent dissection in 86.3% and edge dissection in 25%. In addition, 63.8% of patients had at least one

strut with wrong apposition.

The assessment of the characteristics of the plaque allows identifying the decreased distensibility of heavily calcified lesions and may be useful for the detection of plaques with high risk of rupture^{7,8}.

Compared with histology, OCT has shown high sensitivity and specificity in the detection of some of the characteristics associated with lesions prone to rupture, as necrotic core, the presence of macrophages and the cap^{7,9-11}.

In the case presented, when the coronary angiography was performed in order to initiate a rescue angioplasty a no significant stenosis image in the proximal segment of the Cx artery was observed, which was allegedly responsible for the symptoms according to the electrocardiogram, but did not have a typical angiographic image. For these reasons it was decided to perform the OCT with which the presence of neo-intimal proliferation of the previously implanted stent and the presence of thrombus in the proximal segment of the Cx were shown.

OCT was undoubtedly the key to deciding the most appropriate treatment option, as it allowed diagnosing and treating a coronary lesion that had dubious angiographic characteristics.

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