Clinics in Surgery

Case Report
Published: 04 Jun, 2019

When Coronary Angiography Does Not Give You the Answer, Look More in Detail

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Abstract

Integrating multiple imaging modalities: A 50-year-old male presenting with refractory cardiac arrest was treated by Extracorporeal Membrane Oxygenation (ECMO) and underwent Coronary Angiography (CAG) that excluded significant coronary disease.

However, supported by a Cardiac Magnetic Resonance (CMR) showing findings compatible with an acute ischemic event on the anterior wall, CAG was repeated together with Optical Coherence Tomography (OCT) imaging: it showed a critical lesion with mural thrombus in the mid Left Anterior Descending (LAD) that was successfully treated with implantation of a drug-eluting stent.

Intracoronary imaging is a very important tool to analyze plaque morphology when CAG alone is not sufficient. Moreover this case demonstrates the possible value of intravascular imaging to aid in decision making in patients presenting following cardiac arrest.

Introduction

Intracoronary imaging is a very important tool to analyze plaque morphology when coronary angiography alone is not conclusive. Also after cardiac arrest it is often difficult to reach a definite diagnosis and its role may be diriment in decision making.

Case Presentation

A 50-year-old male, former smoker with family history of coronary artery disease, presented with a witnessed out-of-hospital cardiac arrest due to ventricular fibrillation that was refractory to 40 min of Advanced Life Support (ALS). The patient was therefore transferred to our hospital and was treated with percutaneous veno-arterial Extracorporeal Membrane Oxygenation (ECMO), Intra-Aortic Balloon Pump (IABP), and hypothermia. Baseline Electrocardiography (ECG) did not show significant ST-segment change. Echocardiography demonstrated severe impaired Left Ventricle (LV) function. Coronary Angiography (CAG) was performed at 36 hours from hospital arrival and revealed a moderate and apparently stable stenosis in the mid Left Anterior Descending Artery (LAD) and TIMI (Thrombolysis in Myocardial Infarction) 3 flow. There were no obvious angiographic findings necessitating any further invasive treatment.

Two days later he recovered from mechanic circulatory support, with preserved neurological status. A Cardiac Magnetic Resonance imaging (CMR) was performed on a 1.5 T scanner showing a large area of transmural myocardial edema involving the antero-septal medium and apical LV segments and the entire LV apex, corresponding to the area at risk (Figure 1A and 1B). Myocardial edema was associated to a thin subendocardial area of Late Gadolinium Enhancement (LGE) in the same segments, indicating subendocardial necrosis (Figure 1C and 1D). Although CMR findings were consistent with an acute myocardial infarction in the LAD territory with associated viability, they were not conclusive to identify the genesis of the cardiac arrest. Indeed these findings might be explained by both conditions, acute coronary syndrome with transient proximal LAD occlusion or prolonged hypotension in a patient with non-occlusive stable proximal LAD stenosis in the setting of cardiac arrest. One week after admission, CAG was repeated showing no obvious changes of the lesion (Figure 2A). We decided to perform Optical Coherence Tomography (OCT) to further characterize lesion morphology (Figure 2B-2F). OCT showed a significant stenosis (minimal lumen area: 1.8 mm^2) with mural thrombus and severe atherosclerotic plaque beneath of it. At the proximal

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Received Date: *17 Apr 2019*
Accepted Date: *28 May 2019*
Published Date: *04 Jun 2019*

Citation:
Laricchia A, Gramegna M, Mitomo S, Hachinohe D, Slavich M, Palmisano A, et al. When Coronary Angiography Does Not Give You the Answer, Look More in Detail. Clin Surg. 2019; 4: 2458.

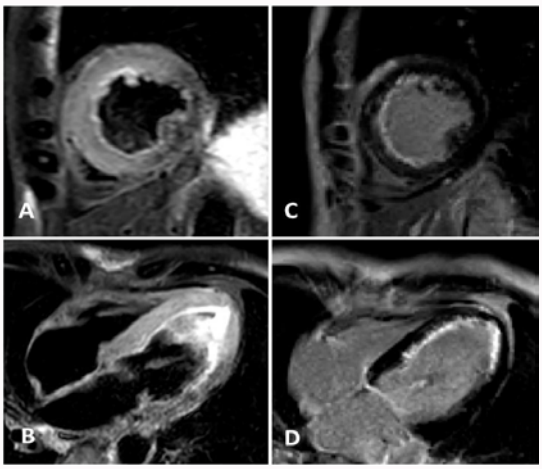

Figure 1: Cardiac Magnetic Resonance (CMR); on the left, short axis (A) and four chambers long axis (B) STIR sequences showing transmural myocardial edema involving the anterior wall, the septum and the apex (area at risk); on the right, short axis (C) and four chambers long axis (D) of Late Gadolinium Enhancement (LGE) sequences showing associated areas of sub-endocardial myocardial necrosis.

edge of the lesion, a finding compatible with intramural hematoma was observed, with no obvious evidence of plaque rupture or coronary dissection in view of the fact that the thrombus completely covered the whole lesion. We supposed two possible mechanisms involved: (1) plaque rupture or dissection initiated at the middle part of the disease leading to thrombus formation and transient vessel occlusion; (2) spontaneous development of intramural hematoma at the proximal portion of the diseased segment compromising the true vessel lumen (eventually thrombus might be created at the middle to distal portion).

According to the OCT findings suggesting the presence of a vulnerable plaque together with a critical stenosis, the lesion was treated by direct stenting with a second-generation drug-eluting stent (3.0 mm × 28 mm). The angiographic result was excellent with final TIMI 3 flow (Figure 2G). Final OCT confirmed well-apposed stent struts without significant tissue protrusion (Figure 2H-2L).

The patient did recover some ventricular function (40% of ejection fraction) and was discharged on optimal medical therapy including cardioaspirin, prasugrel, high dose statin, calcium channel blocker, ACE-inhibitor and diuretics.

Discussion

Cardiac arrest is often subtended by coronary artery disease. However, despite high clinical suspicion, it is sometimes impossible to establish the exact cause of the acute event especially when ECG is unremarkable and presenting symptoms are not clear.

In the 2017 European guidelines a primary Percutaneous Coronary Intervention (PCI) strategy is recommended (class I, level of evidence B) in patients with resuscitated cardiac arrest and an ECG consistent with ST-Segment Elevation Myocardial Infarction (STEMI); conversely, urgent angiography (and PCI if indicated) should be considered (IIa-C) in patients with resuscitated cardiac arrest without diagnostic ST-segment elevation but with a high suspicion of ongoing myocardial ischemia [1]. In these patients a quick clinical evaluation before CAG to exclude non-coronary causes is reasonable as there are other medical conditions in which misdiagnosis can lead to incorrect

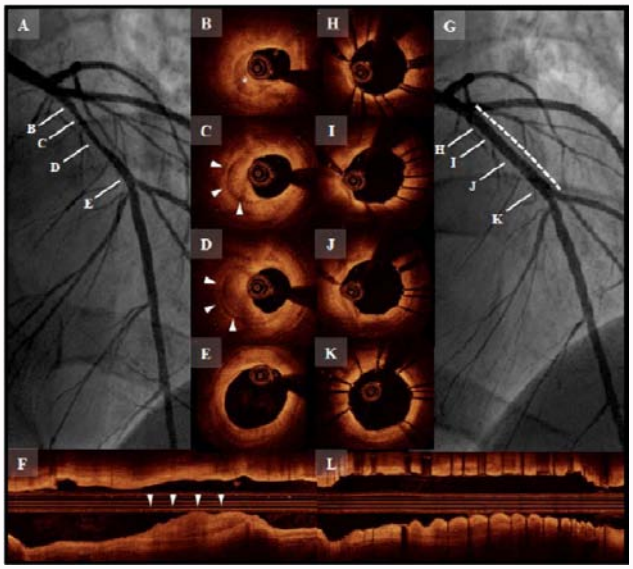

Figure 2: Coronary Angiography (CAG) and associated findings on Optical Coherence Tomography (OCT) at baseline (A and F, on the left) and after stenting (G and L, on the right); in the middle portion of the figure cross-sectional images of OCT are shown together with the corresponding point on CAG: (B) intima can be distinguished along the hematoma (asterisk) in the proximal portion of the lesion; (C) in the middle part intima cannot be seen along thrombus (arrowheads); (D) significant stenosis (minimal lumen area: 1.8 mm^2) with atherosclerotic change beneath of with mural thrombus (arrowheads); (E) the distal portion of the lesion shows no significant findings; (F) longitudinal OCT image shows mural thrombus (arrowheads); (G) dotted line in CAG indicates the site of stent implantation; cross-sectional (H-K) and longitudinal (L) OCT images demonstrates well-apposed stent struts in the whole segments without significant tissue protrusion.

therapeutic decisions with eventually catastrophic consequences [2].

The decision to perform urgent coronary angiography and PCI should also take into account factors associated with poor neurological outcome, risk of bleeding and overall patient prognosis.

In up to 25% of patients studied with coronary angiography, a conclusive diagnosis is not possible [3].

In these cases a transient occlusion of an epicardial coronary artery (such as from a prolonged coronary spasm or spontaneous recanalization of a coronary thrombus) should be taken into consideration among possible explanations.

This case demonstrates the importance of intravascular imaging for decision making after cardiac arrest treated with ECMO; in fact, for patients supported by mechanical devices and in which the neurological status is often unknown, there are concerns with regards to the risks associated with antithrombotic therapies and resultant risk of bleeding.

In our opinion, performing the OCT in this instance enabled us to reach a definitive diagnosis as the underlying etiology of his presentation and afforded us the chance to revascularize viable myocardium that may improve future morbidity and mortality. Moreover, as the cause of the cardiac arrest was an acute coronary syndrome, we avoid to inappropriately implanting the ICD.

Conclusion

In conclusion, in patients presenting with cardiac arrest with a high probability of coronary artery disease but with a non-diagnostic invasive coronary angiogram, the routine use of intracoronary

imaging should be promoted to facilitate establishing a diagnosis and instigating appropriate treatment.

References

1. Ibanez B, James S, Agewall S, Antunes MJ, Bucciarelli-Ducci C, Bueno H, et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). Eur Heart J. 2017;39(2):119-77.
2. Arnaout M, Mongardon N, Deye N, Legriel S, Dumas F, Sauneuf B, et al. Out-of-hospital cardiac arrest from brain cause: epidemiology, clinical features, and outcome in a multicenter cohort*. Crit Care Med. 2015;43(2):453-60.
3. Sánchez-Recalde A, Merino JL, Moreno R, Jiménez-Valero S, Galeote G, Calvo L, et al. [Clinical implications of intracoronary findings beyond coronary angiograms in patients with sudden death and high probability of coronary artery disease]. Rev Esp Cardiol. 2011;64(9):819-23.