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Fogarty technique in the left main coronary artery

Técnica de Fogarty em tronco da coronária esquerda

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ABSTRACT – Acute myocardial infarction caused by massive coronary embolism often entails dramatic procedures, because in this setting, pharmacological options are usually less effective than some unorthodox mechanical alternatives. We describe a patient presenting with cardiopulmonary arrest, and the left main occlusion of probable embolic etiology only resolved with the Fogarty maneuver which prompted immediate hemodynamic recovery.

Keywords: Coronary occlusion; Fogarty technique; Catheterization

RESUMO – O infarto agudo do miocárdio causado por embolia coronária maciça frequentemente envolve procedimentos dramáticos, porque, nesse contexto, as opções farmacológicas são geralmente menos efetivas do que algumas alternativas mecânicas não ortodoxas. Descrevemos um paciente que apresentou parada cardiorrespiratória, e a oclusão do tronco da coronária esquerda de provável etiologia embólica só foi resolvida com a manobra de Fogarty, que resultou em recuperação hemodinâmica imediata.

Descritores: Oclusão coronária; Técnica de Fogarty; Cateterização

INTRODUCTION

Acute occlusion of proximal coronary arteries in absence of underlying obstructive atherosclerotic disease is reported to occur at a sizable rate of 4% to 13% in patients presenting acute coronary syndromes.^{1,2} Among several possible etiologies and pathophysiological mechanisms that can be recognized by imaging methods complementary to angiography,³ coronary embolism often results in a catastrophic event.⁴⁻⁶ Massive proximal coronary embolism also adds to the complexity of the angiographic context and warrants the use of maneuvers other than the conventional thrombolysis or mechanical thrombectomy.⁷

This study was approved by the Research Ethics Committee of Hospital das Clínicas da Faculdade de Medicina de Ribeirão Preto da Universidade de São Paulo (protocol 4.137.814, CAAE 34381320.7.0000.5440).

CASE REPORT

A 42-year-old male patient, with history of heavy tobacco use and hypertension medicated with losartan 50mg bid, was admitted five hours after the onset of severe chest pain, accompanied by anterior-lateral and inferior wall ST-segment-elevation suggesting ST-elevation myocardial infarction (STEMI) (Figure 1). He had received aspirin 300mg plus clopidogrel 600mg, and was referred for primary angioplasty.

Right coronary artery had no obstructive lesions. Left ventriculography showed only mild anterior-basal segment hypokinesia and preserved global systolic function. Immediately after, left coronary catheterization showed a sub-occlusive filling defect in the left main coronary artery (LMCA) (Figure 2 and Video 1), and the patient experienced impaired coronary run-off, severe drop of systolic blood pressure and cardiac arrest with pulseless electrical activity. During subsequent cardiopulmonary resuscitation (CPR) maneuvers, a new angiogram showed total LMCA occlusion (Figure 3, Video 2).

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Figure 1. Admission eletrocardiogram.

Figure 2. Sub-occlusive filling defect with severe distal flow impairment.

Video 1. Left coronary catheterization with a sub-occlusive filling defect in the left main coronary artery.

Figure 3. Left main total occlusion.

The occlusion was crossed with a 0.014" guide-wire and a 3.0x10mm balloon catheter was used, but two high-pressure dilations in the LMCA failed to restore the coronary flow. After about 30 minutes of CPR maneuvers, the same balloon was inflated at 6 atmospheres distally to the LMCA total occlusion, and pulled to the guide catheter aiming thrombus extraction with the Fogarty technique (Figure 4 and Video 3). Immediately thereafter coronary flow was restored, and blood pressure recovered (Video 4).

In the following angiographic images suggesting distal embolization in several coronary branches were documented. Partial rechanneling of these branches was achieved after thrombus extraction was performed, but extensive ST-segment-elevation remained, consistent with failed microvascular reperfusion.

The echocardiogram showed only mild left ventricle dysfunction (left ventricle ejection fraction – LVEF of 44%). The patient was extubated after 48 hours, and discharged 10 days later with no neurological sequelae. He received oral anticoagulation with warfarin, aspirin 100mg q.d., losartan 50mg bid, carvedilol 6.25mg bid, spironolactone 25mg q.d. and atorvastatin 40mg q.d.

At 6-month follow-up he was asymptomatic, without atrial fibrillation at 24-hour Holter monitoring, and with computed tomography coronary angiogram showing no obstructive lesions and zero calcium score. Laboratory tests for thrombophilia screening were carried out with negative results.

DISCUSSION

In a Japanese retrospective survey using data from National Cerebral and Cardiovascular Center (NCVC) acute myocardial infarction database, with 2,135 patients whose first manifestation was STEMI, Shibata et al.⁵ proposed specific criteria for the clinical diagnosis of coronary embolism.

Video 2. Left main coronary artery occlusion.

Figure 4. Fogarty technique.

Video 3. Fogarty technique.**Video 4.** Left coronary recanalization after Fogarty technique.

According to these criteria, the clinical case hereby presented is characterized as probable embolic coronary occlusion, based on the combination of one major (angiographic evidence of arterial embolism/ coronary thrombus in the absence of underlying atherosclerotic disease at the culprit site) and one minor criterion (angiography without other stenoses >25%, with the exception of the culprit lesion).⁵ The thrombus etiology is unclear, since no source for embolization was determined and intravascular ultrasound was not performed to exclude plaque rupture.

Also, a French retrospective study assessed 1,232 patients with STEMI, in which 4.3% (n=53) met the criteria of Shibata et al.⁵ for the cardioembolic etiology. Similar to our patient, these authors reported lower rates of ST-segment resolution, when the STEMI was associated with coronary embolism (50%) in comparison with STEMI caused by atherosclerotic local disease (80%).⁶ These results are probably explained by the fact that emboli leading to coronary occlusion, arising from other cardiac or vascular territories, may be even less amenable to thrombolytic treatment, in comparison with mechanical options using thrombus extractors, and primary angioplasty in general.⁷⁻⁹

It is plausible to assume that reduction of thrombotic burden before stent implantation could minimize distal thrombotic microembolization, thus preventing the occurrence of no-reflow phenomena.¹⁰⁻¹² However, devices using mechanical extraction of thrombi have yielded inconsistent results, so that current guidelines restrict their applicability for selected cases.¹³⁻¹⁵

The challenging scenario of embolic occlusion of a major coronary artery has led to the unconventional use of materials and techniques designed for other conditions, such as reported by Arnous et al., in 2014, who inserted a cerebral protection filter, partially open, to extract non-occlusive thrombus in nine patients.¹⁶ In 2017, Uribe et al. described the use of another cerebral extraction system, to remove a thrombus in the LMCA.¹⁷

The Fogarty technique has been known and broadly used since the 1960's, mainly in peripheral interventions. For most obstructed coronary arteries, balloon angioplasty is preferred for causing less endothelial damage, and less myointimal hyperplasia than Fogarty technique.¹⁸ Nevertheless, in 2016, Larralde et al. published a case of STEMI successfully treated using Fogarty technique, after failure of thrombus aspiration and balloon angioplasty, in the presence of occlusion, probably caused by embolus.¹⁹

This unusual case of probable coronary embolization showed, in the presence of refractory LMCA occlusion leading to shock with cardiorespiratory arrest, the Fogarty technique using the ineffective angioplasty balloon prompted immediate hemodynamic recovery, thus eluding the need for interventional methods that would have demanded more time and materials. This technique worked in desperation, but would not be a good option in other situations, due to likely embolization into the aorta, if the guide catheter were not firmly seated and occlusive.

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None.

CONFLICTS OF INTEREST

The authors declare there are no conflicts of interest.

CONTRIBUTION OF AUTHORS

Conception and design of the study: AVB, UCR, RBP e JAMN; data collection: AVB, UCR e MBS; data interpretation: AVB, UCR, MBS e RBP; text writing: AVB, UCR, MOLF, RBP e JAMN; approval of the final version to be published: JAMN.

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