

## COVID-19 Patients with Acute Coronary Syndrome: Why It Is More Than A Challenging Case?

EL Ghali Mohamed Benouna<sup>1,3\*</sup>, Othmane Benmalle<sup>1,3</sup>, Amine Ech-chenbouli<sup>1,3</sup>, Salim Arous<sup>1,3</sup>, Rachida Habbal<sup>1,3</sup>, Ouissal Aissaoui<sup>2,3\*</sup>, Afak Nsiri<sup>2,3</sup>, Rachid Elharrar<sup>2,3</sup>, Chafik EL Kettani<sup>2,3</sup>, Lahoucine Barrou<sup>2,3</sup>

<sup>1</sup>Department of Cardiology, Ibn Rochd university hospital of Casablanca, Morocco

<sup>2</sup>Department of Anesthesiology and Intensive care, Ibn Rochd university hospital of Casablanca, Morocco

<sup>3</sup>Université Hassan II, Faculté de Médecine et de Pharmacie, Casablanca, Morocco

### \*First authors

**\*Corresponding author:** Ouissal Aissaoui, Department of Anesthesiology and Intensive care, Ibn Rochd university hospital of Casablanca, Morocco. Email: aissaoui.wissal@gmail.com

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### Abstract

COVID-19 is a disease caused by the SARS-COV-2 virus and was recently declared as a pandemic by WHO on March 11, 2020. There are more than 3 million of COVID-19 patients with more than 200000 deaths.

As we observed in the previous viral epidemics, the excessive inflammatory process, hyper coagulation and hypoxia leads to an atherosclerotic plaques destabilization, which can explain the growing number of acute coronary syndrome (ACS) in this context.

We present in this essay two cases presenting respectively STEMI and NSTEMI, describing the management of their acute myocardial infarction with all the challenges that can present a COVID-19 patient during the procedure.

**Keywords:** COVID-19, STEMI, NSTEMI, Acute coronary syndrome, thrombotic burden.

### Introduction

COVID-19 is a disease caused by the SARS-COV-2 virus and was recently declared as a pandemic by WHO on March 11, 2020 [1]. There are more than 3 million of COVID-19 patients with more than 200000 deaths related to this virus in all over the world [1]. The clinical presentation varies from an asymptomatic patient to a typical ARDS with a cytokines storm.

As we observed in the influenza epidemic, the excessive inflammatory process, hyper coagulation and hypoxia leads to an atherosclerotic plaques destabilization, which can explain the growing number of acute coronary syndrome (ACS) in viral infection situation [2].

Cardiac injuries during COVID-19 infection are not rare: there is more than 20% of myocardial lesions defined by an increase of troponins' level beyond the 99th percentiles and more than 10% of coronary artery diseases [3]. Because « time is muscle », a rapid management of ACS in the Cath lab is the only way to improve prognosis.

This pandemic is responsible of a great change in the management of all emergency cares. In other words, emergency medical systems are focused on COVID-19, people are afraid to visit the emergencies in case of chest pain; all of this leads to a delay in the treatment of ACS with important hemodynamic and thromboembolic complications. We work in a tertiary center in Casablanca that is dedicated to critically ill COVID-19 patients. We present in this essay two cases presenting respectively STEMI and NSTEMI and the management of their acute myocardial infarction with all the challenges that can present a COVID-19 patient during the procedure.

### Cases presentation

#### Case n°1

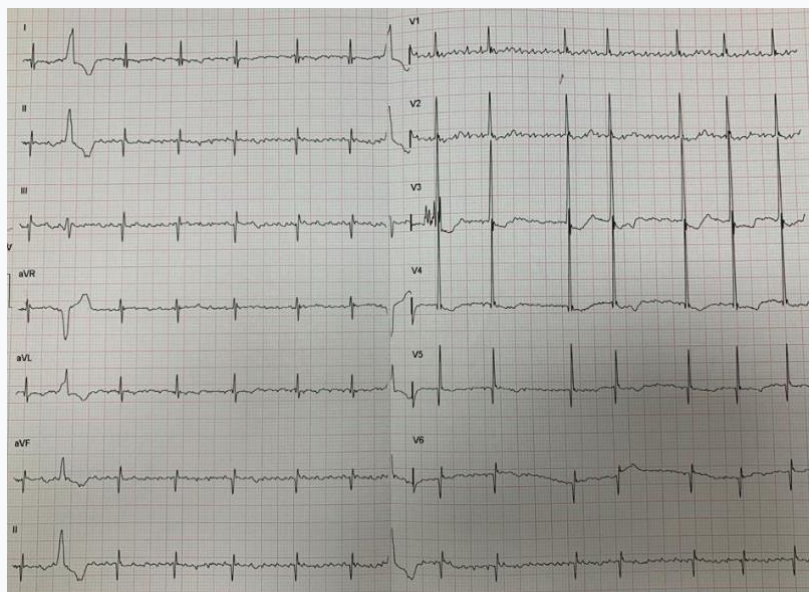
A sixty three years old patient, with a known history of diabetes, presented to the emergency room with atypical chest pain, cough, and fever (38.8°C). In the context of COVID-19 pandemic, a screening was performed including a nasopharyngeal swab, chest X-ray and thoracic tomography showing a basal condensation in the left lung with ground glass opacities (figure 1).



**Figure 1:** A basal condensation in the left lung with ground glass opacities

Also, an electrocardiogram (EKG) was performed because of patient's cardiovascular risk factors and the chest pain. The EKG showed Q waves in the infero-lateral territory and

ST depression in the antero-septal territory, with atrial fibrillation and premature ventricular contractions (figure 2).

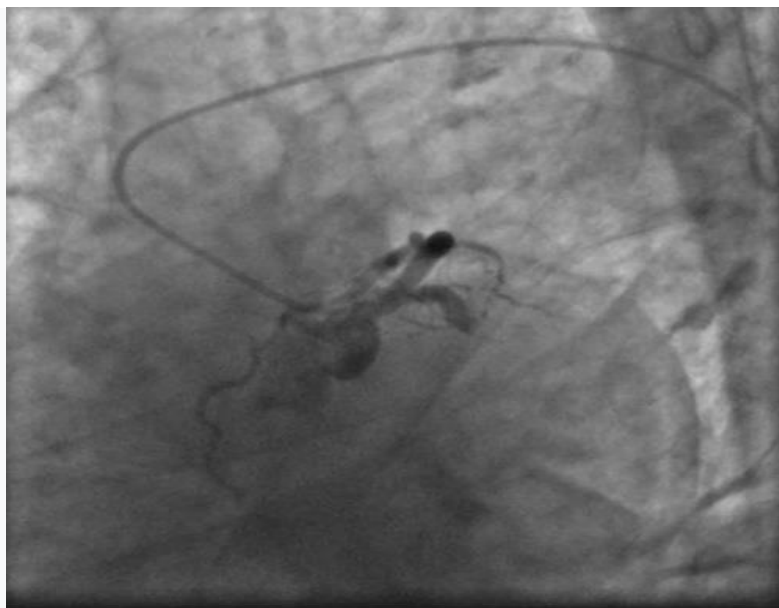


**Figure 2:** Q waves in the infero-lateral territory and ST depression in the antero-septal territory with atrial fibrillation and premature ventricular contractions.

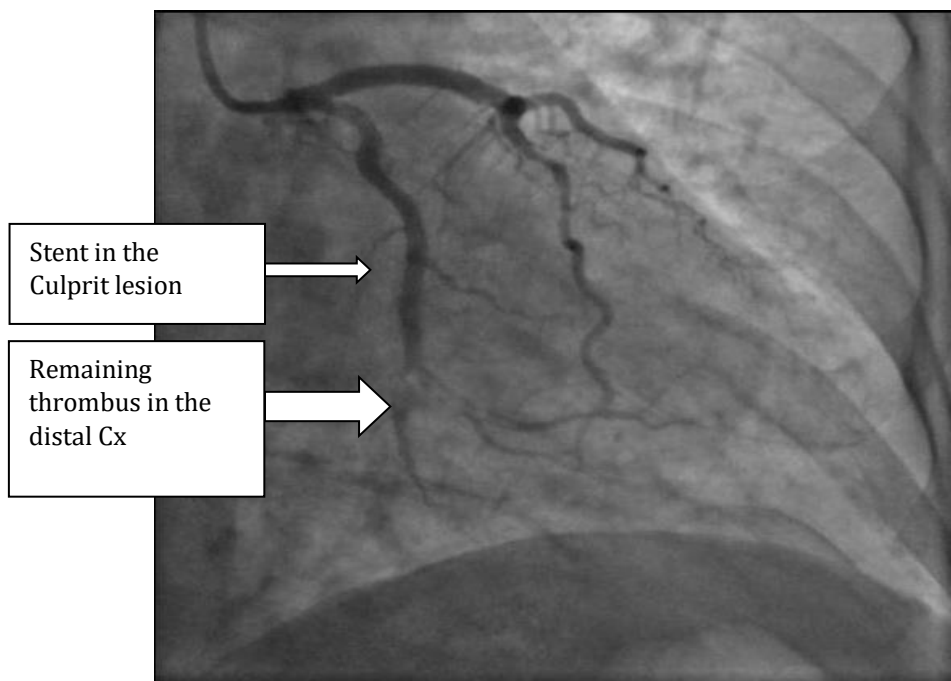
The patient was sent immediately to the cath lab for an invasive strategy. This patient presented at his admission signs of congestive heart failure. Transthoracic echocardiography showed severe mitral regurgitation with 38% of Left Ventricle Ejection Fraction (LVFE).

The coronarography showed an occlusion of the proximal circumflex artery (CX) (Figure 3), and two significant lesions in the middle and the distal right coronary artery. The team decided to perform a classic percutaneous coronary intervention on the CX lesion only.

We intubated the left main with an EBU 3.5 6F guiding catheter. A guidewire went through the CX occlusion, then we realized a pre-dilatation with a 2.5X20 mm balloon, the artery was still occluded with a very high thrombotic burden, the balloon was re-inflated at the middle segment of the CX, then we started intravenous Tirofiban, finally we stented the proximal CX with a 3X24 mm drug eluting stent (DES), with a satisfactory result without any dissection or spam. A thrombus in the very distal segment of the Cx remained with an acceptable TIMI flow (figure 4).



**Figure 3:** A spider view with an occlusion of the proximal CX.



**Figure 4:** The final result after stenting the CX with a remaining distal thrombus

The patient was transferred to the intensive care unit (ICU). The chest pain disappeared with normal hemodynamic constants and signs of congestive heart failure. Antiplatelet therapy, Tirofiban and diuretics, were administrated.

In the meantime, the nasopharyngeal swab (PCR type) returned positive and the patient underwent the national anti-COVID protocol.

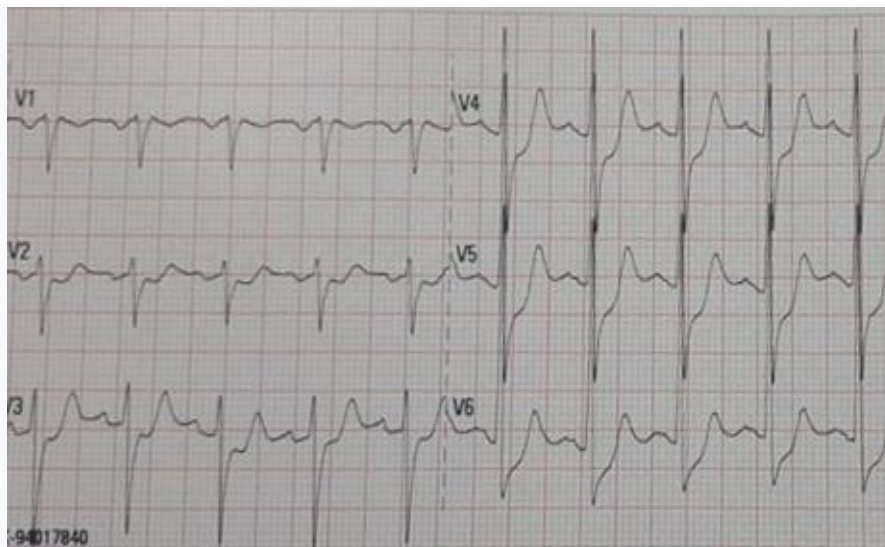
After 3 days, the patient had no signs of heart failure, with a moderate mitral regurgitation and LVEF= 50% on the transthoracic echocardiography. He was discharged after 10 days of hospitalization.

#### Case n°2

Sixty five years old COVID-19 with a known history of diabetes, presented typical chest pain, 2 days after his hospitalization.

Electrocardiogram showed ST depression in the anterior leads (figure5). His GRACE SCORE was 168. The NSTEMI was at a very high risk and must be managed urgently. Due to the optimization of the inter-hospital regulation, the patient was transferred to our Cath lab to perform an invasive strategy.





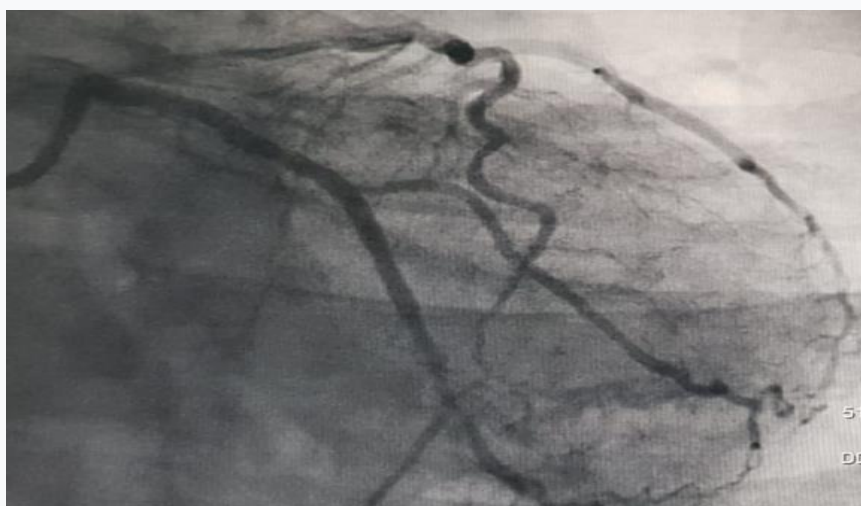
**Figure 5:** ST depression in the anterior leads.

The coronarography showed a sub occlusive thrombotic CX (figure 6). The team decided to perform a PCI. We intubated the left main using an EBU 3.5 6F. A guide wire went

through the CX lesion. After a pre-dilatation with 2,5 x20 mm balloon, we proceeded by stenting the CX with a long DES 2,5x 38 mm with a satisfactory result (figure 7).



**Figure 6:** A spider view with a sub occlusive thrombotic CX.



**Figure 7:** The final result after stenting the CX with a long 2.5 x 38 mm DES

The patient was transferred to the ICU with disappearance of the chest pain. Antiplatelet therapy, diuretics, were administered. After a couple of days, the patient had no signs of heart failure, with a moderate mitral regurgitation and an LVFE= 48% on the transthoracic echocardiography.

We introduced beta blockers and ACE inhibitors. This patient is still hospitalized in the ICU to receive the national protocol treatment against COVID-19.

## Discussion

In COVID-19, acute systemic inflammatory reaction associated with parietal biomechanical stress and vasoconstriction are responsible of the destabilization and rupture of atheroma plaques in patients with a history of cardiovascular risk factors. The severe hypoxia and the cytokine inflammatory storm, encountered in COVID-19 disease promote coagulation and formation of coronary arterial emboli.

These two phenomena lead to the occurrence of acute coronary syndromes with or without ST elevation [4,5]. A lot of controversy have concerned the management of the acute coronary syndrome. According to the recommendations of the Peking Union Hospital, if the patient is stable and seen before 12 hours of the onset of symptoms, thrombolysis can be considered as the treatment of choice after eliminating the contraindications. The aim of this attitude is to protect the medical staff by minimizing contact with the patient [6]. However, an American clinical mayo team continues to adopt the strategy of primary PCI for the majority of STEMI patients [7].

In general, it is strongly advised to assess the balance between the benefit of the patient's revascularization and the risk of medical and para medical staff contamination, in the management of acute coronary syndrome [8].

In the two cases, the team decided to perform revascularization, by stenting the culprit lesion according to the European society of cardiology's (ESC) recommendations in the management of ACS. The non-culprit lesion will be rescheduled to reduce the time of exposure and protect the medical and nursing staff [9].

As we said, COVID-19 patients have a very high thrombotic burden. In fact, in the first case described above, we had to inflate the balloons, twice, in the proximal and middle segment and administrate intravenous Tirofiban, to succeed to open the artery with a remaining thrombus in the very distal segment.

A thrombo-aspiration could not be used in this case because of the late presentation of the ACS and the distal localization of thrombotic lesions, furthermore it is not recommended by the European society of cardiology (ESC) because many studies have proved that thrombo aspiration raises the risk of strokes rather than improving the prognosis [9]. That's why we preferred administrating IV Tirofiban instead of thrombo-aspiration.

In addition, the challenge in the PCI of those cases does not manifest itself in the anatomical complexity of the lesions but it is in the complications of the myocardial infarction, caused by the delay of the presentation.

Among the complications that may happen, we cite mechanical complications: Ventricular septal defect (VSD), rupture of the free wall of the ventricle, and severe mitral regurgitation which complicated the STEMI of the first case described above.

Hemodynamic complications are often described in the literature, with acute heart failure leading to refractory cardiogenic shock, in addition to arrhythmia like ventricular tachycardia or fibrillation that can lead to an imminent cardiac death.

The optimization of inter-hospital regulation is important to avoid the delay of the management of the acute coronary syndrome and therefore to minimize the complications that surely make the PCI harder and risky for patient's life. In fact, due to the inter-hospital regulation the patient described in the second case was immediately transferred to our cathlab to perform an invasive strategy.

After the PCI, a medical treatment is necessary including the dual antiplatelet therapy, ACE, Beta blockers and statins. All those treatments are in association with COVID-19 specific therapeutics.

## Conclusion

The COVID-19 pandemic had challenged the management of coronary patients. Most of these patients find themselves drowned in the COVID-19 circuit. It seems prudent to properly interview confirmed patients, at least those with a history of cardiovascular risk factors, so as not to miss an acute coronary event.

This group of patients should not be excluded from access to revascularization strategies without risking the contamination of medical and nursing staff.

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