



Complicated myocardial infarction in a 99-year-old lady in the era of COVID-19 pandemic: from the need to rule out coronavirus infection to emergency percutaneous coronary angioplasty

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Case presentation

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On March 20, 2020, during the COVID-19 outbreak, a 99-year-old woman with hypertension and a previous history of coronary artery disease treated with coronary angioplasty and stent in the proximal left anterior descending coronary artery was admitted to the Emergency Department of the University Hospital of Modena, in Northern Italy. No impairment of renal or hepatic function was reported in medical history. The patient, who was living at home, with her son and was autonomous and independent in daily living activities, reported dyspnea, atypical chest pain and fatigue. She also reported that in the last 3 days she had fever (up to 37.5 °C degrees) and cough. Physical examination documented bi-basal crackling.

A 12-lead ECG showed sinus tachycardia with 1.5 mm depression of the ST segment and negative T waves in the antero-lateral and inferior lead. The transthoracic echocardiogram showed aortic valve sclerosis, without aortic valve stenosis, left ventricular hypertrophy, with a left ventricular ejection fraction of 50% and no regional wall abnormalities. Chest X-ray documented an increase in the reticular thickening of the peri-bronchovascular interstitium in the middle and lower fields that was more accentuated in the lower para-hilar region (Fig. 1).

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Further investigations and differential diagnosis

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The patient was hypoxemic and hypocapnic (O₂ saturation 90.6%, PO₂ 57 mmHg, PCO₂ 33 mmHg) and was treated with low flow oxygen through a mask. She had leukocytosis (14.3 × 1000/mm³) and antibiotic treatment with piperacillin–tazobactam i.v. was instituted. Serum troponin levels were markedly increased (1800 ng/L, with an upper limit of normal of 34 ng/L with a second assessment up to 4410 ng/L).

Although acute coronary syndrome (specifically non-ST-segment elevation myocardial infarction) was considered as the most probable diagnosis, watchful waiting was initially applied, taking into account patient's history and the very advanced age and, above all, the need to rule out COVID-19 infection in view of the presence of fever, cough and the ongoing COVID-19 pandemic. The patient was therefore considered as suspected for COVID-19 infection and was isolated for 2 days until the negative result of two nasopharyngeal swabs allowed to exclude this type of infection. A chest CT was considered necessary only in case of worsening of the infective status.

On the third day of hospitalization, the patient developed atrial fibrillation at high ventricular rate with onset of typical oppressive chest pain with dyspnea at rest. The ECG showed atrial fibrillation with fast ventricular rate and a severe and diffuse ST-segment depression with a downsloping pattern associated with ST-elevation in aVR (Fig. 2). Considering the severity of the clinical conditions and the Grace score (187), an urgent coronary angiography was planned in consideration of the pattern of



Fig. 1 Chest X-ray at admission, showing an increase in the reticular thickening of the peri-bronchovascular interstitium in the middle and lower fields, more accentuated in the lower para-hilar region

high-risk non-ST-elevation myocardial infarction, coupled with a favourable assessment in terms of Mini Mental Status score (27/30) and a moderate degree of frailty (score

of 6 at the Clinical Frailty Scale), both in support of the decision for an invasive approach despite the advanced age. Moreover, no absolute contraindications to the angiographic study were detected. The indication to coronary angiogram and its potential risks were explained to the patients and the relatives, who consented to the procedure as well as a PCI, if indicated.

At the coronary angiogram performed from the left radial artery, a severely calcified coronary tree with chronic total occlusion of the right coronary artery was documented. The angiography showed also a sub-occlusion of the ostial left circumflex artery, followed by a critical stenosis to the proximal tract of the same vessel and an in-stent restenosis (> 50%) of the proximal left anterior descending coronary artery (Fig. 3, upper left panel). A percutaneous coronary angioplasty with multiple non-compliant balloons and releasing a drug eluting stent (DES 3 × 28 mm) from the ostium to the proximal tract of the left circumflex artery (Fig. 3, upper right panel) was performed, coupled with angioplasty with a cutting balloon for the in-stent restenosis of the left anterior descending coronary (Fig. 3, lower left panel). The final result showed a good reperfusion with TIMI (Thrombolysis In

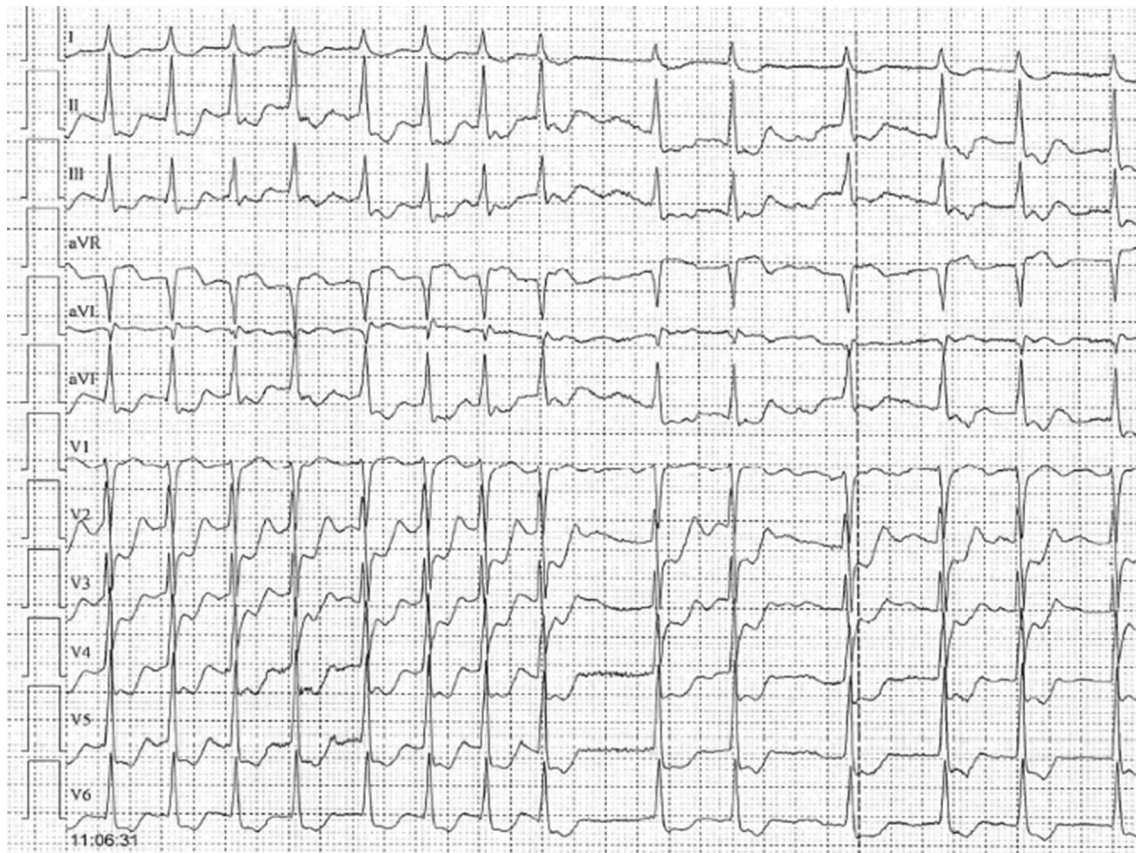


Fig. 2 12-lead ECG with atrial fibrillation and a severe and diffuse ST-segment depression with a downsloping pattern associated with ST elevation in aVR

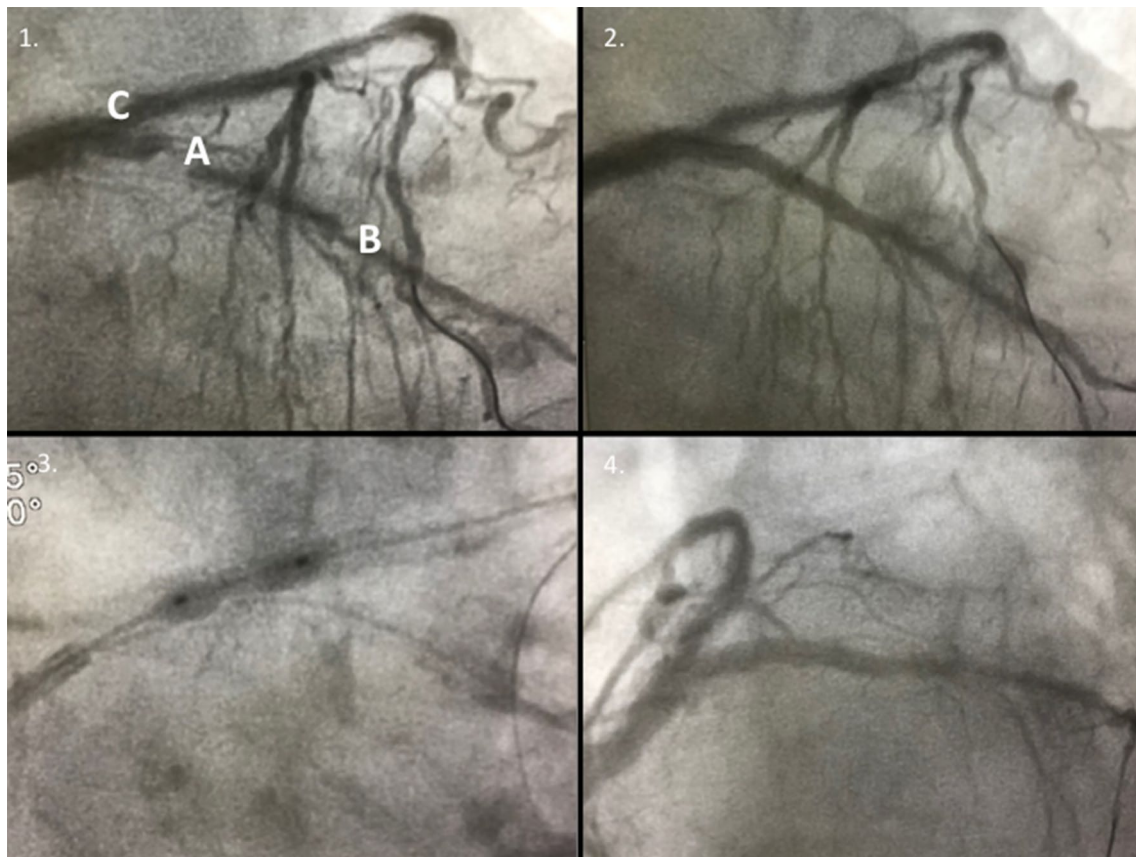


Fig. 3 Panel 1, upper left: in a caudal view 35°, severe calcified coronary artery disease with subocclusion of ostial left circumflex artery (a), critical stenosis of the proximal tract of the left circumflex artery (b). In-stent restenosis (> 50%) of the left anterior descending coronary artery (c). Panel 2, upper right: in a caudal view 35°, percutaneous coronary angioplasty (PCI) with multiple non-compliant balloons

plus drug eluting stent (DES) from the ostium to the proximal tract of the left circumflex artery. Panel 3, lower left: caudal view 35°, angioplasty with cutting balloon of the left anterior descending coronary artery. Panel 4, lower right: spider view left anterior oblique 50°/caudal 30°, final angiographic result with TIMI (Thrombolysis In Myocardial Infarction) flow 3

Myocardial Infarction) flow 3 (Fig. 3, lower right panel). At the end of the procedure, sinus rhythm spontaneously resumed.

In the following days, the general condition of the patient improved, with no more episodes of chest pain, dyspnea or fever. She was discharged after 4 days, in sinus rhythm, with clopidogrel, rivaroxaban, diuretics and low-dose beta-blockers. At 1 month after discharge the patient was asymptomatic and in stable conditions.

Discussion

Prof. Boriani

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the cause of COVID-19, a pandemic that has affected more than 2 430 000 individuals and caused nearly 170 000 deaths as of April 21, 2020 [1]. Little is known

about the impact on public health emergencies during the community outbreak of this infectious disease in terms of provision of care for acute coronary syndromes.

Despite the strenuous effort to counteract COVID-19 pandemic, it is anyway mandatory to continue to ensure appropriate care to all the patients, including the elderly, and this case of an old-old lady shows that invasive treatment of non-ST-elevation myocardial infarction can be practiced even in this complex situation of our health-care system and the patient close to 100 years of age.

The pandemic of COVID-19 infection has exerted a great pressure on Italian hospitals with an impressive increase in the burden of care associated with the need to continue to handle medical emergencies, including acute coronary syndromes. In view of the profound changes required for assisting patients with COVID-19 infection, in some regions of Italy the network of care for primary angioplasty had to be reorganized [2]. This case shows that at the time of COVID-19 pandemic, especially

in regions with the highest referral of patients with suspected COVID-19 infection, delivery of care for urgencies is highly conditioned by the need to rule out this harmful infection, especially in the most frail and vulnerable patients, such as the old-old. The difficulties in ruling out COVID-19 are related to the overlap between symptoms and presentation of this infection and cardiovascular diseases, including acute coronary syndromes [3, 4]. Consequently, the differential diagnosis of chest pain, with regard to coronary artery disease, which is particularly challenging in the female gender [5] is becoming even more complex in the presence of this pandemic.

Despite the general perception, strengthened during the COVID-19 pandemic, that elderly people, and especially the old-old, have severe outcomes in case of acute cardiovascular diseases, leading to uncertainties about the value of intensive care and invasive interventions, our case stresses the need for individualized and shared decision making, involving the patient and relatives, and not excluding percutaneous coronary intervention when the situation is highly unstable. Since few evidence-based data are available for patients with advanced or very advanced age presenting with non-ST-segment elevation myocardial infarction and a variable complexity of the clinical scenario, decision making in these patients is conditioned by a potential higher risk of complications, making much more difficult, as compared to middle age, the prediction and acceptance of the risk–benefit ratio of invasive treatments [6]. However, in very severe conditions, such as acute coronary syndromes with acute heart failure, the challenging decision to perform a coronary angiogram and a percutaneous coronary intervention may be taken even in patients close to 100 years, provided that absolute contraindications are excluded and decision making on this potentially risky option is shared with the patient and the relatives. Very limited data are available in literature on coronary angioplasty at this very advanced level of age [7, 8], and therefore individualized decision making is advised, as done in this case of very advanced age with cognitive status maintained.

In the present case, the decision for coronary angiography was done in conditions of urgency (non-ST-elevation myocardial infarction with acute heart failure) and therefore it was not possible to discuss decision making within a multidisciplinary team, involving geriatricians for a multidimensional geriatric assessment, a strategy that is advisable when feasible [9]. Our patient had a negative swab for SARS-CoV-2 and this allowed performing a coronary angiogram, adopting a personal protection equipment routinely used in catheter laboratories during the coronavirus pandemic, thus without a higher degree of protection that the same procedure, dictated by the severity of hemodynamic worsening, would have required in case of diagnosed or clinically overt COVID-19 infection.

A randomized study on primary angioplasty versus fibrinolysis in patients aged more than 75 years indicated that performing coronary angiography and primary coronary angioplasty seems to be the best approach for ST-elevation myocardial infarction even for the oldest patients [10]. This observation suggests reconsidering, at least for the elderly and when the emergency network for cardiac care is still properly functioning, the proposal of the Chinese colleagues to limit and defer the indications to coronary angiography and angioplasty, even for ST-elevation myocardial infarction, during the community outbreaks of COVID-19 infection [11].

Finally, the diagnosis and management of patients with chest pain admitted to emergency departments has always been a very challenging task [5, 12–14], but it is clear that the COVID-19 pandemic makes the process of triage and appropriate decision making even more demanding [2, 4, 15].

Conclusions

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During the worldwide emergency induced by COVID-19 infection, physicians are continuously requested to apply methods for containing and treating this infection, but they also need to maintain an adequate standard of care for the other diseases, especially for elderly patients who are vulnerable to any major illness, including coronary artery disease. Our case related to an old-old lady shows that invasive treatment of non-ST-elevation myocardial infarction can be practiced even in this situation, particularly complex for health-care provision, and even in selected patients close to 100 years of age.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest for the present work. Prof. Boriani reported speaker's fees of small amount from Biotronik, Boehringer, Boston and Medtronic outside the submitted work.

Statement of human and animal rights All the procedures performed were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from the patient for reporting her data in an anonymous form.

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