



Impact of COVID-19 on STEMI: Second youth for fibrinolysis or time to centralized approach?



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ABSTRACT

On March 11th 2020 the World Health Organization declared the pandemic infection of SARS-CoV-2 (COVID-19) and Italy was one of the most affected country. The regional Emergency Medical System (EMS) founded itself facing an exponential increase in hospitalizations with a consequent organizational system crisis. Experts from Cina, UK and US suggested to reconsider thrombolysis as the best treatment in term of balance between time consumption and operators safety for ST-segment elevation myocardial infarction (STEMI) patients respect to primary PCI (pPCI). The system reorganization consisted in a centralization of all the emergency nets: from 55 hospitals with cardiac catheterization laboratories distributed within our region offering a 24/7 service we passed to 13 Hub and 42 Spoke centres. Dedicated in-hospital paths for patients COVID positive or suspected (pCOV+) and COVID negative (pCOV-) were instituted. We analysed all consecutive patients undergoing emergency coronary angiogram from March 14 to April 14, 2020 at San Carlo Hospital in Milan comparing the two different in-hospital paths. We collected 30 STEMI patients. Eighteen patients (60%) were treated in pCOV-, while twelve patients (40%) in pCOV+. No significant differences were found among the two groups regarding key time points of STEMI care and interestingly we didn't find any treatment delay in pCOV+. In conclusion, a focused overhaul of the EMS may allow to maintain pPCI as the treatment of choice for patients and operators.

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1. Introduction

On March 11th 2020 the World Health Organization (WHO) declared the pandemic infection of SARS-CoV-2 (COVID-19). Italy was one of the most affected countries reaching 159.516 confirmed cases with 20.465 death (WHO data Report-85 April 14th 2020). Our regional Emergency Medical System (EMS) net was reorganized dividing the 55 hospital equipped with cardiac catheterization laboratories offering 24/7 service in to 13 Hub and 42 Spoke centres in order to centralize the resources. In ST-segment elevation myocardial infarction (STEMI) primary percutaneous coronary intervention (pPCI) is to date the recommended therapy [1] if the estimated time is ≤ 120 min from the diagnosis, otherwise fibrinolytic therapy must be preferred. Considering the dramatic impact of COVID-19 on emergency services, experts from China, UK and US proposed to reconsider fibrinolytic therapy as a first-

choice approach [2,3] thanks to the better balance between systems delays and workforce protection.

2. Material and methods

Our population is represented by consecutive STEMI patients undergoing emergency coronary angiography from March 14 to April 14, 2020 at San Carlo Hospital in Milan, HUB center according to EMS network reorganization. Patients were divided in 2 groups (suspected /defined and low probability/no evidence of Covid-19) at the first medical contact according to presence of at least one of the following: recent history of fever, dyspnea, cough, fatigue, gastrointestinal symptoms and contact with Covid-19 cases. All cardiac arrests were treated as suspected. The defined diagnosis of SARS-COV-2 was performed by nasal swab test immediately after pPCI. Two distinct in-hospital paths (pCOV+ and pCOV-) were identified with two different cath labs, setted up with adequate protective personal equipment (PPE). Clinical data and main time components of STEMI care were collected for all patients. The protocol was performed in accordance to the Declaration of

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Table 1
Time components of STEMI care.

	COV+ path M-SD	COV- path M-SD	p value
Symptom onset - first alarm (min)	130.11 ± 224.19	138.41 ± 234.13	0.93
Symptom onset - STEMI diagnosis (min)	162.4 ± 219.17	168.94 ± 240.04	0.94
Symptom onset - balloon (min)	227.00 ± 219.53	222.53 ± 237.05	0.48
STEMI diagnosis - balloon (min)	64.6 ± 21.48	53.59 ± 30.50	0.60
Door-to-balloon (min)	58.25 ± 42.78	35.35 ± 17.85	0.18

Abbreviations: STEMI, ST-elevation myocardial infarction.

Helsinki statements as requested by our local Ethical Committee; all the data were collected anonymously; all the patients subscribe a disclosure statement routinely for the use of personal data at the beginning of hospitalization.

All categorical variables were expressed by percentage, while continuous variables were expressed by mean ± standard deviation (M-SD).

3. Results

We analysed a total of 30 patients, 70% male, with a mean age of 64 ± 11.7 years. Clinical and demographic characteristics are: diabetes 15.9%, hypertension 36.4%, family history of coronary artery disease 13.6%, active smoke 20.5%, dyslipidaemia 9.1%, previous PCI 2.3%, previous myocardial infarction 4.5%, chronic obstructive pulmonary disease 4.5%. The first medical contact was in most cases (73.3%) with the physicians of EMS out of hospital or in the emergency department (20%). In only two cases patients were already hospitalized: one in our HUB center and the in a Spoke distant 8,2 Km from our hospital. The maximum distance planned for Spoke centers was 25 km. In 73.3% STEMI diagnosis was made in pre-hospital setting and anterior STEMI was the most represented (44.8%). Eighteen patients (60%) were treated in pCOV-, while twelve patients (40%) in pCOV+. For seven (58.3%) patients of the pCOV+ COVID-19 diagnosis was confirmed, while, among pCOV- twelve (66.7%) resulted negative, one (5.6%) was positive and five (27.8%) were not tested. No significant differences were found among the two groups regarding key time points of STEMI care (Table 1), in particular regarding STEMI diagnosis-to-balloon (64.6 ± 21.4 vs 53.59 ± 30.50 , $p = 0.60$) and door-to-balloon (58.25 ± 42.78 vs 35.35 ± 17.85 , $p = 0.18$) times.

4. Discussion

Our analysis shows that a dedicated and specific organizational approach during pandemic may be effective to maintain pPCI as the treatment of choice for STEMI patients.

After the defined diagnosis no statistically significant differences were found in all time components of STEMI care independently from the path followed. Despite the time necessary to wear the PPE, the presence of a dedicated pre-hospital path with a specific cath lab did not significantly affect the total time and allow a correct preparation of the environments and staff. From a total of 8 physicians, 16 nurses and 13 technicians two members resulted COVID-19 positive at serial test. The key point of this finding is the reorganization of the emergency system at every level which maintained in both paths the diagnosis-to-balloon and

door-to-balloon times below the limits for the consideration of a fibrinolytic therapy. In favour of this strategy there is also the fact that the real risk related to fibrinolysis in the setting of COVID-19 infection, due to secondary coagulation alterations, is not well defined [4].

5. Limitations

The sample size is too small to draw definite conclusion but are in line with recent editorial guidelines [5]. Data are referred to a specific geographical and logistic region where the public sanitary system is well developed and distances are limited. These two factors may adversely affect the results in other world regions.

6. Conclusion

While a blanket policy of pPCI during a pandemic condition might be not the right choice when applied to the usual organizational system, a complete and focused overhaul of the EMS and STEMI pathways as the one here described may allow to maintain pPCI as the treatment of choice for patients.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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