High-flow oxygen therapy in elderly patients infected with SARS-CoV2 with a contraindication for transfer to an intensive care unit

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Abstract:

In a conventional hospital ward, we used high-flow nasal oxygen (HFNO) to treat elderly COVID-19 patients non eligible for intensive care unit transfer. Of the 41 patients treated, 14 patients were weaned off HFNO (34.1%). HFNO saved the lives of one-third of elderly patients who would have systematically died.

Introduction

COVID-19 has emerged as world pandemic that has caused more than 1.3 million deaths and has infected 53 million people worldwide [1]. Severe infections occur in patients over 65 years of age who are suffering from comorbidities and most deaths have occurred in patients over 80 years of age [2]. The most common complication is severe pneumonia with acute respiratory distress syndrome requiring admission to intensive care units which availability is limited in a pandemic context.

There is uncertainty in the management of COVID-19 between the need to conduct therapeutic trials and the need to focus on the quality of care. A considerable difference has emerged in the way in which Asian and Western countries have managed the pandemic, resulting in a conflict between a pragmatic approach and an almost virtual approach to a previously unknown disease. This may largely explain the higher mortality from COVID-19 in Western countries such as France at the beginning of the outbreak, where some patients were unfortunately offered either a therapeutic trial or the prospect of doing nothing and staying at home, to await the onset of dyspnoea [3]. However, patient management was considerably improved by the quality of care when an early diagnosis was reached [4], when we evaluated "happy hypoxemia" and observed lesions by performing low-dose CT [2, 5], and when we detected coagulation disorders by measuring D-dimers independently of any antiviral treatment, regardless of whether they were are evaluated by a randomised clinical trial [2, 6]. This pragmatic approach allowed us to maintain very low mortality in our institute [2], as well as in our intensive care facility (<15%, personal data) [2, 6].

Nevertheless, one weak point remained the management of patients with comorbidities and/or who were of an age that did not allow them to be transferred to intensive care. For these patients non eligible for an ICU but who presented with refractory hypoxemia not responding to conventional oxygen support, we used high-flow nasal oxygen (HFNO) in our conventional

infectious disease ward from 15 September 2020. Here, we report the use of HFNO to manage these SARS-CoV2 patients.

Material and Methods

Patients

This study was conducted in the Institut Hospitalo-Universitaire Méditerranée Infection, Assistance Publique-Hôpitaux de Marseille (AP-HM). As previously described, we proposed early massive screening and standardised management of the patients in the day-care hospital or in one of the infectious diseases wards of our hospital (75 beds). From 15 September, we were equipped with HFNO (Airvo2®, Fisher and Paykel Healthcare, Villebon sur Yvette, France) which became a standard therapy for acute hypoxemic non-hypercapnic respiratory insufficiency. Data were retrospectively collected and analysed from 14 September to 1 November 2020. Severity was assessed using the National Early Warning Score adapted to COVID-19 patients (NEWS-2) as well as the Charlson score, as previously described [7, 8].

Inclusion criteria:

Patients had to have been not eligible for an ICU transfer due to their age and/or severe comorbidities but, prior to their infection with COVID-19, had to be living independently at home. The decision for beginning HFNO was systematically taken by both infectious disease and ICU physicians.

Ethics

The study was conducted in the Institut Hospitalo-Universitaire (IHU) Méditerranée Infection (https://www.mediterranee-infection.com/), Assistance Publique-Hôpitaux de Marseille in the south of France. Data were collected retrospectively from the routine care setting using the hospital's electronic health recording system. According to European General Data Protection Regulation No 2016/679, patients were informed of the potential use of their medical data and

that they could refuse that their data be used. The analysis of collected data followed the MR-004 reference methodology registered under No. PADS JCW2Y5 in the AP-HM register.

Results

Between 14 September 2020 and 1 December 2020, 44 patients were treated using HFNO. We excluded four patients from the analysis of which three were still on HFNO and one patient, who died, but who had a contraindication (hypercapnia) for the use of HFNO.

Of the 41 patients who were included, the median age of patients treated with HFNO was 83 years (57–94, mean: 80), and 61% (25/41) were men. Patients were admitted to our ward within a median of seven days (1-14) after the first COVID-19 symptoms appeared. The median Charlson score was 7 (1-15) and only two patients had a score < 4. In the medical history of these two patients, one suffered from Down syndrome with obstructive sleep apnoea and obesity, and the other had polycythaemia complicated by acute pulmonary embolism. The median of the NEWS-2 score [3] upon admission was 8 (3-11). The median time from admission to HFNO initiation was three days (0–9 days). The mean level of oxygen flow before initiation of HFNO was 12.5 L/min (7L/min to 15L/min). The median PaO2/FiO2 ratio was 98 (77–151) prior to HNFO initiation. C-reactive protein ranged from 28 to > 350 mg/L (mean of 144 mg/L). As of 1 December, 14 patients (34.1%) had been weaned from HFNO, and 27 patients had died (65.9%). Of the 14 patients who were weaned, the mean duration of HFNO treatment was 10 days (4-25 days). Ten of these 14 patients were transferred to a rehabilitation unit, three returned at home or to their retirement home, and one remained on the infectious disease ward and received standard oxygen supportive care (3 L/min).

We retrospectively analysed the 210 patients who died after hospitalisation in the AP-HM between 1 March and 15 September 2020. Of them, 57 patients died in the ICU, 79 patients were not eligible for HFNO because of metastatic cancer or dementia, but 74 could have benefited from HFNO in a conventional hospital ward. Considering that we were able to save

approximately one-third of these patients, we can estimate that 25 patients could have survived had this technique had been available in non-ICU wards at an earlier stage.

Discussion

Here, we demonstrate that HFNO can be used as oxygen therapy supportive care for COVID-19 infection, outside the ICU, as recently highlighted in another French cohort [9]. The specificity of our cohort is the severity of our patients non eligible for transfer to the ICU. In contrast to one recent report [9], we demonstrated that this technique may be effective in elderly patients and/or in patients with many comorbidities highlighted by an increased Charlson score, and who are contraindicated for an ICU transfer. Despite this, more than a third of such patients who would die in all cases without HFNO, were saved. In addition, patient comfort was optimised, as previously described.

This approach taken was pragmatic, focusing on improving the quality of care and outside of any randomised trial which would have been entirely unethical, given the severity of our patients' conditions and which is not useful in the context of an emerging pandemic, as previously described [10]. We chose a step-by-step implementation of our therapeutic management strategy. From the beginning of the disease, we decided to test patients at an early stage and on a massive basis, using PCR [2, 6]. Secondly, we proposed the use of an antiviral treatment, followed by anticoagulation treatment and anti-inflammatory treatment for late stages of COVID-19 infections [2, 6]. The use of HFNO is a new step in the care of these patients, further reducing mortality. In conclusion, we advocate a physician-driven approach rather than methodology-driven approach.

Issues to be addressed in the future will include a) optimising patient selection and being able to start HFNO earlier in order to increase the proportion of survivors; b) performing a long-term follow-up of elderly COVID-19 infected patients treated with HFNO.

Conflicts of interest

The authors have no conflicts of interest to declare.

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