The utility of high-flow nasal cannula oxygen therapy in the management of respiratory failure secondary to COVID-19 pneumonia

To the Editor: COVID-19 is a potentially fatal infection caused by SARS-CoV-2.[1] As of 4 May 2020, more than 6 000 cases had been confirmed in South Africa (SA) with numbers rising steadily, a situation that will place a major strain on the country's health resources, including its ability to provide intensive care and ventilatory support to patients with severe disease.[2]

Recent evidence suggests that intubation and mechanical ventilation may have limited impact on outcome, with mortality as high as 88% in one large cohort of patients in New York.[3] It has been suggested that non-invasive ventilation may be more appropriate, particularly for the so-called 'L phenotype', which is characterised by low elastance (i.e. high compliance).[4] High-flow nasal cannula (HFNC) oxygen therapy comprises an air/oxygen blender, an active humidifier, a single heated circuit, and a nasal cannula. It delivers adequately heated and humidified medical gas at up to 60 L/min of flow and is considered to have a number of physiological effects, including positive end-expiratory pressure (PEEP), reduction of anatomical dead space, a constant fraction of inspired oxygen, and adequate humidification.[5]

Following international reports of improved survival rates with non-invasive ventilation, the COVID-19 intensive care unit (ICU) at Tygerberg Hospital, Cape Town, changed its standard operating procedure in mid-April 2020 from the initially promoted 'early intubation and mechanical ventilation' to 'HFNC oxygen therapy', to avoid intubation.

The first 6 admissions to our ICU were intubated and mechanically ventilated, with the next 7 treated with initial HFNC oxygen therapy. The demographic data, comorbidities and severity indices were comparable. No patient was enrolled into a therapeutic trial. All patients (6/6) who were intubated and ventilated died, compared with 1/7 (14.2%) managed with HFNC oxygen therapy, suggesting that HFNC oxygen therapy may be associated with a lower mortality rate.

Our observations echo recent evidence.[1,3] Gattinoni *et al.*[4] have postulated that a significant proportion of patients with COVID-19 pneumonia have features not seen in acute respiratory distress syndrome (ARDS), including severe hypoxaemia with near-normal respiratory system compliance. The hypoxaemia is still poorly understood, and may be due to abnormalities of perfusion, or loss of hypoxic vasoconstriction leading to a low ventilation-to-perfusion ratio. Studies have reported that only ground-glass densities are present on computed tomography scans, primarily located subpleurally and along the lung fissures. Consequently, lung weight is only moderately increased and the recruitability remains low, as the amount of non-aerated tissue is negligible.[4] 'Traditional' invasive ventilation with high PEEP may therefore in fact lead to ventilator-induced lung injury and a worse prognosis.

It should be emphasised that a proportion of COVID-19 patients will present with a more 'classic' ARDS picture, and HFNC oxygen therapy will probably not be of benefit in these cases.[4] Moreover, HFNC oxygen therapy requires very high-flow oxygen, far higher than mechanical ventilators utilise, and the infrastructure of many hospitals may preclude the widespread use of this technology.[5]

Many clinicians initially shied away from HFNC, citing potential aerosolisation of respiratory secretions with concomitant infection control risk. New evidence suggests that HFNC oxygen is in fact associated with a low risk of airborne transmission.[6,7] To minimise transmission risk, care in a negative-pressure ventilated room is preferred. Alternatively, the patient may be nursed in a single room, or confirmed COVID-19 patients may be cohorted together. Use of appropriate personal protective equipment must be adhered to.

While HFNC oxygen therapy is by no means a panacea for severe pneumonia secondary to the SARS-CoV-2 virus, it may offer a less harmful method of ventilatory support, particularly early in the disease, and its wider utilisation should be considered in SA.

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S Afr Med J. Published online 7 May 2020. https://doi.org/10.7196/SAMJ.2020.v110i6.14882