


Case report

Trimming the need for invasive ventilation: pragmatic critical care during the COVID-19 pandemic

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SUMMARY

COVID-19 has challenged all medical professionals to optimise non-invasive positive pressure ventilation (NIV) as a means of limiting intubation. We present a case of a middle-aged man with a voluminous beard for religious reasons who developed progressive hypoxic respiratory failure secondary to COVID-19 infection which became refractory to NIV. After gaining permission to trim the patient's facial hair by engaging with the patient, his family and religious leaders, his mask fit objectively improved, his hypoxaemia markedly improved and an unnecessary intubation was avoided. Trimming of facial hair should be considered in all patients on NIV who might have any limitations with mask fit and seal that would hamper ventilation, including patients who have facial hair for religious reasons.

BACKGROUND

The COVID-19 pandemic has challenged medical professionals in a myriad of ways. With a limited amount of resources, including ventilators, intensive care beds and haemodialysis machines, health-care workers have to have a holistic approach to find any advantage that can be used to benefit their patients. One particular challenge is the management of acute hypoxic respiratory failure prior to intubation, with many patients being intubated emergently instead of ensuring effective non-invasive positive pressure ventilation (NIV).^{1,2} NIV is fraught with its own challenges including ensuring proper fit of the mask for optimal ventilation.

CASE PRESENTATION

A 65-year-old man who had a long beard for religious reasons with a history of morbid obesity, hypertension, hyperlipidaemia and diabetes mellitus type II presented following 1 week of progressive cough, dyspnoea and fevers.

On admission, his temperature was 37.2°C, pulse 110 beats per minute, blood pressure 172/80 mm Hg, respiration rate at 28 breaths per minute and oxygen saturation 89% on room air. Breath sounds were distant. Heart sounds distant, no murmur; no peripheral oedema and neck veins difficult to evaluate. Chest radiograph demonstrated bilateral multifocal opacities ([figure 1](#)). ECG demonstrated sinus tachycardia with right axis and normal corrected QT interval ([figure 2](#)). Laboratory tests included positive COVID-19 PCR and nasal swab, lymphopenia and elevated inflammatory markers



Figure 1 Chest radiograph demonstrating bilateral multifocal opacities.

including lactate dehydrogenase, C-reactive protein and D-dimer ([table 1](#)).

Oxygen saturation improved minimally on nasal cannula (NC) and his work of breathing increased. He was placed on a non-rebreather mask at 15 L of oxygen with minimal change. He was moved to a negative pressure room for administration of NIV. He was first placed on high-flow NC with 100% FiO₂ at 60 L/min without improvement. The patient's work of breathing did not improve after being placed on continuous positive airway pressure, with pressure of 10 cm of H₂O. He was finally placed on bilevel positive airway pressure (BiPAP) with inspiratory positive airway pressure (IPAP) of 15 and expiratory positive airway pressure (EPAP) of 5 cm of H₂O with 100% FiO₂ using a Phillips Respironics V60 ventilator and an oronasal mask. The patient's work of breathing significantly improved and oxygen saturation increased to 96%–98%. He was started empirically on azithromycin 500 mg and hydroxychloroquine 400 mg daily after an 800 mg initial dose according to hospital system protocol for patients with severe COVID-19 at that time. While in the emergency department, he was also given ceftriaxone 1g, empirically given rapid respiratory decompensation with uncertain impact of secondary bacterial infection and a dose of 80 mg of intravenous furosemide out of concern for mild volume overload in the setting of acute respiratory distress syndrome.

On hospital day 2, the patient was found to have increasing hypoxaemia with SpO₂ 85%–87% on BiPAP of 15/5 cm of H₂O and 100% FiO₂ despite



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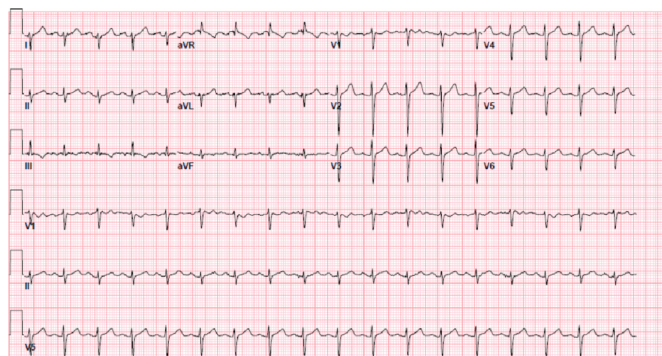


Figure 2 ECG demonstrating sinus tachycardia with right axis and normal corrected QT interval.

minimal increase in work of breathing. We noted that his large, thick beard created a significant air leak, ranging from 100 to 175 cm³ of lost tidal volume with each administered breath. We attempted repeatedly to improve the mask fit by both tightening and loosening the face mask adjustment straps with no effect. We then removed the mask entirely to allow for the mask to remould to the patient’s face with no change in unintentional leak. The patient desaturated with any decrease in IPAP or EPAP. He also quickly desaturated during the use of a nasal

mask despite attempts to minimise mouth leak. After these many efforts, we proactively communicated with the patient and, at his request, received approbation from his family and religious leaders to obtain his permission to respectfully trim >50% of his beard to facilitate optimal fit of the BiPAP face mask. We then used surgical scissors to quickly trim a copious amount of hair surrounding the area of mask fit until the cushions comfortably closed around the patient’s face with ready seal.

OUTCOME AND FOLLOW-UP

After trimming the patient’s beard, calculated air leak rapidly decreased by >50% to consistently <50 cm³ of tidal volume and his SpO₂ increased to 97%–99% on 15/5 cm of H₂O and 100% FiO₂. The patient’s PaO₂ improved from 62 to 204 mm Hg with no other intervention and prevented emergent intubation for invasive mechanical ventilation.

On hospital day 5, the patient began to have altered mental status that limited his compliance with NIV. He was intubated for airway protection and management of his hypoxic respiratory failure. The patient’s hospital course was complicated by profound COVID-19-associated encephalopathy and the need for prolonged intubation requiring tracheostomy. At the time of this writing, the patient has demonstrated minimal neurological recovery with no structural neurological abnormalities and remains mechanically ventilated.

DISCUSSION

The most recent National Institutes of Health guidelines recommend high-flow NC as initial therapy for patients with hypoxic COVID-19, with NIV and mechanical ventilation as backup. However, exuberant facial hair may hinder optimisation of non-invasive ventilation techniques both by a moustache on the upper lip for NC and a perioral beard for ventilatory masks.³ In the setting of the COVID-19 pandemic, optimal use of NIV is needed to pragmatically allocate limited reserves of intensive care beds for patients requiring mechanical ventilation.

Mask fit without unintentional leak is essential for delivery of NIV. Significant air leak around the mask causes a drop in pressure delivered to the alveoli, decreases tidal volume and can trigger patient dyssynchrony with the ventilator.⁴ Mask fit can be improved by adjusting the strap pressure, allowing the mask cushions to reseat around the face and using alternative masks such as nasal masks and helmets.^{5 6} Optimising mask fit and NIV should also include the trimming of facial hair to improve mask seal with the face. This is particularly important for the estimated 21%–33% of men who wear beards for personal or religious reasons.^{7 8}

It is crucial that medical practitioners respect a patient’s autonomy despite the trying, often urgent crises that many practitioners have faced during the coronavirus pandemic. A patient, like ours, who has capacity to make medical decisions, has the right to consent for invasive actions like shaving facial hair. However, involving his family, and religious authorities with his approval will reassure the patient over any hesitancy because of anxiety over potential religious and community ostracism and encourage his compliance with medical recommendations. It is equally important to respect a patient’s autonomy even if decisions made run contrary to medical recommendations.

This case demonstrates how appreciating personal and/or religious convictions interfering with non-invasive ventilation therapy, can be overcome with proactive discussions with the patient and, when warranted, his family, community and religious leaders can optimise clinical care and resource utilisation

Table 1 Laboratory results

	Reference range	Admission	Pretrim	Post-trim
		Day 1 20:00	Day 2 04:30	Day 3 06:00
pH	7.33–7.43	7.38	7.34	7.38
PCO ₂ (mm Hg)	40–50	34	38	34
PO ₂ (mm Hg)	20–50	85	62	204
Lactate (mmol/L)	0.5–2.2	0.8	2.4	1.8
White cell (×10 ³ /L)	4.5–11.0×10 ³	10.2	10.7	11.8
Haemoglobin (g/L)	13.9–16.3	13.3	14.1	13.8
Platelets (×10 ³ /L)	150–450×10 ³	266	331	397
Lymphocytes (×10 ³ /L)	1.0–4.5×10 ³	0.9	0.8	0.7
Sodium (mEq/L)	135–145	141	145	146
Potassium (mEq/L)	3.5–5.2	4.3	4.5	4.3
Chloride (mEq/L)	96–108	108	106	109
HCO ₃ (mEq/L)	22.0–30.0	19.9	19.4	22.2
Urea nitrogen (mg/dL)	6.0–23.0	23	43	50
Creatinine (mg/dL)	0.7–1.3	1.12	1.66	1.45
AST (U/L)	1–35	15	27	36
ALT (U/L)	1–45	28	15	21
Total bilirubin (mg/dL)	0.1–1.2	0.2	0.3	0.4
Albumin (g/dL)	3.5–4.9	3	2.9	2.7
LDH (U/L)	100–220	443	535	578
BNP (pg/mL)	0.0–100.0	<10.0		
Troponin I (ng/mL)	0.00–0.03	<0.01		
INR	1	1	1	1.1
Ferritin (ng/mL)	30–400	319	535	707
D-dimer (µg/mL)	0.0–0.5	1.31		2.51
C-reactive protein	0.0–5.0	143.2	211.6	113.8
ABO group		O–		
Procalcitonin (ng/mL)	<0.49	0.13		

Laboratory values on presentation, pretrim and post-trim. ALT, alanine transaminase; AST, aspartate transaminase; BNP, brain natriuretic peptide; INR, international normalised ratio; LDH, lactate dehydrogenase; PCO₂, partial pressure of carbon dioxide; PO₂, partial pressure of oxygen.

while respecting a patient's autonomy. Full beards are frequent in Islam, Hinduism, traditional Christianity, Orthodox Judaism, Mormonism and Sikhism. Excessive sensitivity to a patient's facial hair, whether for vanity, virility or religious reasons, can be interfered with effective facial masks for NIV used to treat acute respiratory failure. However, with sensitivity to the patient's autonomy, medical professionals can initiate a discussion regarding respectful trimming of their facial hair to improve oxygenation and avoid unnecessary intubation.

Learning points

- ▶ Trimming or shaving facial hair is a useful way to optimise non-invasive ventilation in cases of respiratory failure in which immediate intubation is not the preferred option.
- ▶ All patients should be presented with the option to shave their facial hair despite possible religious reasons for wearing a beard.
- ▶ Medical providers should remain willing to communicate with religious and community leaders on behalf of a patient despite constraints on time in the critical care setting.
- ▶ Respecting patient autonomy must remain foremost during medical care despite challenges presented by the coronavirus.

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