Case Report

The occasional challenge in a rural setting: COVID-19 intubations in patients living with obesity

Denise Jaworsky, MD[1,2,3], Adrien F. Tennent, MD[2], Derek A. Sargent, MD[2,3]

[1]Northern Medical Program, University of Northern British Columbia, BC, Canada, [2]Mills Memorial Hospital, Northern Health, BC, Canada, [3]Faculty of Medicine, University of British Columbia, BC, Canada

Correspondence to: Denise Jaworsky, denise.jaworsky@unbc.ca

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INTRODUCTION

COVID-19 has unique implications for rural Canadian communities where resource limitations influence clinical decision-making. We describe an approach we used when two individuals with an anticipated difficult airway (due to obesity) required intubation for COVID-19–associated respiratory failure. We offer an approach and technique that was successful in our facility and offer practical suggestions for practitioners in other rural/remote communities. We recognise that all rural locations are unique with different resources. We offer these suggestions with the expectation that adaptations would be needed depending on the setting.

Our setting

Our hospital is in a community of 12,000 with a small intensive care unit (ICU) and capacity of up to two mechanically ventilated patients. There is no tertiary care centre within 500 km of our community. ICU care is provided exclusively by general internists (2 local and 3 regular visiting) and anaesthesia care is provided exclusively by general practitioner anaesthetists (GPAs) (3 permanent, supported by occasional locums).

We serve as the COVID-19 and critical care referral centre for multiple primary care hospitals in our region. We receive patients by road (1–4 h) and air (fixed-wing and helicopter). Most ambulance services in our area do not have critical care capacity, and a physician escort is needed for critically ill transfers. Due to our remoteness, transfers from our centre to a tertiary care centre occur exclusively by air ambulance.

CASE HISTORY

Our hospital received two patients with COVID-19 pneumonia with severe hypoxemic respiratory distress. Both individuals were living with obesity (body mass index 55–65 m/kg^2).

Pre-hospital transport

Before transport to our facility, a collaborative discussion was held among the sending, receiving and transporting physicians to determine

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if the first individual should be intubated before transfer. Given the risk of further deterioration after intubation and an anticipated difficult airway, a decision was made to transfer the patient to our facility on non-rebreather face mask plus additional oxygen via nasal prong, as needed. Full personal protective equipment was indicated, including a properly fitted N95 mask for all members involved in the transfer. In one case, two ambulances meeting half way were deployed for a single patient: one from the sending community with the patient, a physician, and two basic life support paramedics and a second ambulance from the receiving community with two basic life support paramedics and additional tanks of oxygen.

Making the decision to intubate

Upon arrival at our hospital, both patients were stabilised on high-flow nasal cannula (60 L/min, 100% FiO_2) plus supplemental oxygen via non-rebreather face mask (up to 15 L/min). Their work of breathing improved, peripheral oxygen saturation was maintained around 86%–88% and they had no signs of tissue/end organ hypoxia. Worsening oxygenation was anticipated such that intubation would be required within 24–48 h, given the patients were marginally compensating with maximal oxygen supplementation. This decision was supported by telephone consultation with a regional intensivist. Key components of our approach included:

1. On-going telephone consultation with a regional intensivist and close communication with the tertiary care centre for support and subsequent transfer of care
2. Early involvement of GPA on call
3. Early involvement of a second GPA to assist
4. Planned, controlled intubation before imminent respiratory failure
    a. Pre-emptive insertion of central venous catheter and arterial line before intubation
    b. Intubation by GPA with second GPA assisting and critical care nurse supporting
    c. Second critical care nurse and internist donned and ready in PPE outside of room.

Alternatives to invasive ventilation

For severely hypoxic COVID-19 patients at risk of respiratory failure, there are limited alternative options aside from invasive mechanical ventilation. It is our practice to use high-flow nasal cannula to improve tissue oxygenation and reduce work of breathing. If this is insufficient, we proceed with invasive ventilation if it is consistent with the patient's goals of care. Furthermore, severely hypoxic patients are difficult to transfer without invasive ventilation.

Non-invasive measures such as BiPAP have been used in the treatment of COVID-19 pneumonia, but our region has not been using this modality due to limitations in negative pressure rooms and concerns over barotrauma, and thus, we would not recommend this modality for rural centres unless there are strong operator comfort and appropriate infection control resources. In Europe, observational studies have reported considerable success using helmet continuous positive airway pressure devices (CPAP) in COVID-19 pneumonia.[1] This modality allows for the delivery of positive end-expiratory pressure (PEEP) which can improve oxygenation and has lower risk of transmission compared to conventional CPAP. Helmet CPAP therapy could be helpful in rural settings to stabilise a patient in a centre with limited experience with intubation. Unfortunately, helmet CPAP devices are not Health Canada approved nor are they readily available in Canada outside of research studies.

Intubation considerations and details

Our considerations around intubation included protection of healthcare workers from COVID-19 exposure, potential rapid desaturation during apnoea, given obesity and increased metabolic demand, potential for hypoxic cardiac arrest, difficult mask ventilation during apnoea, potential difficult intubation and anticipated challenges with mechanical ventilation post-intubation, given chest wall mechanics, ventilation-perfusion mismatch and shunting.

As standard procedure for COVID-19 intubations, we used properly fitted N95 masks, donning and doffing procedures with a buddy check system, in a negative pressure room. We took care to minimise patient coughing and ventilation circuit disconnects. We avoided bag mask ventilation and used a clamp to occlude the circuit during disconnections. We pre-emptively

inserted a central venous catheter and arterial line before intubation for intravenous access and monitoring during and after intubation. This was a recommendation from the regional intensivist, and it greatly facilitated medication administration and monitoring during and after intubation.

Airway management was optimised by placing the patients in Semi-Fowler position, with the head in a ramped position (with pillows) as standard procedure for obese patients. We addressed our concerns regarding desaturation during apnoea by maintaining spontaneous breathing until it was known that the endotracheal tube could easily pass through the vocal cords. This assurance was made by awake intubation facilitated by dexmedetomidine sedation (dexmedetomidine 0.5 mcg/kg ideal body weight, over 10 min followed by 0.5 mcg/kg/h), airway topicalisation with lidocaine (spray to oral pharynx), application of viscous lidocaine by tongue depressors and liquid injection at the vocal cords upon visualisation by video laryngoscope[2] (glidescope). The goal was to minimise coughing and barotrauma while maintaining spontaneous breathing. Induction of anaesthesia (ketamine 2 mg/kg), including paralysis (rocuronium 1.2 mg/kg ideal body weight), was performed only after the vocal cords were in view on the video laryngoscope and the endotracheal tube was positioned in the oral pharynx ready for advancement into the trachea.

Before induction, we pre-set the ventilator with standby settings including a high PEEP, 100% FiO_2 and lung protective volumes (6 cc/kg ideal body weight as per ARDSNET tables) and frequency exceeding the patient's spontaneous rate. This approach was successful in mitigating prolonged desaturation. Our nadir saturation was a SpO_2 of 76% with recovery to baseline in the subsequent 5–10 min after initiation of mechanical ventilation.

Both patients were intubated safely using the same technique. They were transferred to a tertiary care centre in stable condition. No healthcare worker COVID-19 infections have been linked to either case.

Additional planning to prepare for potential complications

The management plan for a potential hypoxic cardiac arrest included ensuring a crash cart was available, and central venous access was placed with a prepared vasopressor (norepinephrine) ready for infusion to manage hemodynamic instability. A second physician was pre-selected as the code team leader, allowing the GPA to continue with airway management if an arrest occurred. In addition, the donned team members outside the room were available to prone the patients if necessary.

The back-up airway plan reflected standard difficult airway literature, including an airway bridging device (laryngeal mask airway), video bronchoscopy and an available front of neck airway access kit.

DISCUSSION

Considerations included anticipation of (1) a difficult airway, (2) no further pre-oxygenation options, (3) poor tolerability of any apnoeic period,[3] (4) difficult ventilation and (5) a challenging secondary and surgical airway. Furthermore, reverting to an emergency airway or a hypoxic arrest would likely result in higher occupational risk than the topicalisation for the awake visualisation. This article does not aim to endorse any particular intubation technique but rather highlights the importance of careful planning that considers healthcare worker safety, patient safety, local resources and operator comfort.

KEY POINTS

1. Early identification of individuals at risk of decompensation in remote/rural communities is essential to ensure that they can be assessed for the need for ventilatory support before their condition becomes critical. Communication with local and regional specialists can be helpful to develop a collaborative plan around timing of transfer and intubation
2. While preferable to transfer decompensating patients out of rural/remote areas early, before the need for intubation, this may not always be possible. Rural/remote hospitals should have adequate supplies (e.g., central lines, arterial lines, range of induction and sedation agents) and training so that resuscitation can be done in the safest way possible
3. Frequent communication among local team members and supporting tertiary care sites

are helpful to develop a safe collaborative care plan
4. Rural hospitals should maximise the use of locally available resources and expertise to provide COVID-19 care in challenging cases. Although much of the literature around COVID-19 intubation recommends that the most skilled operator performs the intubation, we would advocate that low-volume sites should involve the two most skilled operators, where safely available
5. Rural hospitals are an important part of the COVID-19 response, and there is a need for more literature discussing strategies to respond to COVID-19 in these communities.

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