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Extubation of patients with COVID-19

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Editor - Recommendations for anaesthetic management of patients with COVID-19 have recently been published.¹⁻³ These guidelines emphasise techniques for safe tracheal intubation and it has been recommended that all COVID-19 patients be intubated using a rapid sequence induction². However, we are not aware of published recommendations for minimising aerosolization and droplet expulsion during extubation.

Extubation is an aerosol-generating procedure, commonly associated with coughing, which necessitates proximity of the anaesthetist to the patient.³ Significantly, patients requiring intubation for respiratory failure or emergency surgery are likely to remain infective at the time of extubation⁴. Leaving COVID-19 patients intubated after emergency surgery provides the best protection against coughing and aerosolisation. Complications of prolonged ventilation and resource constraints during the SARS-CoV-2 pandemic make this strategy inappropriate. The following is a summary of our extubation guidelines for COVID-19 patients including description of an extubation technique aimed at minimising staff exposure to SARS-CoV-2.

Pre-extubation planning

Parameters for assessing suitability for extubation after general anaesthesia are well described.⁵ This assessment is critical as commonly used rescue strategies are complicated by increased risk of exposure to healthcare workers. Specific considerations include:

- Strategies for supporting respiration after extubation, such as noninvasive ventilation and high-flow nasal oxygen, are relatively contraindicated due to their ability to aerosolise SARS-CoV-2.³
- Extubation should ideally take place in a negative pressure room, if available.

- All non-essential staff should exit the room prior to extubation.²
- Personal protective equipment (PPE) with airborne precautions are required during extubation, and for personnel entering the room for at least 30 min after extubation.^{6,7}
- Limit the need for subsequent staff interactions with:
 - o Prophylactic anti-emetics.⁸
 - o Adequate analgesia, consider regional anaesthesia.
- Perform oropharyngeal suction with vigilance as this may generate aerosols.⁹
- Antitussive drugs such as remifentanyl, lidocaine and dexmedetomidine reduce the risk of coughing and minimise agitation on extubation.^{10, 11}

Extubation technique

We have developed a technique to minimise exposure of staff in proximity during extubation. The “Mask Over Tube” technique described below uses a second airway filter. The second airway filter is critical to ensuring that disconnecting the circuit on extubation does not allow the anaesthetist to be exposed directly to droplets or aerosols produced by extubation or associated coughing.

Exchange for a supraglottic airway (laryngeal mask airway) prior to emergence from anaesthesia could be considered as an alternative technique for reducing the risk of coughing. We do not recommend this technique because of the risk of exposure to infective secretions during the additional airway interventions, and manipulation of a supraglottic airway may trigger coughing or laryngospasm.

“Mask Over Tube” extubation (Figure 1)

- Position the patient 30° head up.
- Anaesthetist and assistant positioned behind the patient’s head, attempting to avoid exposure to any coughing.
- Optimise anaesthetic facemask seal (prior to induction of general anaesthesia the anaesthetist will have ensured correct facemask size, adjusted inflation of mask cuff, shaved any facial hair).
- Attach a *second* airway filter to the facemask. The CO₂ sampling port should be capped.
- Position the tracheal tube (TT) to one side of the mouth, closest to the anaesthetic assistant’s position for extubation.
- Position the facemask with second airway filter, using a two-handed technique to ensure a seal over the mouth and nose with the TT exiting under the facemask.
- No positive airway pressure during extubation: ventilator off with no or low fresh gas flow. Consider attempting to extubate at end-expiration.
- Deflate TT cuff and extubate while maintaining facemask seal.
- Discard TT and connect circuit to the second airway filter facemask to the anaesthetic circuit (in the operating theatre) or the non-rebreather valve of a self-expanding bag (in the intensive care unit).
- Maintain a two-handed mask seal until regular breathing via the circuit and any immediate post-extubation coughing has subsided.

Post-extubation

- Place a surgical mask on the patient once the anaesthetic facemask is no longer required. Supplemental oxygen can be delivered under a surgical mask via nasal prongs.
- Staff members should confirm that PPE integrity has been maintained.⁸
- Doffing should only occur once the patient has been handed over to another staff member. The room requires airborne precautions for at least 30 min after an aerosol generating procedure such as extubation⁷.

Complications

- The ability to communicate and make rapid changes to plans is inhibited by PPE.⁴ Therefore it is critical that the airway team discuss possible complications and plan specific roles prior to extubation.
- If laryngospasm occurs, consider early use of pharmacological agents to treat the spasm and avoid or minimise need for positive pressure ventilation.
- If apnoea occurs after extubation necessitating positive pressure support, consider bag mask ventilation with a two-handed technique, attempting to minimise positive pressure with small tidal volumes.

The extubation technique described here requires minimal extra equipment (one airway filter). A potential risk of the technique is kinking of the TT where it is directed under the mask, although this problem has not occurred during our mannequin testing. We did consider alternative techniques including passing the TT through the port of a standard

facemask, or the self-sealing port of a bronchoscopy facemask, but those methods involve clamping the TT to remove the connector, and were not always possible depending on the exact geometry of the mask. We have found the mask-over-tube extubation technique simple to adopt and teach, and it can be practiced during extubation of elective patients without COVID-19. Strict adherence to PPE is essential for reducing the risk of viral transmission to healthcare providers, however techniques to reduce droplets and aerosolisation are also strongly recommended. The technique we describe for extubation could reduce the risk to anaesthesia providers.

Authors' contributions

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All authors read and approved the final version of the manuscript.

Declarations of interests

All authors declare that they have no conflicts of interest.

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