

Review Article

Anesthesia for oral surgeries during the COVID-19 pandemic

Sheila N. Myatra, Sushan Gupta, Prathamesh S. Pai¹

Departments of Anaesthesiology, Critical Care and Pain and ¹Head and Neck Surgical Oncology, Tata Memorial Hospital, Homi Bhabha National Institute, Mumbai, Maharashtra, India

Abstract

The severe acute respiratory syndrome corona virus 2(SARS-Cov2) virus replicates in the nasal cavity, nasopharynx, and the oropharynx. During oral surgery, the risk of viral transmission is high during instrumentation in these areas, while performing airway management procedures, the oral surgery itself, and related procedures. During the corona virus disease 2019 (COVID-19) pandemic, patients with an oral pathology usually present for emergency procedures. However, patients with oral cancer, being a semi-emergency, may also present for diagnostic and therapeutic procedures. When elective surgeries are resumed, these patients will come to the operating room. In asymptomatic patients, the false-negative rate can be as high as 30%. These patients are a source of infection to the healthcare workers and other patients. This mandates universal precautions to be taken for all patients presenting for surgery. Lesions along the airway, distorted anatomy secondary to cancer therapy, shared airway with the surgeon, surgical handling of the airway and the risk of bleeding, make airway management challenging in these patients, especially while wearing personal protective equipment. Airway management procedures, oral surgery, use of cautery, and other powered surgical instruments in the aero digestive tract, along with constant suctioning are a source of significant aerosol generation, further adding to the risk of viral transmission. Maintaining patient safety, while protecting the healthcare workers from getting infected during oral surgery is paramount. Meticulous advance planning and team preparation are essential. In this review, we discuss the challenges and recommendations for safe anesthesia practice for oral surgery during the COVID-19 pandemic, with special emphasis on risk mitigation.

Keywords: Anesthesia for oral surgeries, COVID-19 pandemic, oral surgeries in COVID-19 patients, SARS coronavirus 2

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and the associated coronavirus disease 2019 (COVID-19) has emerged as a global pandemic, resulting in unprecedented pressures on the healthcare systems globally.^[1] Elderly individuals and those with serious underlying medical

conditions might be at higher risk for severe illness from COVID-19.^[2] Cancer is in itself a high risk for severe illness with COVID-19, with a study in 928 cancer patients showing significantly higher 30-day all-cause mortality in those with general risk factors and moderate or poor Eastern Cooperative Oncology Group (ECOG) performance status.^[3]

SARS-CoV-2 virus replicates in the nasal cavity, nasopharynx, and the oropharynx. The maximum viral load is present in the respiratory tract and procedures involving the respiratory tract cause major aerosolization of the virus.^[4] Thus, the risk of viral transmission might be higher with instrumentation in these areas during airway procedures (tracheal intubation, bronchoscopy, tracheostomy) and while performing oral surgery.^[5] Most patients presenting to the operating room (OR) during the pandemic are for an emergency procedure or a tracheostomy. When elective surgeries are resumed, patients with oral pathologies will present to the OR. These patients may be asymptomatic or prodromal. In asymptomatic patients, the false-negative rate can be as high as 30%.^[6] These patients are a significant source of infection to the healthcare workers and other patients.^[7] This mandates universal precautions for all patients presenting to the OR.^[8]

All this notwithstanding, cancer is a semi-emergency and patients will present for diagnostic, therapeutic, or emergency procedures. A recent study from our center, Tata Memorial Hospital, showed favorable outcomes in 494 patients who underwent major elective cancer surgeries, thereby supporting the continuation of elective major cancer surgery during the COVID-19 pandemic.^[9] There are recent safe practice recommendations for head and neck surgical oncology practice in the setting of acute severe resource constraints during the COVID-19 pandemic by the Head and Neck Cancer International Group (HNCIG), a collaboration of 20 national clinical trial groups for head and neck cancer in which Tata Memorial Hospital has contributed.^[10]

Airway management in a patient presenting for elective or emergent oral procedures poses a unique challenge to the anesthesiologist. Lesions along the airway, distorted anatomy secondary to cancer therapy, shared airway with the surgeon, surgical handling of the airway and the risk of bleeding, make airway management challenging in these patients, especially while wearing personal protective equipment (PPE).

Airway procedures, oral surgery, use of cautery, and other powered surgical instruments in the aerodigestive tract, along with constant suctioning are a source of significant aerosol generation, further adding to the risk of viral transmission.

In this review, we discuss the challenges and recommendations for safe anesthesia practice during oral surgery including tonsillectomy, intraoral wide excisions, and transoral laser resections during the COVID-19 pandemic, with special emphasis on risk mitigation.

How Does the Virus Spread in the Operating Room?

The SARS-CoV-2 is a single-stranded enveloped RNA virus with a diameter of 100–160nm.^[11] This virus can be transmitted in an OR by one of these methods:

1. Direct spread via inhalation of respiratory droplets (size >5-10µm) when the patient speaks, coughs or sneezes
2. Generation of aerosol (airborne droplet) particles: Airway instrumentation can cause aerosolization of the respiratory droplets from the patient, which tends to remain in the air for about 2–3 hours or longer
3. Spread via contact of an infected inanimate object: The virus can enter via touching of face, nose, or eye.^[12] The infectious bigger droplets tend to fall quickly over the surface and have a shorter half-life.

A surgical mask worn by the patient can significantly reduce this viral transmission via droplets. The N-95 mask is effective against aerosols and significantly better than surgical masks in case of a droplet mode of infection.

What is an Aerosol Generating Procedure (AGP)?

The Centre for Disease Control (CDC) defines an aerosol

Address for correspondence: Prof. Sheila N. Myatra,
Department of Anaesthesiology, Critical Care and Pain,
Tata Memorial Hospital, Dr. Ernest Borges Road, Parel,
Mumbai - 400 012, Maharashtra, India.
E-mail: sheila150@hotmail.com

Access this article online	
Quick Response Code:	Website: www.joacp.org
	DOI: 10.4103/joacp.JOACP_355_20

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Myatra SN, Gupta S, Pai PS. Anesthesia for oral surgeries during the COVID-19 pandemic. *J Anaesthesiol Clin Pharmacol* 2020;36:S96-104.

Submitted: 19-Jun-2020 **Revised:** 27-Jun-2020 **Accepted:** 04-Jul-2020
Published: 31-Jul-2020

generating procedure (AGP) as one that generates a higher concentration of fine airborne droplets called aerosols. Procedures involving the respiratory tract are associated with significant aerosolization.⁴⁾ While larger droplets tend to quickly fall on the ground, smaller droplets (<5µm) can float in the air for several hours and can also remain active on surfaces for a longer time.^[13]

The AGPs commonly performed by anesthesiologists, include, noninvasive ventilation (NIV), high flow nasal cannula oxygen (HFNO), mask ventilation, nebulization, bronchoscopy, tracheal intubation, extubation, and tracheostomy. These are commonly performed procedures, especially during the management of a difficult airway, as may be the case in a patient presenting for oral surgery.

Theoretically, these aerosols can pass through pores of a surgical mask, thus such procedures require the use of the N-95 mask protection or higher. The risk of infection from an AGP is even more with prolonged exposure, poor infection control compliance, such as poor hand-washing, inadequate spacing, and the ineffective use of PPE.^[14]

Aerosol Generation during Surgery

Aerosols are generated with the use of powered surgical devices such as the cautery, drill, micro-debriders, saw, and ultrasonic devices.^[14-16] Use of these devices in the upper airway during surgical procedures poses a significant threat to the spread of the virus.^[16] When the laser is used for excision of oral lesions, the plumes generated have been shown to contain viable viral load, which can infect the healthcare personnel in the OR. Covering the microscope and the patients with a transparent plastic drape may help contain the aerosols generated, which can be sucked out using the laser plume extractor.

Personal Protective Equipment (PPE)

The PPE acts as a barrier device in protecting the OR personnel and preventing them from becoming a carrier of viral droplets generated during the surgery. It also prevents cross-contamination from infected patients. The PPE includes a fluid impervious coverall/gown, a cap, goggles, a fit-tested N-95 mask, a double layer of gloves, a head hood or a full-face shield and long shoe covers.^[17,18] If available, a full face shield respirators or powered air purifying respirators (PAPRs) may be used instead of the N-95 masks. A surgical mask reduces this viral transmission via droplets, while the N-95 mask is also effective against aerosols. The WHO recommends the use of airborne, droplet, and contact precaution when aerosol-generating procedures are performed.^[18]

The amount of risk depends on the total viral load in respiratory secretions and the duration of exposure. Hence, despite the use of PPE, healthcare workers should limit the time period in close proximity of an infected patient. It is essential to have a separate designated area for performing supervised donning and doffing to minimize self-contamination and have minimal contamination of the OR and surrounding areas.

Operating Room Preparation

The ORs are routinely positive pressure areas (5–10 cm H₂O). However, a negative pressure OR is preferred, as it prevents the spread of the virus outside the room. Changing from an existing positive to a negative pressure system if feasible should be done in advance after consultation with engineers. Increasing the air exchanges in the OR should be considered. Each “air exchange” removes approximately 63% of the potentially virus bearing aerosols in the air.^[19] Thus, after five air exchanges, <1% of the original aerosol load is left in the room. Scavenging of anesthetic and expired gases from the anesthesia machine via an appropriate exhaust is required. The OR door must be kept closed at all times. The information and understanding of the number of OR air exchanges will help plan the safe time interval required before entering the OR for the next surgery.

Additional requirements in the OR, specifically for use during the pandemic include two heat and moisture exchanging filters (HMEF) to prevent contamination of the breathing circuit and the anesthesia machine, a videolaryngoscope (VL), closed tracheal suction system, barrier devices like a transparent sheet or a customized intubation box (optional) and disinfectant solutions like 1% sodium hypochlorite or as per the institutional policy.

A standby airway cart bearing additional airway equipment that may be required, such as alternate size end tracheal tube (ETT), masks, oral/nasal airways, rescue airway equipment etc. should be available just outside the OR to avoid contamination.

Team Preparation

Avoid having healthcare workers with comorbidities, immunocompromised status, pregnancy, and advanced age as part of the OR Team. Advance teaching and training of all OR team personnel in the proper performance of hand sanitization, donning, and doffing of PPE is essential for preventing cross-contamination. Prior simulation-based training in the OR wearing full PPE with the use of patient

barrier devices (if planned) is essential to prepare for airway management using unfamiliar and modified techniques.

Barrier devices may be used during aerosol-generating procedures like tracheal intubation, mask ventilation, extubation, bronchoscopy, etc. Though widely used, there is no evidence regarding the efficacy of these barrier devices in reducing aerosol spread. A recent study showed that the aerosol boxes may increase intubation time and therefore expose patients to the risk of hypoxia. In addition, they may cause damage to conventional PPE, placing the airway operator at risk of infection.^[20]

There may be significant cognitive dysfunction while performing airway management using PPE, which may affect performance, hence advanced practice is essential. Communication after donning PPE is challenging, especially in the use of critical language during an airway emergency, which can occur while dealing with patients with a difficult airway for oral surgery.^[21] Advance training in the use of sign language may be useful to overcome this.

Factors for Prioritization of Head and Neck Cancer Patients for Surgery

The HNCIG has developed consensus practice recommendations for head and neck surgical oncology that can be applied globally in the setting of severely constrained resources during this pandemic. They identified the five most important factors to be considered for prioritization of surgery to be based on. likelihood of tumor progression due to delay in surgery. COVID-19 status of the patient, (risk to the patient, other patients, and staff). disease prognosis. availability of infrastructure to operate on patients with COVID-19 and the availability and effectiveness of alternative treatments.^[10]

Patient Assessment and Preparation

Patients with oral cancer are usually elderly with associated comorbidities. Advanced age and comorbidities are associated with adverse outcomes in COVID-19 patients. Most of these patients may also be malnourished, anemic secondary to dysphagia, chronic inflammation or chemotherapy, adding to the increased risk of postoperative morbidity.^[22] In addition, tobacco chewing and smoking may further cause cardiorespiratory compromise.

Previous cancer therapies

History of previous cancer therapies must be noted in patients with oral cancer. Prior surgery or radiation to the head and

neck region can make airway management in these patients difficult. This may be secondary to distorted anatomy, trismus, post-radiation edema, and fibrosis. Such patients may require awake tracheal intubation (ATI), which is associated with significant aerosol generation. Prior chemotherapy can cause end-organ damage, thus cardiac, renal, and coagulation systems should be assessed.

Airway assessment

A careful history of progressive dysphagia, hoarseness of voice, breathlessness might give an important clue regarding airway compromise. In patients with oral cancer, a primary tumor along the airway, prior radiation or surgical therapy, poor submental compliance, trismus, ankyloglossia, and poor dentition all contribute towards an anticipated difficult airway. Airway imaging studies like CT scan, X-ray, previous direct or indirect laryngoscopy, help in assessing the extent of the tumor, and the expected difficulty in securing the airway. Based on the airway assessment, a plan for securing the airway (awake or asleep) should be made by the anesthesiologist with the surgical team.

Patient preparation

PPE should be worn while examining the patient. Awake patients should be made to wear a surgical face mask and directly transferred to the OR bypassing the preoperative holding area. Recent studies have shown that povidone-iodine (0.23-1%) gargles and nasal drops administered prior to transfer to the OR significantly reduces viral load in the oro and nasopharynx.^[23] Povidone-iodine has multimodal activity against pathogens. It targets the structure needed for viral replication and survival.

Tracheal Intubation Procedure

It is important to have all essential items readily available to the airway operator prior to administering general anesthesia. To increase the chance of first-pass success during airway management, the most experienced airway operator among the team members should perform TI. Minimize the airway management team (preferably two persons). Only essential staff should be present in the OR at the time of tracheal intubation. All team members should be briefed about specific patient concerns, their specific role, airway management strategy, and airway rescue plan. The method of communication after donning PPE should be discussed.

Preoxygenation

- The patients should be wearing a surgical mask and covered with a transparent plastic sheet or an intubation box (if used) while on the OR table
- An HMEF is attached between the breathing circuit and the mask and another one is attached between the

expiratory limb of the breathing circuit and the anesthesia machine. The side stream capnography tubing is attached to the machine end of the HMEF

- Position the patient appropriately. Minimize the time between removal of the patient's mask and the application of the face mask
- Preoxygenation with 100% oxygen for 3–5 minutes using a tight-fitting face mask and a two-hand technique with tidal volume breathing using a closed circuit is recommended. Preoxygenation with HFNO and NIV should be avoided
- Continuous waveform capnography should preferably be used during pre-oxygenation. A triangular rather than a square end-tidal carbon dioxide (EtCO₂) trace or a low numerical EtCO₂ value during preoxygenation, may indicate a leak around the face mask and should prompt interventions to improve the seal.^[24]

Induction of general anesthesia

- Rapid sequence induction (RSI) is the preferred method to avoid mask ventilation and facilitate faster tracheal intubation^[25-27]
- Appropriate doses of rapidly acting neuromuscular blocking drugs like rocuronium or suxamethonium should be used to achieve complete muscle relaxation
- Cricoid pressure should be avoided if the patient is adequately fasted. Use of cricoid pressure makes the assistant lean closer to the patient's airway, thereby increasing the risk of exposure to aerosols^[24]
- Avoid mask ventilation to prevent aerosol generation, unless the oxygen saturation (SpO₂) goes below 95%. Mask ventilation if required should be done with a tight mask fit using a two-hand technique to prevent leaks around the face mask. Apneic oxygenation with HFNO should be avoided.^[8]

Tracheal intubation

- VL assisted tracheal intubation is recommended to keep the face away from the oral cavity and increase the chance of first pass intubation success. It is preferable to preload the ETT with a stylet or use a bougie as appropriate
- After tracheal intubation, the ETT cuff should be inflated and the HMEF connected directly to the ETT. Ensure that there is no leak around the ETT cuff
- Mechanical ventilation should be initiated only after the ETT cuff is inflated. Confirm ETT placement in the trachea using waveform capnography. The use of a stethoscope is not feasible while wearing PPE.

Disposal and decontamination of contaminated equipment

Single-use items should be immediately discarded in the

appropriate disposal bags and reusable items dropped into the container with disinfectant solution, without touching them elsewhere.

Unanticipated Difficult Airway Management

In case an unanticipated difficult airway is encountered during the first attempt at tracheal intubation, the guidelines for unanticipated difficult airway in adults during the COVID-19 pandemic may be followed to ensure patient safety while minimizing the risk of cross-infection.^[8,24,26]

When faced with an unanticipated difficult airway, avoid using HFNO and face mask ventilation with a leak, as they may lead to aerosol generation. A two-person two-hand technique should be preferred for mask ventilation. Two further attempts at tracheal intubation are recommended only if the SpO₂ is $\geq 95\%$ with intermittent mask ventilation performed only if the SpO₂ is $< 95\%$.^[8] Further attempts at tracheal intubation should be done using a VL.

The use of a second-generation supraglottic airway (SGA) is recommended in case of a failed tracheal intubation. Awakening the patients should be preferred after established ventilation with an SGA. Avoid tracheal intubation through the SGA and performing a tracheostomy, as they are high AGPs. In the event of a complete ventilation failure, it is recommended to proceed with a surgical cricothyroidotomy. Avoid a needle cricothyroidotomy with the use of jet ventilation as this may increase the chances of aerosol spread.^[8]

Precautions during General Anesthesia to Prevent Viral Spread

- Maintain an adequate depth of anesthesia and neuromuscular blockade throughout the surgical procedure to avoid any bucking or coughing
- Avoid unnecessary disconnection of the ETT and the breathing circuit during mechanical ventilation
- If a circuit disconnection is required, put the anesthesia machine on a standby mode. Keep the HMEF connected to the ETT during disconnection. However, if an HMEF change is required or a tracheal aspirate needs to be collected, clamping the ETT transiently may be considered
- If a self-inflating bag needs to be used for manual ventilation, attach it to the machine end of the HMEF
- Tracheal suction should be done using a closed suction system at all times.

Awake Tracheal Intubation

An awake tracheal intubation (ATI) is associated with significant aerosol generation and thus should be avoided if possible. However, it might be necessary in case of an anticipated difficult airway, where induction of anesthesia before securing the airway might be considered unsafe for the patient. Anesthetizing the airway using local anesthetic techniques is challenging. There is a potential risk of aerosol generation with all the techniques. Thus, these should be performed with the use of PPE, after weighing the benefits and the risks of the local anesthetic technique. Nebulization is best avoided as it is considered as an AGP. It is important to keep in mind that even after anesthetizing the airway, the patient may still cough during the procedure resulting in a potential aerosol generation. In addition, the use of a flexible bronchoscope may itself take time, increasing the risk of viral transmission. If feasible, awake VL aided tracheal intubation (TI) should be preferred over TI using a flexible bronchoscope, as it is associated with shorter TI time.^[28]

Proper planning, preparation, and execution of the procedure is required to ensure patient and operator safety. Modification of techniques to reduce aerosol generation and spread is required. The goal should be to minimize TI time, reduce aerosol generation, and prevent aerosol transmission. Adequate sedation and other measures might be necessary to suppress the cough reflex and allay the patient's anxiety. Dexmedetomidine or remifentanyl infusion are preferred for their favorable pharmacokinetics. Adequate counseling and optimal level of sedation increases the success rate and decreases the procedural time.

The postoperative airway of patients undergoing oral surgery can be managed using a tracheostomy or a delayed extubation strategy. Delayed extubation usually involves keeping the patient intubated overnight and extubating the patient in the morning. This decision is usually based on the extent of surgical resection and the reduction in airway caliber due to a bulky flap.

Elective or Emergency Tracheostomy

Tracheostomy is an AGP performed either as an emergency or an elective procedure in an intubated patient. It is preferable to perform a tracheostomy in the OR. The OR personnel should be reduced to minimal during the procedure. Different size tracheostomy tubes should be readily available. Only cuffed, nonfenestrated tracheostomy tubes should be used. An experienced surgeon should perform this procedure to reduce the time required.

The patient should be given 100% oxygen through ETT to increase the safe apnea time during tracheostomy. The depth

of anesthesia should be adequate to prevent patients from coughing or bucking. As the surgeon dissects the anterior wall of the trachea, and the trachea is opened, mechanical ventilation should be stopped. The anesthesiologist should deflate the cuff of the ETT and withdraw it partially to allow the surgeon to place the tracheostomy tube into the trachea. The tracheostomy tube should be pushed distally and cuff hyper-inflated to avoid any air leak. The anesthesia circuit with the viral filter should be attached to the tracheostomy tube. Mechanical ventilation should commence once after a closed system is established. The tracheal position of the tracheostomy tube should be confirmed by the presence of capnography tracing.

Tracheal Extubation

Tracheal extubation is a higher AGP than tracheal intubation and should be done with all precautions as used during tracheal intubation. A deeper plane of anesthesia should be preferred during extubation if airway compromise is not a risk. Pharmacological methods may be used to avoid coughing and agitation. Tracheal suction should be performed only if required, using a closed suction system. Alternately, the anesthesiologist can pass the face mask over the ETT to cover the mouth during tracheal extubation to reduce the risk of aerosol spread in case of coughing. Airway manipulation and the use of airway exchange catheters should be avoided.

Following major oral surgery, most patients are kept intubated overnight to maintain airway patency while allowing time for the airway edema to settle. Healthcare workers should wear the recommended PPE with an N-95 mask while managing these patients in the recovery room/ICU. Patients should be adequately sedated overnight to avoid anxiety and coughing while the tube is in situ. A closed tracheal suction should be used and suction performed only if required. Nebulization being an AGP should be avoided and metered dose inhalers should be used instead. The ETT cuff should not be deflated for tracheal extubation until the staff are adequately protected. Tracheal extubation should be carried out using the same precautions as in the OR.

Management of a Patient with a Tracheostomy

It is preferable to have a separate area in the ward dedicated to patients with a tracheostomy. In a tracheotomized patient, extreme care should be exercised during patient transfer in and out of the OR to prevent viral transmission. Gauze pieces or a bib may be placed above the tracheostomy tube to limit the release of respiratory droplets to the surrounding, especially

during coughing. If a tracheostomy tube change is required, full PPE should be worn. The tracheostomy tube cuff should not be deflated until the surrounding healthcare staff are adequately protected. A cuffed tracheostomy tube should be changed to an uncuffed tracheostomy tube only when the patient is confirmed to be COVID-19 negative.

Care during Routine Oral Surgery

Tonsillectomy is the most commonly performed oral surgery in the pediatric age group. The tonsils can harbor a high viral load, making tonsillectomy a high-risk procedure for cross-infection. The concerns for administering general anesthesia are the pediatric age group, upper respiratory tract infection, bleeding tendency, and the risk of a postoperative bleed. Children with COVID-19 may have a reactive airway, adding to the risk of perioperative airway compromise. Agents with lesser airway irritation should be preferred for the induction of anesthesia.

The main concern while managing a patient for tonsillectomy is to ensure minimal disconnection of the anesthesia circuit and avoid any air leak. A south-pole tube may be preferred with laryngeal packing. It provides an advantage for easy ventilation when the Boyle–Davis gag is used. Closed suction should be preferred, even for clot extraction. Tracheal extubation in a deeper plane of anesthesia in a lateral position may be considered. In the case of rebleeding, large-bore intravenous access for rapid resuscitation, smaller size ETT, lateral position, and rapid tracheal intubation are necessary. Similar precautions should be followed while resecuring the airway as mentioned earlier.

The Do's and Don'ts for perioperative management of patients for oral surgery during the COVID-19 pandemic are summarized in Table 1.

Conclusion

The SARS-CoV-2 pandemic and the COVID-19 disease has resulted in unprecedented pressures on the healthcare systems globally. Maintaining patient safety, while protecting the healthcare workers from getting infected during oral surgery is paramount. Meticulous preparation of the OR and the team in advance is essential. Preparing a team of surgeons, anesthesiologists, nurses, and other healthcare personnel who understand and implement measures to mitigate the spread of the virus in the perioperative period, especially during tracheal intubation, oral surgery, extubation, and tracheostomy may help achieve this goal.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. World Health Organization. WHO Director-General's Opening Remarks at the Media Briefing on COVID-19—11 March 2020. Geneva, Switzerland: World Health Organization; 2020.
2. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *J Autoimmun* 2020;109:102433.
3. Kuderer NM, Choueiri TK, Shah DP, Shyr Y, Rubinstein SM, Rivera DR, *et al.* Clinical impact of COVID-19 on patients with cancer (CCC19): A cohort study. *Lancet* 2020;395:1907-18.
4. Wang W, Xu Y, Gao R, Lu R, Han K, Wu G, *et al.* Detection of SARS-CoV-2 in different types of clinical specimens. *JAMA* 2020;323:1843-4.
5. Day AT, Sher DJ, Lee RC, Truelson JM, Myers LL, Sumer BD, *et al.* Head and neck oncology during the COVID-19 pandemic: Reconsidering traditional treatment paradigms in light of new surgical and other multilevel risks. *Oral Oncol* 2020;105:104684.
6. Wikramaratna P, Paton RS, Ghafari M, Lourenco J. Estimating false-negative detection rate of SARS-CoV-2 by RT-PCR. *medRxiv* 2020. doi: 10.1101/2020.04.05.20053355.
7. Rothe C, Schunk M, Sothmann P, Bretzel G, Froeschl G, Wallrauch C, *et al.* Transmission of 2019-nCoV Infection from an asymptomatic contact in Germany. *N Engl J Med* 2020;382:970-1.
8. Patwa A, Shah A, Garg R, Divatia J, Kundra P, Doctor J, *et al.* All India difficult airway association (AIDAA) consensus guidelines for airway management in the operating room during the COVID-19 pandemic. *Indian J Anaesth* 2020;64:107-15.
9. Shrikhande SV, Pai PS, Bhandare MS, Bakshi G, Chaukar DA, Chaturvedi P, *et al.* Outcomes of elective major cancer surgery during COVID 19 at Tata Memorial Centre: Implications for cancer care policy. *Ann Surg* 2020. doi: 10.1097/sla.0000000000004116.
10. Mehanna H, Hardman JC, Shenson JA, Abou-Foul AK, Topf MC, AlFalasi M, *et al.* Recommendations for head and neck surgical oncology practice in a setting of acute severe resource constraint during the COVID-19 pandemic: An international consensus. *Lancet Oncol* 2020;21:e350-9.
11. Salata C, Calistri A, Parolin C, Palù G. Coronaviruses: A paradigm of new emerging zoonotic diseases. *Pathog Dis* 2019;77:ftaa006.
12. Adhikari SP, Meng S, Wu YJ, Mao YP, Ye RX, Wang QZ, *et al.* Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: A scoping review. *Infect Dis Poverty* 2020;9:29.
13. van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN, *et al.* Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. *N Engl J Med* 2020;382:1564-7.
14. Tran K, Cimon K, Severn M, Pessoa-Silva CL, Conly J. Aerosol generating procedures and risk of transmission of acute respiratory infections to healthcare workers: A systematic review. *PLoS One* 2012;7:e35797.
15. Zheng MH, Boni L, Fingerhut A. Minimally invasive surgery and the novel coronavirus outbreak: Lessons learned in China and Italy. *Ann Surg* 2020;272:e5-6.
16. Zou L, Ruan F, Huang M, Liang L, Huang H, Hong Z, *et al.* SARS-CoV-2 viral load in upper respiratory specimens of infected patients. *N Engl J Med* 2020;382:1177-9.

Table 1: Do's and don'ts for perioperative management of patients for oral surgery during the COVID-19 pandemic

Steps	Do'S	Don'ts
Preparation		
Operating Room (OR) preparation	Negative pressure OR if feasible Increase the number of air exchanges Keep the OR door closed	Positive pressure OR
Team preparation	Training in proper hand hygiene, donning and doffing of personal protective equipment (PPE) Simulation-based training in communication and procedures in OR wearing full PPE Preferably two anesthesiologists (one experienced in airway management) Wear appropriate PPE Team briefing before the procedure	Healthcare workers with advanced age, immunocompromised status and pregnancy in the team Nonessential staff inside the OR
Patient preparation	The patient should wear a surgical mask Transfer the patient directly from the isolation ward to the OR Examine the patient wearing full PPE The patient may be covered with a transparent plastic sheet/customized intubation box before tracheal intubation (TI)	Patient waiting in the holding area with other noninfected patients
Tracheal intubation and extubation procedure		
Pre-oxygenation	A heat and moisture exchange filter (HMEF) attached between the breathing circuit and the mask and another one attached between the expiratory limb of the breathing circuit and the anesthesia machine Side-stream capnography tubing is attached to the machine end of the HMEF Two-hand technique for mask holding with a good seal Use waveform capnography to monitor for leaks	Increased interval between removal of surgical mask and placement of the face mask Use of noninvasive ventilation (NIV) Use of high flow nasal oxygen (HFNO)
Induction of anaesthesia	Rapid sequence intubation Use adequate doses of rocuronium or suxamethonium	Cricoid pressure Bag-mask ventilation Use of HFNO
Tracheal intubation (TI)	Performed by the most experienced operator Use a videolaryngoscope Initiate mechanical ventilation only after inflating the cuff of the endotracheal tube (ETT) Use waveform capnography to confirm the tracheal placement of the ETT	Repeated attempts at TI Use of a stethoscope
Airway rescue	Mask ventilation only if required (two-person two-hand technique should be preferred) Second generation supraglottic airway device in case of a failed TI Surgical cricothyroidotomy if there is complete ventilation failure	Use of HFNO Face mask ventilation with a leak More than three attempts at TI Needle cricothyrotomy and jet ventilation
During general anaesthesia	Maintain an adequate depth of anesthesia and neuromuscular blockade Keep the HMEF connected to the ETT during breathing circuit disconnection Use a closed tracheal suction system	Unnecessary disconnection of the ETT and the breathing circuit
Tracheal intubation and extubation procedure		
Extubation	Same level of protection as TI Active measures to prevent agitation, coughing, and emesis Prefer to defer tracheal extubation if there are concerns of extubation failure	Airway manipulation and the use of airway exchange catheters Unnecessary tracheal suction Nebulization
Awake tracheal intubation (ATI)	Avoid ATI if possible Adequate counseling, sedation and other measures to avoid anxiety, agitation, coughing, and emesis Minimize the time taken for ATI	Use of HFNO Use of nebulization Multiple attempts at ATI
Care during surgical procedures		
Use of powered surgical devices	Airborne precautions during the use of cautery, laser, micro-debriders, saw, etc.	Non-essential operation room staff inside the OR
Tracheostomy	Should be performed by an experienced surgeon The tracheostomy tube should be pushed distally and the cuff hyperinflated Start ventilation only once a closed circuit is established with the tracheostomy tube cuff inflated	Disconnection of the breathing circuit during the tracheostomy Mechanical ventilation when the ETT is being withdrawn and the tracheostomy tube is inserted Use of an uncuffed tracheostomy tube

17. Cook TM. Personal protective equipment during the coronavirus disease (COVID) 2019 pandemic-a narrative review. *Anaesthesia* 2020;75:920-7.
18. Lockhart SL, Duggan LV, Wax RS, Saad S, Grocott HP. Personal protective equipment (PPE) for both anesthesiologists and other airway managers: Principles and practice during the COVID-19 pandemic. *Can J Anaesth* 2020;67:1005-15.
19. Coia JE, Ritchie L, Adishes A, Makison Booth C, Bradley C, Bunyan D, *et al.* Guidance on the use of respiratory and facial protection equipment. *J Hosp Infect* 2013;85:170-82.
20. Begley JL, Lavery KE, Nickson CP, Brewster DJ. The aerosol box for intubation in coronavirus disease 2019 patients: An in-situ simulation crossover study. *Anaesthesia* 2020. doi: 10.1111/anae.15115.
21. Myatra SN, Patwa A, Divatia JV. Critical language during an airway emergency: Time to rethink terminology? *Indian J Anaesth* 2020;64:275-9.
22. Hill JB, Patel A, Del Corral GA, Sexton KW, Ehrenfeld JM, Guillaumondegui OD, *et al.* Preoperative anemia predicts thrombosis and free flap failure in microvascular reconstruction. *Ann Plast Surg* 2012;69:364-7.
23. Eggers M, Koburger-Janssen T, Eickmann M, Zorn J. *In vitro* bactericidal and virucidal efficacy of povidone-iodine gargle/mouthwash against respiratory and oral tract pathogens. *Infect Dis Ther* 2018;7:249-59.
24. Brewster DJ, Chrimes NC, Do TB, Fraser K, Groombridge CJ, Higgs A, *et al.* Consensus statement: Safe Airway Society principles of airway management and tracheal intubation specific to the COVID-19 adult patient group. *Med J Aust* 2020;212:472-81.
25. Yao W, Wang T, Jiang B, Gao F, Wang L, Zheng H, *et al.* Emergency tracheal intubation in 202 patients with COVID-19 in Wuhan, China: Lessons learnt and international expert recommendations. *Br J Anaesth* 2020;125:e28-37.
26. Cook TM, El-Boghdady K, McGuire B, McNarry AF, Patel A, Higgs A. Consensus guidelines for managing the airway in patients with COVID-19: Guidelines from the Difficult Airway Society, the Association of Anaesthetists the Intensive Care Society, the Faculty of Intensive Care Medicine and the Royal College of Anaesthetists. *Anaesthesia* 2020;75:785-99.
27. Luo M, Cao S, Wei L, Tang R, Hong S, Liu R, *et al.* Precautions for intubating patients with COVID-19. *Anesthesiology* 2020;132:1616-8.
28. Jiang J, Ma DX, Li B, Wu AS, Xue FS. Videolaryngoscopy versus fiberoptic bronchoscope for awake intubation - a systematic review and meta-analysis of randomized controlled trials. *Ther Clin Risk Manag* 2018;14:1955-63.