



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Review Article

Facial Trauma Management during the COVID-19 era: a primer for surgeons



Suhani Ghai

Department of Oral and Maxillofacial Surgery, People's Dental Academy, People's University, Karond By-Pass, Bhanpur, Bhopal, 462 037, India

ARTICLE INFO

Article history:

Received 3 June 2020

Accepted 14 July 2020

Available online 21 July 2020

Keywords:

COVID-19

SARS-CoV-2

Emergency

Trauma

OMFS

ABSTRACT

Coronavirus disease 2019 (COVID-19) caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) has caused more than 6.1 million confirmed cases of COVID-19 in more than 188 countries, and has caused more than 370,000 deaths globally as of June 1, 2020. In addition, thousands of healthcare workers have also got infected with the virus. COVID-19 patients release large amounts of infectious viral particles in form of droplets from cough, sneeze and respiratory secretions. These droplets are the main modes of transmission of COVID-19. This mode of transmission puts the healthcare professionals at an increased risk of infection, especially from asymptomatic patients. As a result, during the current pandemic, most routine surgeries all around the world have been suspended, and only emergency surgeries are being performed. Facial trauma surgery is one such emergency surgery that cannot be delayed or suspended even in this pandemic. This review focuses on precautions surgeons have to take while managing facial trauma patients in the emergency department and while performing emergency surgeries on these patients during the current COVID-19 pandemic.

© 2020 Sir Ganga Ram Hospital. Published by Elsevier, a division of RELX India, Pvt. Ltd. All rights reserved.

1. Introduction

The World Health Organization (WHO) has officially declared the current outbreak of Coronavirus disease 2019 (COVID-19) caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) as a pandemic.¹ This disease which originated from Wuhan, China in December 2019, as of June 1, 2020, has caused more than 6.1 million confirmed cases of COVID-19 in more than 188 countries, and has caused more than 370,000 deaths globally.² In addition, till the middle of April 2020, more than nine thousand healthcare workers in United States have been infected, accounting for 19% of total number of patients data available with the CDC.³

The asymptomatic incubation period for patients with COVID-19 has been reported to be 1–14 days.⁴ During the symptomatic phase, the main symptoms are fever, dry cough, fatigue, myalgia and dyspnea, but many patients of COVID-19 remain asymptomatic or have only inconspicuous flu like symptoms.⁵ During the early phase of infection, whether asymptomatic or symptomatic, patients of COVID-19 release large amounts of infectious viral particles in form of droplets from cough, sneeze and respiratory secretions. These

droplets are the main modes of transmission of COVID-19.⁶ This mode of transmission puts the healthcare professionals at an increased risk of infection, especially from asymptomatic patients. As a result, during the current pandemic, most routine surgeries all around the world, have been suspended, and only emergency surgeries are being performed.⁷ Facial trauma surgery is one such emergency surgery that cannot be delayed or suspended even in this pandemic.

Although most of the facial trauma occurs due to road traffic accidents and sports injuries, which may have reduced during the current lockdown due to COVID-19 pandemic, however, facial injuries due to falls and assaults due to domestic violence continue to occur with same frequency as before. Surgeons managing facial trauma, such as oral and maxillo-facial surgeons, head and neck surgeons, and plastic surgeons are routinely needed in emergency departments, not only to manage facial trauma cases, but also to triage patients, perform swab testing for COVID-19, and help to intubate difficult facial trauma patients.⁸ Almost all surgical procedures performed on facial trauma patients require intimate contact with naso-oro-pharyngeal region which carry high viral load SARS-CoV-2, if the patient is positive for COVID-19.⁶ This review will focus on precautions surgeons have to take while managing facial trauma patients in the emergency department and

E-mail address: suhanighai@gmail.com.

while performing emergency surgeries on these patients during the current COVID-19 pandemic.

2. Methods

Published articles and guidelines were searched from PubMed, Google Scholar, Cochrane database, and peer-reviewed ahead-of-print publications. Multiple search terms were employed (independently and in combination with the Boolean method) as a broad net for capturing relevant publications, including facial trauma, COVID-19, SARS-CoV-2, guidelines, respiratory precautions, personal protective equipment, and aerosolization. Regarding specific equipment, such as PPE, specifications published by the manufacturers were also reviewed.

3. Facial trauma case in emergency department

During the current COVID-19 pandemic, every patient who arrives in the emergency department for any reason should be assumed to be positive for COVID-19, till it is proved otherwise by appropriate history, examination, and tests if required. When a patient of facial trauma arrives in the emergency department, every precaution should be taken to ensure prevention of infection to the surgeon, emergency unit staff and other healthcare providers. The emergency resident and staff should wear proper personal protective equipment (PPE), and keeping in mind the current shortage of PPE kits, every effort should be made to limit or avoid unnecessary visits by other healthcare professionals, whose services are not immediately needed in the emergency department. This can be done by evaluating and managing the trauma patients by the emergency resident himself and proper documentation of the history, examination findings, photos and the radiographs. Discussions with the surgeon can be done over audio or video calls, and digital technology can be used for sharing patient's history and examination notes, photographs, blood reports and radiological images. With the teleguidance of the surgeon, soft tissue and minor facial injuries can be managed by the emergency resident and staff without the physical involvement the surgeon. During the current pandemic, telecounseling and triaging of patients is the need of the hour, to prevent unnecessary exposure of scarce healthcare providers, and to avoid unnecessary quarantine of the emergency healthcare providers.

In cases of major facial injuries, when physical examination of the patient of facial trauma by the surgeon becomes imperative, the availability of PPE for the facial trauma surgeon becomes essential. The physical examination by surgeon involves very close contact with patient's head and neck before any surgical procedure can be planned. As naso-oro-pharyngeal region carries a high viral load of SARS-CoV-2, extreme precaution is needed.⁹ In addition, surgeon needs to be familiar with proper donning and doffing techniques of the PPE kits.

4. Triaging the facial trauma patients from emergency department

Since there is high risk of infection in management of facial trauma owing to the high viral load in the oral cavity and naso-oro-pharyngeal region, triaging the patients to decide the type of personal protection and treatment plays an important role in the current pandemic.

Generally, the facial trauma patients can be triaged into three groups depending on the nature and extent of injury: Patients requiring urgent surgeries; patients requiring semi-urgent surgeries; and patients requiring delayed surgeries.

When emergency surgery has to be performed in cases of life-

threatening traumas, and the COVID-19 status of the patient cannot be immediately tested, **extreme** airborne precautions are recommended during the emergency surgery. These include powered air purifying respirator (PAPR), fluid-resistant gown, and surgical gloves.¹⁰ If not available, as in countries with limited resources, **enhanced** airborne precautions should be taken using N95 mask, face shield/eye protection, fluid-resistant gown, caps and surgical gloves.^{10,11}

There may be facial injuries which are less urgent but nevertheless have to be managed like in cases where delayed management might lead to infection, permanent functional and esthetic deformity. In such cases COVID-19 testing can be performed. The Stanford University protocol recommends 48 h of pre-operative testing that includes two COVID-19 tests done 24 h apart. In case both the tests are negative, **enhanced** airborne precautions can be used. In case either one test is positive, **extreme** airborne precautions should be undertaken.¹² The detection of nucleic acid of SARS-CoV-2 shows high false negative rate and therefore caution must always be exercised.¹³

In cases where there is no emergency, the patients should be observed, treated in the emergency department as outpatients and/or treated electively. Patients should be thoroughly informed and be counseled regarding the on-going pandemic and risk-benefit ratio of delaying the treatment.

5. Emergency surgery on facial trauma patients with unknown or positive COVID-19 status

During surgery, only absolutely required number of healthcare providers, including anesthetic team and nursing staff should be allowed inside operating room. All operators should wear the required PPE, double gloves and perform hand hygiene. If PAPR is not available, a FFP3 mask with visors or goggles should be worn especially while operating on infected patients. Eye protection is important due to the susceptibility of conjunctiva to viral transmission.¹⁴ All patients should also be wearing masks if feasible to reduce the risk of cross-infection.

All surgical procedures should be streamlined, and surgery should be well-planned. The number and types of surgical equipment should be reduced. It is imperative that intubation for general anesthesia be done by an experienced doctor to avoid unneeded exposure to patient's fluids and generation of aerosols during endotracheal intubation.¹⁵ A good use of muscle relaxants can reduce choking during intubation and subsequently the release of viral particles. At the time of intubation and extubation, the surgical team should be best present outside the OR. After intubation, the waiting time before entering the OR should be approximately 20 min. It is so because after intubation, which is an aerosol generating procedure (AGP), the virus could be present in air; and based on OR air exchange per hour, 99% of pathogens clear in approximately 14 min and 99.9% by 21 min.¹⁶ Surgery should be performed in the negative pressure operating room to minimize dissemination of virus.¹⁷

Since facial trauma surgery involves the naso-oro-pharyngeal region, these are the sites where SARS-CoV-2 is found in high concentration. The surgical sites might be contaminated. It is advised to use scalpel or ultrasonic scalpel wherever feasible as they generate no or less surgical smoke.¹⁸ Since COVID-19 infection is droplet infection, it may easily spread through aerosols and droplets of contaminated fluid. Electrosurgical equipments produce smoke and aerosols, therefore, when they are used, powerful suction should be used to prevent dissemination of surgical aerosols and smoke.

Whether SARS-CoV-2 has aerosol transmission or not is still debatable but WHO recommends airborne precautions for

circumstances and settings in which aerosol generating procedures are performed after risk assessment.¹⁵ Airborne transmission of COVID-19 may be possible during i.e., endotracheal intubation, open suctioning, manual ventilation before intubation, turning the patient to the prone position, disconnecting the patient from the ventilator, non-invasive positive-pressure ventilation, tracheostomy, and cardiopulmonary resuscitation.¹⁵

Another method to reduce the viral load is the use of mouth rinses prior to surgery. The use of 1% hydrogen peroxide or 0.2% povidone iodine in addition to commonly used mouth rinses is recommended.⁶ This reduces the salivary load of SARS-CoV-2 in patients as it appears to be sensitive to oxidation and thus these mouthwashes can be used before procedure.

The surgeon must be careful while removing the PPE in order to prevent contamination of personal clothing and hand. Doffing procedure should be adequately performed and hand disinfection should be done after complete removal of PPE.

If possible, majority of the equipment inside the OR should be disposable. All other equipment and OR should be sterilized after surgery and such instruments should be handled as biohazardous. The waste material should be disposed-off in infectious-risk health waste (IRHW) containers.

6. Site-specific management of facial trauma in patients with unknown or positive COVID-19 status

For managing a particular fracture, calculated clinical decision based on clinical presentation, fracture pattern, invasiveness of operative procedure, condition of the patient, feasibility of secondary correction, risk–benefit ratio and availability of resources is required.

Fractures of the **maxilla and mandible** are high risk fractures and should be managed as conservatively as possible. These fractures when operated under GA require nasal intubation which is a high risk procedure.^{15,19} Mildly displaced closed mandibular fracture and those which are stable after closed reduction can be treated by inter-maxillary fixation (IMF). They are immobilized using self-drilling IMFscrews followed by IMF. Interdental wiring should be avoided as it involves a great risk of contamination during application and removal.

Unstable fractures with airway compromise, comminuted mandibular fractures, displaced mandibular fractures, segmented maxillary fractures and those with palatal spilt might have significant morbidity if treatment is held back and will result in difficult secondary reconstruction.⁹ Displaced mandibular fractures, displaced low condylar fractures, displaced and segmented maxillary LeFort I fractures and dentoalveolar fractures might have unpredictable result of secondary reconstruction if management is delayed. Therefore a calculated clinical decision based on clinical presentation as to the risk, modified by the fracture pattern, and operative procedure is required.⁹

If ORIF is necessary, then such fractures should be approached from a transcutaneous approach and intraoral incisions should be avoided. Mucosal incisions should be made with scalpel and electrocautery should be eluded. For hemostasis bipolar cautery should be used at lowest power setting.¹⁶ Self-drilling screws should be used but if drilling is required, battery-powered low-speed drill should be used with limited irrigation.¹⁶ In maxilla Carroll-Girard screw should be considered for reduction if two point fixation provides acceptable stabilization.¹⁶ Power saw should be replaced

with osteotome in cases where osteotomy is required.

Nasal fractures should be urgently managed in case of uncontrollable active bleeding or septal hematoma. Naso-orbito-ethmoid fractures and grossly displaced nasal bone fractures results in disruption of bony morphology, which is difficult to restore when treatment is delayed.⁹ All the other cases of nasal fractures should be considered for elective management. Endoscopic nasal examination and endoscopic procedures should also be avoided. Whenever the surgeon manipulates the nose, topical medication for intranasal vasoconstriction and anesthesia should be applied intranasally using pledgets as nasal sprays increase the risk of aerosolization of virus and nasal secretions.²⁰ Oxymetazoline in combination with 4% lidocaine provides efficient nasal anesthesia and vasoconstriction.

The vast majority of **zygomaticomaxillary complex fractures** do not require active management. After evaluating the risk–benefit ratio, these fractures should be electively managed especially in cases of mild facial esthetic deformities. Zygomatic arch fractures with bone and muscle impingement with difficulty in mouth opening could be considered for urgent management. Significantly segmented zygomatic body fractures and significantly displaced zygoma fractures should also be addressed timely as they might result in concomitant soft and bony tissue changes which are difficult to treat.⁹

Most **orbital fractures** can be also managed in a delayed fashion. Orbital fractures requiring immediate intervention include those with elevated intra-ocular pressure, extra-ocular muscle entrapment (trap door fractures), oculocardiac reflex, progressive loss of vision, superior orbital fissure syndrome or orbital apex syndrome etc.^{10,21}

Patients with anterior **skull base fractures** with CSF leak can be monitored or operated depending on severity and clinical discretion of the surgeon. Anterior table frontal sinus fractures can be electively managed as secondary repair with grafts or mesh produces predictable outcome.⁹

Patients with extensive soft tissue injuries, facial nerve transection, contaminated lacerations, open fractures and those whose delayed management might compromise with patient's health and esthetics should be addressed emergently/urgently. A summary is provided in [Table 1](#).

7. Tracheostomy in patients with unknown or positive COVID-19 status

Emergency and elective tracheostomy is a commonly performed procedure in oral and maxillofacial surgery. COVID-19 testing should be done in all patients prior to elective tracheostomy.

For emergency tracheostomy, when COVID-19 status of the patient is unknown or positive, all healthcare persons involved in tracheostomy should wear PPE including N95 masks, goggles, protective clothing, caps and gloves during the procedure. Open or percutaneous tracheostomy can be performed depending on the situation and discretion of the surgeon. An open tracheostomy, has less risk for aerosolization and is therefore preferred.^{10,16} Endotracheal tube should be advanced before the tracheostomy window is made and all precautions should be taken to avoid the piercing of cuff or tube. To prevent aerosolizing the virus a non-fenestrated tube with cuff should be used. Ventilation should be ceased before trachea is incised to prevent aerosolization and cuff should be checked before resuming ventilation.¹⁶ Use of bipolar cautery

Table 1
Site-specific management of Facial Trauma in Patients with Unknown or Positive COVID-19 Status.

	Conservative management	Immediate management	Management may be delayed with unpredictable outcome	Elective
Maxilla/Mandible	<ul style="list-style-type: none"> Mildly displaced fracture 	<ul style="list-style-type: none"> Unstable fractures Comminuted mandibular fractures Displaced mandibular fractures Segmented maxillary fractures and those with palatal split 	<ul style="list-style-type: none"> Displaced mandibular fractures Displaced low condylar fractures Displaced and segmented maxillary LeFort I fractures Dentoalveolar fractures 	
Nasal	<ul style="list-style-type: none"> Uncontrollable active bleeding Septal hematoma 	<ul style="list-style-type: none"> Naso-orbito-ethmoid fractures Grossly displaced nasal bone fractures Zygomatic arch fractures with bone and muscle impingement with difficulty in mouth opening 	<ul style="list-style-type: none"> All other fractures 	
Zygomaticomaxillary complex		<ul style="list-style-type: none"> Significantly segmented zygomatic body fractures and significantly displaced zygoma fractures 	<ul style="list-style-type: none"> Mild facial esthetic deformities 	
Orbital fractures		<ul style="list-style-type: none"> Orbital injuries with elevated intra-ocular pressure, extra-ocular muscle entrapment (trap door fractures), oculocardiac reflex, progressive loss of vision, superior orbital fissure syndrome or orbital apex syndrome 		
Other Injuries		<ul style="list-style-type: none"> Extensive soft tissue injuries, facial nerve transection, contaminated lacerations, open fractures 	<ul style="list-style-type: none"> Anterior table fractures 	<ul style="list-style-type: none"> frontal sinus

and closed suctioning systems is preferred. Greater vigilance is required to prevent virus transmission from COVID 19 positive patients and therefore it is prudent to keep tracheostomy tube cuff properly inflated, performing in-line suctioning, maintaining a closed circuit, and rescheduling routine post-tracheostomy changes until COVID-19 status becomes negative.^{10,22}

8. Post-operative care of patients with unknown or positive COVID-19 status

COVID 19 positive/unconfirmed patients must be kept in isolation wards post-operatively. Asymptomatic patients and COVID-19 negative patients should also be kept preferably isolated or at a distance from other patients during the current pandemic to reduce the risk of them getting infected and reducing cross-infection. Post-operatively, the surgeons should still wear masks, goggles, protective clothing and disposable gloves as patients infected with SARS-CoV-2 including asymptomatic virus carriers, can spread virus while coughing and sneezing. Thus, the respiratory secretions of the patient can be a potential source of infection for healthcare providers. Hand hygiene using alcohol based hand scrubs and sanitizers, before and after visiting the patient should be mandatory.

After discharging the patient, short term follow-ups of the patient should be avoided and telecommunication should be encouraged.

9. Conclusion

The current COVID-19 pandemic has taken a toll on the medical fraternity including the head and neck surgeons, who are at the top of the pyramid of healthcare professionals at risk of getting infected. The existing and future surgical practice needs to undergo some drastic changes in dealing with the patients while ensuring health safety for all including patients and healthcare providers. To provide the best care to the facial trauma patients, the surgeons have to make decisions regarding the treatment priority based on patients' condition and available resources. There are various challenges as the patient handling has become strenuous. The surgeons need to abide by some principles like, properly assessing the risk, ensuring patient and healthcare provider safety, providing necessary and optimal care to the patient while preserving the vital resources, adopting a low-transmission approach, following personal safety using PPE, adopting proper hand hygiene, following universal precaution and practicing of work ethics.

Funding

The author declares that there is no funding received.

Declaration of competing interest

The author declares no potential conflicts of interest with respect of research, authorship and/or publication of this article.

References

- WHO. Director-General's Opening Remarks at the Media Briefing on COVID-19—11 March 2020. <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19--11-march-2020>. Accessed March 12, 2020.
- COVID-19 Map. Johns Hopkins Coronavirus Resource Center. <https://coronavirus.jhu.edu/map.html>. Accessed June 1, 2020.
- CDC COVID-19 Response Team. Characteristics of health care personnel with COVID-19 - United States, February 12–April 9, 2020. *MMWR Morb Mortal Wkly Rep.* 2020;69(15):477–481. <https://doi.org/10.15585/>

- mmwr.mm6915e6.
4. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*. 2020;395(10223):497–506. [https://doi.org/10.1016/S0140-6736\(20\)30183-5](https://doi.org/10.1016/S0140-6736(20)30183-5).
 5. Kaul D. An overview of coronaviruses including the SARS-2 coronavirus - molecular biology, epidemiology and clinical implications. *Curr Med Res Pract*. April 9 2020;10:54–64. <https://doi.org/10.1016/j.cmrp.2020.04.001>.
 6. Peng X, Xu X, Li Y, Cheng L, Zhou X, Ren B. Transmission routes of 2019-nCoV and controls in dental practice. *Int J Oral Sci*. 2020;12(1):9. <https://doi.org/10.1038/s41368-020-0075-9>.
 7. Moletta L, Pierobon ES, Capovilla G, et al. International guidelines and recommendations for surgery during covid-19 pandemic: a systematic review. *Int J Surg*. May 23 2020. <https://doi.org/10.1016/j.ijsu.2020.05.061>.
 8. Patel NA, Ji YD, Odera SL. The role of oral and maxillofacial surgeons in COVID-19 response. *J Oral Maxillofac Surg*. 2020. <https://doi.org/10.1016/j.joms.2020.04.016>, 0(0).
 9. Holmes S, Bhatti N, Bhandari R, Chatzopoulou D. Toward a consensus view in the management of acute facial injuries during the Covid-19 pandemic. *Br J Oral Maxillofac Surg*. 2020. <https://doi.org/10.1016/j.bjoms.2020.03.024>, 0(0).
 10. Hsieh T-Y, Dedhia RD, Chiao W, et al. A guide to facial trauma triage and precautions in the COVID-19 pandemic. *Facial Plast Surg Aesthet Med*. April 16 2020. <https://doi.org/10.1089/fpsam.2020.0185>.
 11. Vukkadala N, Qian ZJ, Holsinger FC, Patel ZM, Rosenthal E. COVID-19 and the otolaryngologist - preliminary evidence-based review. *Laryngoscope*. March 26 2020. <https://doi.org/10.1002/lary.28672>.
 12. Otolaryngologists May Contract COVID-19 During Surgery. ENTtoday. Accessed April 23, 2020. <https://www.enttoday.org/article/otolaryngologists-may-contract-covid-19-during-surgery/>.
 13. Yuan Y, Wang N, Ou X. Caution should be exercised for the detection of SARS-CoV-2, especially in the elderly. *J Med Virol*. March 30 2020. <https://doi.org/10.1002/jmv.25796>.
 14. Wang D, Hu B, Hu C, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in wuhan, China. *J Am Med Assoc*. February 7 2020. <https://doi.org/10.1001/jama.2020.1585>.
 15. Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations. Accessed April 23, 2020. <https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations>.
 16. Grant M, Schramm A, Strong B. AO CMF International Task Force Recommendations on Best Practices for Maxillofacial Procedures during COVID-19 Pandemic; 2020. https://aocmf3.aofoundation.org/-/media/project/aocmf/aocmf/files/covid-19/ao_cmf_covid-19_task_force_guidelines.pdf?la=en&hash=C2B89E1E6E9AB72EBF386C747D3BC74CF1009C1E.
 17. Ti LK, Ang LS, Foong TW, Ng BSW. What we do when a COVID-19 patient needs an operation: operating room preparation and guidance. *Can J Anaesth*. March 6 2020;1–3. <https://doi.org/10.1007/s12630-020-01617-4>.
 18. Fitzgerald JEF, Malik M, Ahmed I. A single-blind controlled study of electrocautery and ultrasonic scalpel smoke plumes in laparoscopic surgery. *Surg Endosc*. 2012;26(2):337–342. <https://doi.org/10.1007/s00464-011-1872-1>.
 19. The Use of Personal Protective Equipment by Anesthesia Professionals during the COVID-19 Pandemic. Accessed April 23, 2020. <https://www.asahq.org/about-asa/newsroom/news-releases/2020/03/the-use-of-personal-protective-equipment-by-anesthesia-professionals-during-the-covid-19-pandemic>.
 20. 139939. Academy Supports CMS, Offers Specific Nasal Policy. *American Academy of Otolaryngology-Head and Neck Surgery*; March 19 2020. <https://www.entnet.org/content/academy-supports-cms-offers-specific-nasal-policy>. Accessed April 26, 2020.
 21. Edwards SP, Kasten S, Nelson C, Elner V, McKean E. Maxillofacial trauma management during COVID-19: multidisciplinary recommendations. *Facial Plastic Surgery & Aesthetic Medicine*. April 7 2020. <https://doi.org/10.1089/fpsam.2020.0158>.
 22. Sommer DD, Engels PT, Weitzel EK, et al. Recommendations from the CSO-HNS taskforce on performance of tracheotomy during the COVID-19 pandemic. *J Otolaryngol Head Neck Surg*. 2020;49(1):23. <https://doi.org/10.1186/s40463-020-00414-9>.