

# Otolaryngological procedures during the COVID-19 pandemic

## *Procedury otorynolaryngologiczne w trakcie pandemii COVID-19*

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**Słowa kluczowe:** COVID-19, SARS-CoV-2, otolaryngologia.

### Abstract

The purpose of this paper was to present a review of the scientific literature on carrying out typical otolaryngological procedures during the COVID-19 pandemic and periods of increased numbers of SARS-CoV-2 infections. The recommendations on reducing the risk of SARS-CoV-2 infection of ENT (ear, nose, and throat) professionals during typical otolaryngology procedures published by numerous authors are of great importance. The presented recommendations limit the use of unverified advice from the media, in particular, those published on the Internet by the otolaryngological environment not only during the first wave of increase in incidence but also during anticipated recurrent periods of increased numbers of infections caused also by mutated SARS-CoV-2.

### Streszczenie

Celem pracy było przedstawienie przeglądu piśmiennictwa dotyczącego wykonywania typowych procedur otolaryngologicznych w czasie trwania pandemii COVID-19 i w okresach zwiększonej liczby infekcji SARS-CoV-2. Zalecenia dotyczące postępowania z chorymi z infekcją oraz podejrzanymi o infekcję SARS-CoV-2 opublikowane przez wielu autorów mają istotne znaczenie dla zmniejszenia ryzyka zakażenia personelu podczas wykonywania procedur otolaryngologicznych. Przedstawione rekomendacje ograniczają korzystanie z niezwyfikowanych porad publikowanych w mediach, w szczególności w mediach elektronicznych, nie tylko w czasie pierwszej fali wzrostu zachorowań, lecz także w przewidywanych okresach nawrotów zwiększonej liczby zakażeń powodowanych także przez mutacje SARS-CoV-2.

### Preface

In December 2019, the first cases of pneumonia caused by the newly identified  $\beta$ -coronavirus were noted in Wuhan, China [1]. The WHO officially announced this disease to be induced by the coronavirus 2019 (COVID-19 – Coronavirus disease 2019). In early March 2020, the WHO announced a pandemic caused by SARS-CoV-2 [2]. For coronaviruses, including SARS-CoV-2, droplet pathways and close contact transmission are the main routes of infection. Aerosol transmission is also possible when subjected to prolonged exposure of high aerosol concentrations in a relatively closed environment (e.g. in a room) [3].

Aerosols are made of solid or liquid particles dispersed and suspended in the air. While sneezing, coughing, or during vigorous breathing, as well as when speaking loudly, the virus can be excreted from the body in the form of bioaerosol. The particles gen-

erally have a diameter of 0.3 to 100  $\mu\text{m}$ , but a particle fraction of 1 to 10  $\mu\text{m}$  is critical for the infection to spread. The physical properties of bioaerosol components mean that the spread of infection can occur within a radius of about 1 to 2 m from its source [4]. The pathway of the SARS-CoV-2 infection spread means that healthcare professionals, especially those in contact with upper respiratory secretions, are especially at risk of COVID-19 infection and development. In addition to anaesthesiologists, dentists, maxillofacial and ophthalmic surgeons as well as ophthalmologists, a group of physicians with high risk of SARS-Cov-2 infection while performing their professional duties are otolaryngologists [5]. This particularly applies to those performing procedures related to the formation of bioaerosol [6].

Reports published in the mass media, especially on the Internet, are publicly available. At the same time, numerous scientific institutions publish their

recommendations on reducing the risk of infection of healthcare professionals during typical otolaryngology procedures. They specifically relate to the period of increased incidence during the pandemic caused by SARS-CoV-2. These recommendations are of great importance not only during the first wave of increase in incidence, but also during anticipated recurrent periods of increased numbers of infections.

The aim of the study was to present a review of the scientific literature on carrying out typical otolaryngological procedures during the SARS-CoV-2 pandemic.

### General recommendations

The division of patients into those infected, those with suspected infection, and those with a negative PCR test for SARS-CoV-2 performed up to 48 h prior to the planned procedure is very useful during the SARS-CoV-2 pandemic. Another division concerns procedures in which bioaerosol is or is not produced. This division forces appropriate caution, shortening the time of the procedure and carrying it out using a limited number of experienced staff in increased-risk patients, especially in the case of bioaerosol-producing procedures. In such situations, it is necessary to use all indispensable personal protective equipment. Proper removal donning and doffing of personal protective equipment is also of great importance.

If a decision is made to perform an otolaryngological procedure, it is important to correctly assess the risk of infecting the personnel and to use appropriate personal protective equipment.

Therefore, establishing general guidelines for performing surgical procedures during the SARS-CoV-2 epidemic is of great significance. In the case of procedures that result in the production of bioaerosol among patients with confirmed SARS-CoV-2 infection, during diagnostics or presenting symptoms of COVID-19, as well as those not tested for SARS-CoV-2 (high-risk patients), it is recommended that the operator use a PAPR or disposable N95 mask and goggles or visor, a barrier apron, and double gloving. Treatments with an increased risk of SARS-CoV-2 infection include, but are not limited to, the following: intubation, extubation, nasal and larynx endoscopy, bronchoscopy, drainage of peritonsillar abscess, nasal tamponade, removal of foreign bodies in the nose or airway, tracheotomy, and using such tools as drills, rotary cutting knives, and medical lasers. In the case of performing the above procedures in asymptomatic patients with negative results within 48 h preceding the surgical procedure (lower-risk patients), it is recommended to use an N95 mask, goggles or visor, apron, and two pairs of surgical gloves.

For tissue incision without intervention in the upper gastrointestinal tract among high-risk patients, it is recommended that the operator use a disposable

N95 mask, goggles and/or visor, barrier apron, and one pair of surgical gloves. In the case of the above-mentioned procedures in low-risk patients, the same set of protective clothing is recommended, except for use of a surgical instead of an N95 mask. In addition, smoke and aerosol suction with closed-circuit suction devices is recommended. The need to examine patients for infection is also highlighted, and if infection is confirmed, such patients should undergo surgery in specially designated rooms with negative pressure. Givi also recommends that for procedures under general anaesthesia, during intubation, all medical personnel not involved in the process should leave the room and return only after securing the respiratory tract. The same recommendations apply to the extubation procedure. Jet ventilation procedures pose a particularly high risk and should only be carried out in cases of absolute necessity and using appropriate protective equipment, preferably in a room with negative pressure.

According to this author, it is also important to properly protect patients with a positive result for SARS-CoV-2 infection or patients with unknown infection status after high-risk surgery. During the procedure, except in the case of upper respiratory and digestive tract surgery, patients should wear a surgical mask. If they require a supply of oxygen, it can be given to them through a surgical mask. Intubated patients should be transported while connected to a closed-circuit ventilator with an appropriate filter. Applicable personal protective equipment should be used by all medical personnel involved in transport [7].

It seems, therefore, that by maintaining proper standards and procedures, it is possible to sustain a significant level of safety for medical personnel present during laryngological procedures [8].

### Specific recommendations

Diagnostic procedures applying endoscopic techniques are widely used in otolaryngology. However, nose, throat, and larynx endoscopic procedures carry a high risk of infection due to evidence of high virus concentration in both the nose and nasopharynx [9]. Givi provides detailed recommendations on how to perform endoscopy. He advises against using local anaesthesia in the form of a spray; instead, he recommends using setons or swabs soaked in anaesthetics. Procedures in the area of larynx endoscopy requiring spray anaesthetics and biopsy, tissue injection, and the use of medical lasers are considered high-risk procedures and should be delayed for as long as possible. Visual track tests reduce the risk of infection by separating the patient's face from the examining physician. The use of disposable endoscopes may be considered. After examination, the endoscope requires appropriate sterilisation and should be removed from the examination room in a cover [7].

Tracheotomy is considered a procedure with the highest level of risk of infecting medical personnel with SARS-CoV-2. Due to direct access to the respiratory tract and mechanical ventilation, which generates large amounts of bioaerosol, especially in the event of damage to the cuff of the endotracheal tube, tracheotomy procedures pose a high risk of infection with SARS-CoV-2. Pichi *et al.* believe that tracheostomy in a sedated and intubated patient or percutaneous procedure is much lower risk than tracheotomy performed on a conscious patient. They proposed the acronym CORONA, which aims to create easy-to-remember steps during tracheotomy. These include the following: use of personal protective equipment (C – cover yourself), organisation of the operating room (OR – operating room setting), opening of the trachea (O – open the trachea), and care for the respiratory tract (NA – nursing and airway management).

In addition to the proposed stages of the procedure, it is equally important to prepare the treatment team for the operation. Attention is drawn to the need to use barrier aprons, double aprons, double gloving, shoe covers, and special surgical masks. FFP3 (Europe) or N99 (USA) masks are preferred. In case of their deficiency, FFP2 or N95 masks, covered with a surgical mask, can be used. Face and eye protection in the form of goggles is also necessary. In addition, it is advisable to use a visor.

After putting on coveralls, Pichi *et al.* also recommend that the accompanying team check that the clothes are correctly applied to prevent incorrect or incomplete protection. Tay *et al.* recommend that the entire process of donning and, above all, doffing the protective clothing be closely supervised by dedicated nursing staff involved in infection control [10, 11].

Pichi *et al.* believe that tracheotomy should be performed in an operating room. According to these authors, it is also permissible to prepare a temporary operating room within the intensive care unit, optimally with the option of maintaining negative pressure in the operating theatre [10]. However, Tay *et al.* think differently, suggesting that open tracheostomy should be performed at the patient's bedside in the intensive care unit in a room with the possibility of maintaining negative pressure. Such a procedure would avoid unnecessary patient transport as well as reconnection and disconnection of closed ventilation circuits [11].

Pichi and Tay recommend the appointment of a dedicated team for performing the tracheotomy, consisting of experienced surgeons, which should cause the duration of the procedure and potential exposure to be reduced. It is advisable to prepare one complete set of surgical instruments for the procedure [10, 11].

A key moment of the procedure in terms of the risk of exposure to infectious bioaerosol is incision of the tracheal wall, removal of the endotracheal tube, and insertion of a tracheotomy tube into the trachea.

In their work, Pichi *et al.* provide detailed recommendations concerning this part of the procedure.

After dissection of the anterior wall of the trachea, the anaesthesiologist should reduce the percentage of oxygen in the injected air to 21%, push the tube down the trachea as deep as possible, and then inflate the cuff once more to ensure isolation of the lower respiratory tract [10].

Pichi and Tay also point out the need for the anaesthesiologist to hinder mechanical ventilation while exchanging the tracheostomy tube. Pichi *et al.* believe that it is important to quickly make tracheal incisions while avoiding damage to the cuff. Attention should also be paid to ensuring that the endotracheal tube remains in the trachea until it is quickly and simultaneously replaced with a tracheotomy tube. The cuff of the tracheotomy tube is immediately inflated again, and the ventilation kit is reconnected. Only at this point is mechanical ventilation resumed. The position and tightness of the cuff of the tracheostomy tube is assessed by capnograph recording. If possible, using a stethoscope on the patient's chest should be avoided. The tube is completely removed only after obtaining the correct CO<sub>2</sub> values and with a sterile drape covering the patient's face [10, 11].

In their study, Pichi *et al.* also pay attention to the aspect of stoma and respiratory tract hygiene after surgery. These activities should be performed by trained nursing staff and include safe airway suctioning and regular cuff pressure checks. No changes should be made to the dressing unless signs of local infection occur. The tube cuff should also remain unsealed. Tube replacement can be scheduled for 7–10 days after surgery [10].

At some centres, postponing planned open tracheotomy is advised in patients intubated during the COVID-19 pandemic. Givi believes that tracheotomy should be avoided or delayed (sometimes for more than 14 days) due to the high risk of infection during the procedure. He suggests that percutaneous tracheotomy may be considered in the case of favourable anatomical conditions of the patient's neck, which would allow the procedure to be performed with or without carefully performed bronchoscopy [7].

Tay, who believes that percutaneous tracheostomy requires more intense airway manipulation, is of a different opinion. Patients with high ventilation pressures may also require multiple connections and disconnections from a closed ventilation circuit. According to this author, using appropriate procedures during tracheotomy decreases the risk of producing infectious bioaerosol [11]. Reports on the 2003 SARS epidemic regarding open tracheostomy as the preferred procedure could support Tay's stance [12].

However, both authors agree on the recommendations that this procedure should be performed under full anaesthesia with total muscle relaxation of the pa-

tient, and mechanical ventilation should be stopped when changing the tracheotomy intubation tube. The use of diathermy as a potential source of aerosol production should also be avoided [10, 11].

Another group of procedures associated with an increased risk of SARS-CoV-2 infection of the ENT staff are operations on the nasal mucosa and paranasal sinuses. These include functional endoscopic surgery of the nose and paranasal sinuses, for which the referrals should be significantly selected. This is due to the high concentration of the virus in the nasal cavity and nasopharynx [13]. Treatments with a very high risk of SARS-Cov-2 infection include, in particular, sinus surgery using power tools, i.e. drills, rotary cutting knives, and CO<sub>2</sub> medical lasers [14]. It is especially important to avoid, intentionally or unintentionally, the activation of power tools outside the nasal cavity and paranasal sinuses [15]. Most authors consider endoscopic nasal surgery as a very high-risk procedure, which, except in urgent cases, should be postponed in patients with SARS-CoV-2 infection or in those who have been tested for SARS-CoV-2 infection until the pandemic subsides [7, 16, 17].

Similar recommendations apply to procedures performed on the tonsil area. According to Couloigner, those involving the pharyngeal lymphoid ring should be postponed until the end of the pandemic. The exception is intense forms of obstructive sleep apnoea syndrome [18].

A group of patients requiring urgent treatment, regardless of the epidemiological situation, includes those with diagnosed oncological diseases of the head and neck. Ansarin et al. suggest that during diagnostic procedures generating bioaerosol in these patients (laryngoscopy, endoscopy of the nose, palpation of the mouth and throat), the examining physician should use protective clothing (personal protective equipment – PPE): FFP2 masks with an additional surgical mask, barrier apron, gloves, and goggles and/or visor.

Ansarin also proposes delaying the treatment of low-risk malignancies, such as differentiated thyroid cancers. It is also advisable to shorten, if possible, the duration of the operation, preferably using less invasive instead of classical surgical techniques.

If reconstructive procedures are necessary, it is recommended that pedicle flaps be used instead of flaps with microvascular anastomosis. As with other otolaryngological procedures, the number of individuals in the operating room who are not involved in the surgery or anaesthesia should be kept to a minimum.

According to Ansarin, all patients should be considered as potential carriers of SARS-CoV-2. Patients undergoing tracheotomy are special cases. Medical personnel must pay particular attention during tracheostomy hygiene and should be equipped with appropriate protective clothing: an FFP2 mask with a surgical mask on it, a disposable barrier apron, gloves, and goggles and/or a visor [19].

Surgical procedures of the neck that do not involve upper respiratory tract mucosa are considered to be lower risk procedures. However, coagulation is not recommended due to the bioaerosol it generates. Studies on the presence of other coronaviruses in the blood of patients suggest that special caution in these cases should also apply to patients suspected of being infected and those infected with SARS-CoV-2 [20].

Givi believes that otosurgical procedures, in particular mastoidectomy, are high risk due to the production of bioaerosol while drilling into the bone and the potential risk of spreading the virus from the nasopharynx to the mucoperiosteum through the continuity of the auditory/Eustachian tube.

Therefore, it is recommended that every patient undergoing ear surgery should be tested for SARS-CoV-2 infection prior to the procedure. If the patient is tested positive, consideration should be given to postponing surgery until the disease has resolved [7]. Saadi *et al.* even recommends restricting the use of a drill during otosurgical procedures whenever possible and using all personal protective equipment available [21]. Chen *et al.* is of a similar opinion, suggesting that the entire otosurgical procedure be performed using a microscope and covering the surgical area with drapes or a surgical tent [22].

Givi *et al.* recommends that all patients with unknown COVID-19 status should be treated as though infected if they need to be surgically treated for craniofacial injuries. Facial lacerations that penetrate the mucosal surface should be considered highly infectious. In the case of injuries requiring surgical intervention, it is recommended that the status of the patient's infection be confirmed first. Conservative treatment of injuries should be considered in all possible cases [7].

## Conclusions

It should be emphasised that the principles of conduct in otolaryngological procedures during the SARS-CoV-2 pandemic are constantly being established and improved. The dynamically changing epidemiological situation and the availability of personal protective equipment as well as verified tests for SARS-CoV-2 infection make these guidelines experience based (on the basis of the authors' own experiences).

It is necessary to publish the practices of individual scientific centres regarding the conduct of ENT procedures in the era of the SARS-CoV-2 pandemic. This will allow the creation of clear recommendations and limit the use of unverified advice from the media, in particular, those published on the Internet by the otolaryngological environment.

## Conflict of interest

The authors declare no conflict of interest.

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