



Head and neck surgery during the COVID-19 pandemic

Kirurgija glave in vratu med pandemijo covid-19

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Abstract

Head and neck surgery during the COVID-19 pandemic presents a major challenge to the healthcare system. Prior to surgery, appropriate preparation and awareness of all treatment options are required, in order that the patient and healthcare workers do not risk the infection. All procedures should be postponed unless the patient's health is endangered. According to the level of emergency, surgical procedures are divided into three groups – the first group includes emergent procedures that must not be postponed, the second group contains procedures that might be postponed for up to four weeks, and the third group consists of procedures whose postponement for six to eight weeks does not affect the outcome of treatment. Prior to the planned surgery, the infection status of the patient with SARS-CoV-2 should be determined, except for emergency procedures that are performed regardless of the patient's infection status. Head and neck surgical procedures vary according to the probability of transmission of infection from a SARS-CoV-2 positive patient to a healthcare worker; thus, the likelihood of aerosol formation during the procedure is considered. The highest-risk procedures include endoscopic examinations of the upper aerodigestive tract, as well as the salivary glands and operations in this area, which include incision of the mucosa. These are: tracheostomy, laryngectomy, pharyngectomy, oral cancer surgery, transoral laser microsurgery, transoral robotic surgery. Taking into account the health of medical personnel and patients, consistent use of personal protective equipment is mandatory during surgery regardless of the patient's infection status.

Izveček

Kirurgija glave in vratu med pandemijo covid-19 je za zdravstveni sistem velik izziv. Pred kirurškimi posegi je potrebna ustrezna priprava in poznavanje vseh možnosti zdravljenja, da bolnik in zdravstveni delavci ne tvegajo okužbe. Treba je odložiti vse posege, katerih odložitev ne ogroža bolnikovega zdravja. Operacijske posege glede na nujnost delimo v tri skupine – v prvo skupino sodijo urgentni, neodložljivi posegi, v drugo skupino posegi, ki jih lahko odložimo za največ štiri tedne, in v tretjo skupino posegi, katerih odložitev za šest do osem tednov ne vpliva na izid zdravljenja. Pred predvideno operacijo je treba ugotoviti status okužbe bolnika z virusom SARS-CoV-2, razen ob urgentnih posegih, ki jih opravimo ne glede na status okužbe bolnika. Kirurški posegi glave in vratu se med seboj razlikujejo glede na možnost prenosa okužbe z

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virusom SARS-CoV-2 s pozitivnega bolnika na zdravstvenega delavca; pri tem upoštevamo predvsem verjetnost tvorbe aerosola med posegom. Med posege največjega tveganja sodijo endoskopske preiskave zgornjih dihal in prebavil ter žlez slinavk in operacije v tem področju, ki prekinejo sluznice. Te so: traheotomija, laringektomija, faringektomija, operacija raka ustne votline, transoralna laserska mikrokirurgija, transoralna robotska kirurgija. V skrbi za zdravje zdravstvenega osebja in bolnikov je med kirurškimi posegi nujna dosledna uporaba osebne varovalne opreme ne glede na okuženost bolnika.

1 Introduction

Head and neck surgery involves the diagnosis, surgical treatment and rehabilitation of patients with head and neck disorders, with the exception of the eyes and the central nervous system. In Slovenia, in addition to otorhinolaryngologists and maxillofacial surgeons, these issues are dealt with by general surgeons, plastic surgeons and thoracic surgeons. Medical conditions in this area include congenital diseases, inflammation, injuries, neurogenic disorders, as well as benign and malignant tumours.

The most serious disease among these, one that also places the greatest burden on the health system, is the head and neck cancer (HNC), which accounts for about 5% of all cancers and ranks sixth in terms of its frequency. The incidence in Slovenia has been stable in recent years; in 2019, there were 442 new cases (1). There is no evidence in the literature yet that a pandemic of SARS-CoV-2 could affect the incidence of HNC. The global dimension of COVID-19 and the reorganization of medical work, especially in times of high numbers of infected people, pose a challenge for the diagnosis and treatment of cancer (2). Therefore, special attention should be paid to oncology patients not only with respect to the risk of COVID-19 transmission to both patients and healthcare professionals (HP), but also to avoid aggravation of their problems and to avoid a worse outcome of the disease (3).

The exposure of HP to an aerosol which may contain the SARS-CoV-2 and the possibility of virus transmission are high during clinical examination and diagnostic and therapeutic interventions on the head and neck. The doctor has direct contact with the mucous membrane of the upper aerodigestive tract during the examination with instruments, so handling patients must be adjusted accordingly and personal protective equipment (PPE) must be used consistently.

2 Postponement of interventions and the role of telemedicine

Before diagnosing and treating a patient with head and neck surgical disease during the COVID-19 pandemic, a risk assessment of all planned interventions in an individual patient should be made. Interventions

should be postponed, only if doing so does not endanger the patient's health. In principle, oncological operations (OP) are not postponed regardless of the SARS-CoV-2 infection status, except in cases where it is known that the disease will not progress in the time until the postponed treatment (4,5,6).

The indications, manner and duration of the treatment delay should be decided in multidisciplinary consultant meetings. In order to avoid the transmission of SARS-CoV-2, these can take place without personal contact between the participants, for example, via video conferencing (7). In times when the number of SARS-CoV-2 infections is increasing, telemedicine plays an important role, especially in the exchange of histopathological and radiological information with patients via videoconferences, SMS messages and telephone calls. The same applies to consultations between specialists within the same or between different medical professions. However, teleconsultations for discussing treatment decisions are in some parts of the world poorly accessible due to social differences and technical constraints (8).

At the University Department of Otorhinolaryngology and Cervicofacial Surgery, University Medical Centre Ljubljana, videoconferencing calls were not utilized. Multidisciplinary consultation meetings discussions regarding the treatment of outpatient oncology patients took place in the presence of the patient in the usual clinic premises using the prescribed PPE, while hospitalized patients were discussed in their absence. The latter were later informed of the treatment plan in a hospital room with the appropriate PPE. More administrative-oriented consultations and less demanding problems took place (without patients) via telephone calls between specialists from various medical disciplines. Before deciding on chemotherapy or immunotherapy, the patient's general clinical condition was considered. If a patient was hospitalized in the grey zone of the clinic, the multidisciplinary treatment of the patient was postponed until their quarantine measures were completed.

If the HNC OP is postponed for a long time due to a pandemic, imaging tests (e.g. computed tomography with a contrast agent) are performed again before the procedure to determine possible growth progression and

spread of the primary tumour and metastases due to time delay. It makes the most sense to perform the pre-surgery imaging tests in the radiology department, where a smaller number of people are being treated, to avoid infection with the SARS-CoV-2 (7,9).

The duration of the COVID-19 pandemic cannot be predicted, and it is very likely that, given the daily growth trend of new infections, it will last for quite a long time. It should therefore be emphasized that postponing interventions indefinitely will not be possible, nor will it make sense.

3 Testing patients for COVID-19

The diagnosis of COVID-19 is based on the clinical picture, laboratory findings, and imaging studies, but all of these investigations are nonspecific. The gold standard for disease confirmation is a positive molecular biology test of potentially infectious material obtained from a patient - polymerase-chain reaction (PCR). Most often, a nasopharyngeal swab is taken (10) to detect the RNA of the virus.

Different sources cite different time frames for testing patients to rule out SARS-CoV-2 infection prior to OP. As the diagnostic test for COVID-19 has low sensitivity, which means a higher number of false-negative results, it is recommended that each patient be tested twice. A false-negative result means the test is negative although the patient has COVID-19. Such COVID-19 and asymptomatic patients are extremely difficult to identify and therefore difficult to isolate properly (11). Therefore, a false-negative result is an extremely dangerous circumstance for the spread of the disease. Crosby and Sharma therefore advocate testing 48 hours before admission to the hospital and additional testing 24 hours before the procedure. If the latter cannot be performed, it is recommended that a swab be taken from the patient 48 hours before admission, followed by a quarantine order (12).

At the University Department of Otorhinolaryngology and Cervicofacial Surgery Ljubljana, patients were tested for COVID-19 upon admission to the clinic, i.e., approximately 24 hours before the planned surgical procedure. Until the swab test result was obtained, patients were hospitalized in the grey zone, and upon confirmation of a negative swab test result on COVID-19, they were transferred to the appropriate hospital ward. Therefore, all patients in whom a surgical procedure was planned and performed after admission had negative results before the procedure, or enough time had passed since the positive result and/or recovery from COVID-19 to be considered non-infectious. In the second wave of

the pandemic, we introduced regular periodic testing of HP and hospitalized patients in accordance with the Hospital Infection Prevention and Control Service (HIPCS). In this way, we made an important contribution to controlling the COVID-19 incursion into the clinic.

Unlike the period before the pandemic when patients were temporarily discharged to home care after the completion of diagnostic treatment and until the OP, during the pandemic they spent this time in the clinical department to avoid infection in the home environment.

In individual cases of the second wave of the pandemic, when we admitted a patient to the "grey zone" who proved positive for COVID-19 after receiving the swab test result, we discharged him/her into home isolation. The guidelines of Slovenian infectologists on the duration of isolation of patients with COVID-19 contain the following instructions (13):

- Patients without symptoms but with a positive swab test result, without a severe immune disorder, are ordered to be isolated for 10 days from the first positive nasopharyngeal PCR test.
- Patients without symptoms with a severe immune disorder are assigned a 20-day isolation from the first positive nasopharyngeal PCR test.
- HIPC advised isolation and postponement of OP for 14 days for patients with HNC, a positive swab test result, but without other immune deficiencies. At the University Department of Otorhinolaryngology and Cervicofacial Surgery Ljubljana, due to safety and the fact that the instructions on COVID-19 change frequently, HNC was treated as a condition with a severe immune disorder. Therefore, in patients with HNC and COVID-19 a longer isolation period (i.e. postponement of the procedure) was opted for, namely for 20 days, which according to the guidelines corresponds to the instructions for the condition of patients with severe immune disorders (14).
- Considering the current knowledge of COVID-19, in addition to the previously mentioned time frames, it should also be considered that the patient must be free of COVID-19-related symptoms for 48 hours so that s(he) is no longer infectious. Therefore, according to the guidelines, all patients with COVID-19 should be free of any COVID-19-related symptoms for 48 hours before the surgical procedure.

In the second wave of the pandemic, a patient with oral cancer was treated at the clinic who then became infected and contracted COVID-19 during the treatment. Considering this was an HNC, which is regarded as a serious immune disorder at the clinic for safety reasons

(as mentioned earlier), the surgical treatment was postponed, taking into account the duration of isolation of three weeks, i.e. one day more than 20 days.

4 Referral of patients to subspecialized centres

Control and prevention of SARS-CoV-2 infections is particularly important in oncology patients scheduled for surgical treatment. In this regard, it makes sense to refer patients with HNC, for whom to delay treatment would be unacceptable, to (some, but not all) specified subspecialized centres and clinics within the same country (15), where only COVID-19-negative patients are admitted (3). A multidisciplinary approach to treatment remains crucial here (16).

Given the small size of the country, the small number of patients and the few specialized centres, this way of organizing work and patients was not utilized in Slovenia.

5 Dangers of COVID-19 for otorhinolaryngologists during clinical work

In the presence of SARS-CoV-2 in the population, diagnosis and surgical treatment of head and neck disorders are particularly challenging compared to other diseases. There are several dangers of spreading the infection during otorhinolaryngological treatment leading to several restrictions regarding work. Epidemiological sources state that in the population there are between 7% and 13% of patients with COVID-19 who are asymptomatic, unknowingly endangering HP with the infection, especially otorhinolaryngologists (17). Even more informative are studies on random population samples that have shown significantly higher asymptomatic infection compared to confirmed infection (18,19).

The SARS-CoV-2 is known to replicate in the upper respiratory and gastrointestinal mucosa with which an otorhinolaryngologist is in contact during outpatient examinations of patients, during certain diagnostic procedures and OP. Aerosols containing SARS-CoV-2 are released during surgical procedures of mucosa, where particular emphasis is given to endoscopy and the use of electric haemostatic instruments and laser surgical techniques (20).

Otorhinolaryngology clinics are often visited by patients with signs of acute respiratory infection (e.g. fever, cough, fatigue, sore throat, dyspnea), which may, understandably, be the first signs of COVID-19 (21). Thus, a patient with signs of acute respiratory infection may have COVID-19 without knowing it, and may as a first

specialist (inappropriately) visit an otolaryngologist (and infect him), instead of reporting to the COVID-19 entry point.

Due to the risk of SARS-CoV-2 transmission, the benefit of the procedure to the patient should always be weighed against the aforementioned risk factors and it should be well prepared for.

6 Head and neck surgery and personal protective equipment

Until reliable drugs are developed and a high level of COVID-19 vaccination coverage is achieved, infection prevention and isolation of both patients with or without COVID-19 symptoms are the main measures to limit its spread. One of the preventive measures is the use of PPE. If a patient's condition regarding SARS-CoV-2 infection is unknown or if the patient tests negative, the use of at least a protective surgical mask (FFP2 or FFP3), goggles or eye shield, gloves and a protective coat is recommended. The following describes the protection of HP dealing with COVID-19-positive patients.

High-risk interventions include diagnostic and therapeutic endoscopies of the upper aerodigestive tract, taking tissue samples for histopathological examination, OP in the oral cavity, pharynx, larynx, trachea, nasal cavity and paranasal sinuses, insertion of the nasogastric feeding tube, tracheotomy and insertion and replacement of tracheal cannulas (7). During these procedures, the mucosa (which can be heavily loaded with SARS-CoV-2) is manipulated, so appropriate adjustment of procedures and careful use of PPE are required.

In COVID-19-positive patients, the use of a hood powered air-purifying respirator (PAPR) is recommended to avoid transmission as well as the use of either a FFP3 or FFP2 filtering face mask, which differ from each other based on the amount and the size of aerosol particles released to the user of the mask. FFP3 masks retain smaller aerosol particles 4–30 nm in size, which is much smaller than the SARS-CoV-2, which measures 70–90 nm. Overall, FFP3 masks are expected to retain 99% of aerosol particles and FFP2 slightly less, approximately 94% (22). The use of protective gloves is mandatory for safe work and in the operating room, the use of double gloves is recommended in all HPs who are in contact with a COVID-19-positive patient. Positive patients are also advised to wear three layers of clothing simultaneously (plain surgical drape, waterproof long-sleeved protective coat and the usual sterile surgical drape), goggles or visor, protective cap, socks and protective shoe cover (23). Regardless of the patient's condition regarding

SARS-CoV-2, the PPE is discarded after the OP and replaced with a new one. Just as the integrity and reliability of PPE are important, so is the correct order of putting it on and taking it off.

The use of PPE is important and unavoidable, but unfortunately it is difficult to access in some places and limits the surgeon in working with positive patients (20). There is especially a problem during the use of magnifying glasses or a microscope in combination with goggles, the visor and PAPR. An example of such a procedure is transoral laser microsurgery on localized vocal cord cancer, in which the microscope cannot be used or is inconvenient and difficult to use due to the recommended use of appropriate PPE for eye protection (e.g. PAPR or visor). Alternative options for this procedure which do not include the aforementioned problems with PPE due to use of the surgical microscope are open cordectomy, open partial laryngectomy and radiation (radiotherapy, RT). The choice of another, less optimal surgical technique or another method of treatment due to the inability to work with PPE does not mean a worse prognosis of the outcome of cancer treatment for the patient, but a poorer functional outcome is possible (24).

Anguita reports about customized protection of the surgical field, the microscope, and the operating surgeon for COVID-19 circumstances in ophthalmic surgery. He has introduced the use of an individually prepared protective sterile transparent drape, into which an opening is cut before sterilely covering the patient. The prepared drape is placed and sealed around the microscope lens so that the sterility of the surgical field is still ensured (25). In head and neck surgery, similar protection could be used when performing transoral laser microsurgery.

7 Degrees of emergency of surgical procedures

Head and neck surgeries are divided into three groups, depending on the degree of emergency of surgical procedure. The *1st group* includes interventions due to emergencies - care of bleeding or dyspnea, which are resolved immediately. If the clinical condition allows (it usually does not), a nasopharyngeal swab is performed 24 hours before the surgical procedure. In patients at risk (these include most patients from this group) it is not possible to wait for the swab test result, so the patient should be treated as positive for COVID-19, taking all measures to protect HP (5,26). Desai and his colleagues additionally include the OP of malignant tumours of the upper aerodigestive tract, cutaneous melanoma, and high-risk squamous cell carcinoma in the non-delayed group (27). At the University Department of Otorhinolaryngology

and Cervicofacial Surgery Ljubljana, if time allows, a rapid PCR test for SARS-CoV-2 is performed in urgent procedures and then the operation is performed immediately after obtaining the results.

The *2nd group* includes removals of HNC, which can be delayed for a maximum of four weeks, as a longer delay in the procedure would lead to cancer progression and a worse prognosis. These include removal of squamous cell carcinoma of the upper aerodigestive tract and aggressive salivary gland and skin cancers. Some authors also mention OP of low-risk upper aerodigestive cancers, various low-grade salivary gland cancers, thyroid and parathyroid cancers, basal cell carcinoma, and low-risk squamous cell carcinoma (5,26,27). All imaging tests (e.g. chest X-rays, neck and abdomen ultrasounds, contrast-enhanced computed tomography of the neck,) should be performed during the same hospitalization to avoid the risk of SARS-CoV-2 infection and the spread of infections. In our Department, patients with HNC were not postponed, but were treated as a matter of priority, the same as before the pandemic.

The *3rd group* includes surgeries of malignant diseases in which the surgical procedure delayed for 6–8 weeks does not affect the prognosis of the outcome; so, they are rescheduled. These include removals of well-differentiated types of thyroid cancer, some slow-growing types of salivary gland cancer, atypical salivary gland nodules, unsuspected leukoplakias, and limited vocal fold hyperplastic lesions (5). Some authors also include OP of basal cell skin cancers (5) in this group, which others place in the second group. Desai and his colleagues also include non-essential procedures in this group of procedures: elective cosmetic facial procedures and excisions of benign head and neck lesions. These procedures can be postponed for an indefinite time (27). In our department, surgical treatments postponed for an indefinite time were those of patients with histologically defined benign skin lesions, adenoidectomy, tonsillectomy, (rhino)septoplasty, radiofrequency turbinoplasty, functional endoscopic sinus surgery for benign pathologies, and microlaryngoscopies due to limited hyperplastic lesions of the vocal folds.

As the pandemic is likely to continue for some time and the diagnostics and treatment of benign and especially malignant diseases cannot be delayed indefinitely, the diagnostics of potentially dangerous conditions should be carried out as soon as possible and confirmed malignancies treated in a way that is best for the patient. At the same time, prevention of the spread of COVID-19 between patients and HP should always be borne in mind. Safety protocols should be followed essentially and

consistently, PPE used, and asymptomatic patients with COVID-19 should be rapidly identified.

8 Risks of SARS-CoV-2 infection in head and neck surgery

It is always important to know the patient's SARS-CoV-2 infection status before starting a surgical procedure (28,29,30). If the status is unknown and the condition requires emergent acting, the patient should be treated as COVID-19 positive without symptoms (31). Surgical procedures are divided into three groups according to the degree of risk of HP being infected by the patient with SARS-CoV-2 (20). The first group with a *low risk* of infection includes procedures in which the aerosol is not formed due to the surgical work itself. However, it is possible that the patient cough spreads the SARS-CoV-2 aerosol to the HP, who can then become infected. Procedures in this group include biopsies and removals of skin lesions of the head and neck under local anaesthesia and even clinical examinations of the ear – otoscopy. The use of an aspirator is avoided. The dangers of otoscopy and adjustments to the audiovestibular and otosurgical treatment of COVID-19 are reported in detail by Vozel and Battelino, so our article does not address this area (32).

Medium-risk surgeries include parotidectomy, thyroidectomy, neck dissection, and surgery of congenital anomalies (e.g. branchiogenic or thyroglossal cysts) in the neck (20). These do not include incision of the mucosa, so these are clean surgical wounds. HP are at risk for SARS-CoV-2 infection due to possible contact with infected blood. Various authors state that the presence of SARS-CoV-2 RNA in the blood of asymptomatic COVID-19 patients is 1–15% (33). Hamish concludes, however, that according to Chinese studies, in Chinese patients with COVID-19, RNA of the virus was detected in the blood of as many as 30–40% of cases (34). There are no data on the transmission of SARS-CoV-2 infection through the blood in the literature (yet). Transmission of infection by transfusion has also not been proven (35).

The highest risk for HP becoming infected with SARS-CoV-2 is posed by the third group of interventions, where the surgery includes incision of the mucosa and entering the lumen of the upper aerodigestive tract. These are clean or contaminated wounds. Examples include tracheotomy, laryngectomy, pharyngectomy, OP of oral cavity cancer, transoral laser microsurgery, transoral robotic surgery, and sialendoscopy, for which U.S. authors have even suggested a complete abandonment during the COVID-19 pandemic (9). Endoscopic examinations

of the upper aerodigestive tract (e.g. direct laryngoscopy, panendoscopy) also belong to the third group, although the mucosa, except when performing biopsy, is not incised. In these procedures, the surgical team is exposed to the aerosol due to manipulation of the mucosa during endoscopy. As the viral load on the mucous membrane surfaces is high, surgeries promote the formation of aerosol rich in viruses, thus exposing HP to infection if they do not comply with safety regulations (23). They are therefore performed only in patients in whom delaying diagnosis and treatment would worsen the outcome of the disease (31).

The SARS-CoV-2 is known to be very stable in the environment. It survives 3 hours in the aerosol, up to 24 hours on porous surfaces and up to 72 hours on non-porous (steel, plastic) surfaces (4,36). In order to reduce the risk of transmitting the infection, the use of electrically powered instruments such as microdebriders and electrocautery devices is not recommended (4,8,20,23). The use of local anaesthetics in the form of sprays is also not recommended, as their use poses a high risk of infection due to the formation of aerosols (37).

9 Specifics of surgical interventions during a pandemic

There are quite a few differences from interventions in normal conditions in pandemic situations. If an OP is not opted for, RT or radiochemotherapy may be considered as an alternative treatment in certain cases (38). If a patient is operated on during the incubation period of SARS-CoV-2 infection, the risk of death in patients with squamous cell carcinoma of the head and neck increases by 20% according to the study by Brody et al. and Liaa et al. (39,40). The overall mortality from COVID-19 infection is 2–5% (41,42). Before deciding on an OP, the expected outcome of treatment, the likelihood of cancer cure, and safety restrictions should be considered. We must not forget about the availability of equipment and the availability of infrastructure for possible complications of treatment that require emergent intervention (43).

Regardless of the type of surgery, cooperation between the surgeon and the anaesthesiologist is mandatory before, during and after the planned procedure (36,44,45). Depending on the individual procedures, the following recommendations by different working groups can be found in the literature:

- Safety guidelines for COVID-19 should be followed in all patients, meaning that all should be considered as asymptomatic carriers of SARS-CoV-2 and appro-

- priate PPE should be used (31).
- Head and Neck Cancer International Group (HNCIG), which includes 40 experts in surgery, RT and medical oncology for head and neck, has issued a set of recommendations for the treatment of patients with HNC. Transnasal flexible fiberoptic endoscopy is recommended only for patients with suspected primary or recurrent HNC and for patients with airway obstruction, but only if using appropriate PPE. Without this, the examination is not recommended. It is not recommended for patients after HNC treatment who are asymptomatic for cancer and for patients with non-typical symptoms such as a lump in the throat (30).
 - Greater safety for the examiner is achieved if transnasal flexible fiberoptic endoscopy is performed behind the patient's back. The doctor and the patient look in the same direction, i.e., towards the monitor. In this way, the doctor's face is placed furthest from the patient's face. Thus, the direction of aerosol spread during, for example, coughing and pharyngeal reflex of the patient is favourable, as the patient coughs away from the doctor. This method of endoscopy is popular and widespread in Italy, but not yet in Slovenia (44).
 - According to the guidelines of the Foundation for Head and Neck Oncology (FHNO), complex OPs of patients over 65 years of age with concomitant diseases and OPs requiring elective tracheotomy are avoided (31). Unfortunately, most patients with HNC meet these criteria, so only a small proportion of patients would be treated surgically if these recommendations were strictly followed.
 - The risk of COVID-19 infection is high with intubation (9,36). It is recommended that everyone except the anaesthesiology staff leave the operating room at that time (9).
 - In surgical procedures of the parotid and submandibular gland the virus may spread during haemostasis by electrocoagulation and related instruments, so classic methods of haemostasis are recommended (vascular ligation, tamponade of bleeding sites with or without adrenaline, placement of surgical clamps).
 - During OP of the minor salivary gland cancer, which is most commonly found in the mucosa of the oral and sinonasal cavity, the risk of SARS-CoV-2 infection is great (18), as in surgical procedure the mucosa is incised or the surgeon comes into contact with it. Therefore, good preparation and knowledge of all treatment options are required prior to the procedure to avoid the risk of transmission (20). Unlike in the case of the minor glands, the surgeon is much safer from the SARS-CoV-2 infection during the OP of the large glands because he/she does not come into contact with or does not incise the mucous membranes (46).
 - The OP of low-risk squamous and basal cell types of skin cancer may be postponed or RT may be chosen. OP of high-risk squamous and basal cell types of skin cancer are not postponed (20).
 - There are no recommendations for alterations in tonsillectomy and adenoidectomy techniques during the pandemic. Le Boulanger et al. recommend covering the patient and the operating field with a sterile transparent drape to prevent the transfer and spread of blood and aerosol towards the surgical and anaesthesia team (47).
 - Indications for not delaying tonsillectomy and adenoidectomy despite the SARS-CoV-2 pandemic are enlarged palatine tonsils and adenoids causing obstructive sleep apnoea, where the operation can be performed without prior drug-induced sleep endoscopy. In children, tonsillectomy is not delayed in case of associated sickle cell anaemia, regardless of the COVID-19-infection status. This is anaemia with haemoglobin S, in which stagnant and damaged erythrocytes cause a vaso-occlusive crisis with obstruction of breathing during sleep. There is severe pain as a result of blockage of blood vessels due to abnormal accumulation of sickle erythrocytes. In the case of SARS-CoV-2 infection, exacerbation of the disease and vaso-occlusive crisis may occur, so tonsillectomy is not delayed (7).
 - It is mentioned in the literature that polysomnographic examinations are not performed during the SARS-CoV-2 pandemic to avoid additional possibilities of infection (7). During polysomnography, the person examined, positive to the SARS-COV-2, has aerosol droplets with SARS-COV-2 floating in the room, through which the infection can be transmitted to the examiner. Exceptions where polysomnography is performed are acutely ill with severe breathing disorders during sleep, in which worsening of the underlying disease is expected without polysomnographic examination (and appropriate measures) (48,49).
 - In the case of suspected laryngeal or hypopharyngeal malignancy, which would require endoscopy to obtain tissue samples for histological examination, a fine needle aspiration biopsy of suspicious lymph nodes of the neck should be performed if these are, of course, present (43). The author does not consider nor does he mention the shortcomings of this diagnostic procedure due to the omission of endoscopy, where the

- position of the primary tumour and its spread is defined.
- The same is true for the HNCIG, which defends the position that the cytology findings of the neck metastasis with coordinated imaging findings of the primary tumour is sufficient to confirm the diagnosis of HNC. In this case, histological evidence of the primary tumour is not required (30).
 - In the case of T1/T2 laryngeal cancer, high-risk laser microlaryngoscopic surgery is not an option. RT (4) is recommended. The American Society for Radiation Oncology has issued guidelines in which RT is the treatment of choice when such treatment predicts improvement in the patient's condition (28). On the other hand, it should be borne in mind that RT and chemotherapy cause immunosuppression, which can lead to an unfavourable outcome of treatment of the patient in case of infection with SARS-CoV-2 or worsening of the disease (12). Brody et al. describe more serious complications and higher mortality rates from SARS-CoV-2 infection in patients after RT and chemotherapy (39).
 - The HNCIG's opinion on T1N0 laryngeal cancer is that the OP can be postponed for a maximum of 8 weeks. It is perfectly acceptable for such patients to be treated with RT instead of surgery (30).
 - Despite these recommendations (4,28,30), which favour RT (at the expense of surgery due to the risk of HPs and patients getting infected with SARS-CoV-2), the capacity of the Institute of Oncology Ljubljana should be considered, which may not be able to treat such an increased influx of patients on an ongoing basis and in a timely manner.
 - T3 and T4a oropharyngeal, laryngeal and hypopharyngeal cancers can be treated surgically or non-surgically, the results of both being comparable, with the last two cancer sites not including the infiltration of laryngeal cartilages (12). According to the HNCIG, surgical treatment of advanced HNC may be delayed for a maximum of 4 weeks. If OP is not feasible within this time frame, the patient is offered RT or radiochemotherapy instead of OP. If a longer delay of the OP is anticipated, induction chemotherapy is possible, followed by OP, but only half of the HNCIG experts support this (30).
 - Despite the SARS-CoV-2 pandemic, in his study Lei still recommends surgical treatment of oral cancer be considered as the preferred modality (39).
 - Non-surgical treatment is recommended in early cases of laryngeal cancer and HPV-related oropharyngeal cancer (4,39).
 - During the SARS-CoV-2 pandemic, the use of microvascular free flaps in the head and neck reconstruction should be avoided, as they are, according to the reconstruction ladder, more demanding in execution and postoperative care. Reconstruction with skin grafts or local and regional flaps is recommended. In this case, surgery and post-operative recovery is shorter and easier. The results of the reconstruction are better and there are fewer flap failures due to thrombosis on anastomoses. The purpose of this is to shorten the time of OP and recovery, reducing the chances of transmission of SARS-CoV-2 and releasing hospital capacity faster (11,27,31). Nevertheless, Desai and his colleagues recommend a radial free flap in the reconstruction of the oral cavity.
 - After systematically reviewing the literature, Chies-Estomba et al. leave the decision on surgical or percutaneous tracheotomy in patients to the head and neck surgeons. Some analyses are more in favour of surgical tracheotomy, others of percutaneous tracheotomy, and still others support both techniques. Percutaneous tracheotomies are performed electively in long-term intubated patients, and surgical tracheotomies are additionally performed in the context of surgical treatment of HNC and acute respiratory distress. Some authors argue that percutaneous tracheotomy means an increased chance of infection with SARS-CoV-2 due to more extensive manipulation of the tracheal mucosa (endoscopy, dilatation) and therefore greater contact with respiratory secretions. Surgical tracheotomy is advised (as far as there is an indication for its implementation) in the tumour removal and cervical dissection, in which access to the trachea with a classic surgical incision is better and faster (50). The surgical technique of open tracheotomy in patients with COVID-19 differs significantly from tracheotomy under normal circumstances (45).
 - In a patient infected with SARS-CoV-2 or of unknown COVID-19 status, induction of deep general anaesthesia with complete muscle relaxation and good oxygenation without intubation is recommended in case of indication for emergent surgical airway management. Then, in apnoea, a classic surgical cricothyrotomy is performed as soon as possible and a thin tube is inserted through an incision (in the crico-thyroid space) through the larynx into the trachea. The tube cuff is inflated, then the anaesthesiologist ventilates and stabilizes the patient. This is followed by the conversion of cricothyrotomy into tracheotomy and the insertion of a cuffed tracheal cannula (44).

10 Surgical procedures performed at the University Department of Otorhinolaryngology and Cervicofacial Surgery Ljubljana, during the pandemic

During the first COVID-19 pandemic in the Republic of Slovenia from 12th March 2020 to 14th May 2020, the following procedures were performed at the University Department of Otorhinolaryngology and Cervicofacial Surgery Ljubljana: a single extended tonsillectomy (due to cancer); four open surgical drainages of deep neck abscesses; seven laryngectomies (partial or total with or without partial hypopharyngectomy), of which four with reconstructions with pectoralis major flap; 20 neck dissections; one removal of a congenital branchiogenic cyst; nine parotidectomies; two sialoendoscopies; seven removals of neck lymph nodes or soft tissue tumours of the neck; two hemiglossectomies; and five resections of other types of cancer of the oral cavity or the lips. We also performed excisions of basal cell and squamous cell skin carcinomas of the head and neck under local anaesthesia. In the first wave of the pandemic, none of the patients were infected with the SARS-CoV-2 before the procedure according to the nasopharyngeal swab test. No SARS-CoV-2 infections were reported in patients during hospitalization.

In the second wave, we operated on a patient who recovered from COVID-19. We postponed the operation to the day when she was no longer contagious. Unfortunately, we had to deal with some COVID-19 incurSIONS into our department. These patients were either discharged to home care with quarantine instructions or temporarily transferred to the COVID wards within the University Medical Centre.

In the intensive care unit of the University Department of Infectious Diseases, we have performed several surgeries on patients with COVID-19 since the first pandemic was declared: 15 elective open tracheotomy procedures due to prolonged endotracheal intubation, four treatments of bleeding from the nasal or oral cavity and throat bleeding, treatment of facial haematoma, drainage of parapharyngeal abscess, necrectomy and later revision due to cervical necrotizing fasciitis. No complications were observed after surgical treatment of patients with COVID-19.

11 Postoperative care

During the hospitalization of patients operated on due to HNC, there is a real concern about patients becoming infected with SARS-CoV-2, which can be prevented by

consistent use of PPE and by limiting contact between patients, their relatives and HP. In addition, patients are also at risk for nosocomial infections. It makes sense to discharge a stable patient to home care as soon as possible. Visits from relatives during hospitalization are not permitted to avoid the intrusion of SARS-CoV-2 and other infections into the hospital (20). Day et al. state that the status of SARS-CoV-2 infection in patients and healthcare professionals should be monitored even after the OP.

During the first two waves, at the University Department of Otorhinolaryngology and Cervicofacial Surgery Ljubljana, nasopharyngeal swabs were not performed after surgery to rule out a new infection with the SARS-CoV-2, unless symptoms were noticed. In accordance with the instructions of the University Medical Centre Ljubljana, patient visits were not allowed, except for patients in the intensive care unit or in palliative care, provided that the visit was approved by the attending physician. In the second wave, there were several “intrusions” of COVID-19 into the wards. Patients who tested positive after the OP were transferred to the COVID wards of the University Medical Centre Ljubljana. Patients who were in contact with people testing positive were isolated in the grey zone or discharged to home care with instructions regarding quarantine measures.

12 Post-treatment monitoring

As part of the follow-up of patients who had undergone HNC treatment and to minimize the possibility of infection of patients and HP with SARS-CoV-2, the FHNO advises (31):

- Minimizing the number of patient visits to outpatient clinics.
- Organizing follow-up examinations of patients according to the probability of cancer recurrence. If the probability is low, postponing the follow-up examination for 18–24 months and giving priority to patients with a high probability of recurrence is advised.
- Planning longer intervals between individual follow-ups.

The HNCIG allows patients to be monitored after the OP via videoconferencing and telephone calls, but in case of suspicious findings, personal contact between the patient and the doctor is required (30).

At the University Department of Otorhinolaryngology and Cervicofacial Surgery Ljubljana, we reduced the number of outpatient examinations by accepting only patients with referrals marked “emergent” and “very

fast". We reduced the number of follow-up examinations of patients after the conclusion of HNC treatment, with each surgeon making decisions on a patient-by-patient basis, also on the basis of a telephone conversation with the patient and/or his relatives.

13 Conclusion

Head and neck surgery is a major challenge during the COVID-19 pandemic. Patients with head and neck pathology should be properly triaged and the timing of the procedure should be managed accordingly. For safe diagnostics and surgical work and postoperative care, the use of PPE and the knowledge of the patient's COVID-19

status are crucial. It is necessary to follow the instructions of working groups from different fields for the treatment of patients and decide on the most successful and safest method of treatment, considering the specific capabilities of the institution. Final decisions on the treatment of an individual patient are made at multidisciplinary tumour boards. Diagnostics and treatment of potentially dangerous conditions and HNC should be performed in such a way that treatment is best for the patient regardless of the COVID-19 pandemic.

Conflict of interest

None declared.

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