



# Sialendoscopy before, during and after the COVID-19 pandemic

Sialendoskopija v času pred, med in po pandemiji covid-19

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## Abstract

The sialendoscopic techniques represent a new paradigm that has essentially changed the management of the obstructive salivary gland disease. The COVID-19 epidemic represents a new challenge for the health system of each particular country and puts numerous particularly elective surgical procedures to the test. The surgical procedures of head and neck, especially the ones of oral cavity, present a high risk for the transmission of COVID-19. During sialendoscopy and sialendoscopically assisted surgery, the surgical and anaesthesiological teams are exposed to the saliva and the products of reflexes of the sensitive anatomical regions of the oral cavity and the rest of the upper aerodigestive tract. The level of risk of the surgical procedure according to the phase of surgery, type of anaesthesia, personal protective equipment and current epidemiological situation of COVID-19 remains unknown. At first, the emergent and later also elective sialendoscopic and sialendoscopically assisted procedures were performed during the COVID-19 epidemic in the University Department of Otorhinolaryngology and Cervicofacial Surgery Ljubljana. We believe that in the period of containable COVID-19 epidemiological situation, taking into account indications and protective measures, the sialendoscopic surgery is safe for the patient and the practitioner.

## Izvleček

Sialendoskopske tehnike predstavljajo novo paradigmo, ki je bistveno spremenila zdravljenje zastojne bolezni žlez slinavk. Epidemija covid-19 predstavlja nov izziv za zdravstveni sistem sleherne države in postavlja na preizkušnjo številne, predvsem elektivne kirurške metode zdravljenja. Kirurški posegi v področju glave in vratu in še posebej v ustni votlini predstavljajo hudo tveganje za prenos covid-19. Pri izvajanju sialendoskopije oziroma sialendoskopsko asistirane operacije sta kirurška ter anesteziološka ekipa izpostavljeni slini in refleksom občutljivega anatomskega področja ust oziroma zgornjih dihal in prebavil. Ostaja vprašanje, kolikšno je tveganje glede na fazo operacije, vrsto anestezije, uporabljeno osebno varovalno opremo ter trenutno epidemiološko situacijo covid-19. V času pandemije covid-19 smo na Kliniki za otorinolaringologijo in cervikofacialno kirurgijo Ljubljana izvajali le nujne, kasneje pa tudi elektivne sialendoskopske in sialendoskopsko asistirane posege. Menimo, da je v času obvladljive epidemiološke situacije sialendoskopska kirurgija ob upoštevanju indikacij in zaščitnih ukrepov lahko varna za bolnika in izvajalca.

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## 1 Introduction

Sialendoscopy (SE) is a minimally invasive procedure that has fundamentally changed the treatment of obstructive salivary gland disease. With the help of miniature endoscopes, it is possible not only to examine and determine the causes of the obstructive disease, but also to eliminate them. It is primarily a matter of removing salivary gland stones (SGS) or resolving any stenosis of the salivary ducts. The sialendoscopic method is thus not only a diagnostic but also an interventional procedure (1). It can be either solely endoscopic or combined, where endoscopy and open surgery are performed simultaneously within the same procedure.

Following an exclusively endoscopic route, it is possible to remove smaller SGS with the help of a particular basket or forceps. However, medium-sized SGS (3-7 mm) must generally be reduced before removal; which means breaking them into smaller pieces, i.e. fragmenting them by laser or pneumatic method endoscopically or extracorporeally with shock waves. By endoscopic route, it is also possible to dilate the narrowing of the duct and insert a temporary stent.

However, if the obstructive pathology is too extensive or the obstruction is located in an unfavourable location (e.g. extremely proximal), the sialendoscope plays a more navigational role in determining the most suitable position for the open part of the procedure: the incision of the oral mucosa or skin of the face or neck. Either way, the purpose of the procedure is to eliminate the obstruction of saliva flow while preserving the gland.

In rare cases when it is not possible to eliminate the stagnation of saliva, and the gland's function of the gland is already permanently impaired, the salivary gland needs to be removed.

## 2 Our experience with sialendoscopy before the COVID-19 epidemic

From January 2012 to the end of June 2020, 400 SE or sialendoscopy-assisted surgeries were performed in a total of 357 patients at the Clinic of Otorhinolaryngology and Cervicofacial Surgery. The vast majority of sialendoscopic procedures were performed in patients with SGS and stenosis of salivary glands (300/400, 75%). Other SEs (100/400, 25%) were performed due to other causes of occasional swelling of the salivary gland, such as recurrent parotitis in children and adolescents (juvenile relapsing parotitis, JRP), Sjögren's syndrome, consequences of radio-iodine therapy, and indeterminate swelling of the salivary

gland during meals. The ductal system of the submandibular gland was affected more often (264/400, 66%). In 31 patients (8.7%) the procedure was performed twice and in six patients (1.7%) even three times. With a consistent sialendoscopic approach, we managed to significantly reduce the annual number of submandibular gland removals compared to the period before introducing of this method in our institution (2).

In addition to knowledge and experience, good equipment with a wide range of endoscopes is required, especially with smaller diameters (e.g. 0.89 mm, 1.1 mm).

## 3 COVID-19 epidemic in Slovenia

The Corona Virus Disease 19 (COVID-19) pandemic, which broke out in China in December 2019, was confirmed to have started spreading in Slovenia on 4<sup>th</sup> March 2020, when the first infection was detected (3). The epidemic was officially declared on 12<sup>th</sup> March (4), after which we introduced measures to limit its spread (5), which, as elsewhere in the world, drastically limited public life in the country. The measures successfully curbed the spread of infections and after several weeks of a minimum number of newly detected infections or no infections detected at all, the epidemic was revoked on 31<sup>st</sup> May 2020. At the same time, most restrictions on public life were lifted (6). The Health Advisory Group under the Crisis Staff Unit of the Republic of Slovenia prepared instructions for carrying out the necessary elective activities of surgery departments during the COVID-19 epidemic and sent them to the heads of surgery departments and to hospitals with surgery departments on 25<sup>th</sup> March 2020 to ensure the flow of such healthcare services (7).

## 4 Sialendoscopy at the University Department of Otorhinolaryngology and Cervicofacial Surgery in Ljubljana after 4<sup>th</sup> March 2020

The time after 4<sup>th</sup> March 4 2020 can be divided into three periods:

- The first period - shortly before the epidemic (from 4<sup>th</sup> March 2020 to 11<sup>th</sup> March 2020)
- The second period - the period of the officially declared epidemic (from 12<sup>th</sup> March 2020 to 31<sup>st</sup> May 2020)
- The third period - after the epidemic and until the end of the survey (from 1<sup>st</sup> June 2020 to 31<sup>st</sup> August 2020)

In the first period (before the COVID-19 epidemic), five SE or sialendoscopy-assisted interventions were performed. In four of these patients (80%) the procedure was performed under local anaesthesia, which is in line with our usual practice, as almost three quarters of all such operations (73.5%) are performed in this way at the University Department of Otorhinolaryngology and Cervicofacial Surgery Ljubljana. This period did not differ from our previous sialendoscopic practice in terms of content, either, which means most elective surgeries were performed due to sialolithiasis or its consequences; in two patients, laser fragmentation of SGS was used followed by endoscopic removal, in one patient, SGS was removed with a combined transoral approach, and in the other patient, SE was performed after spontaneous extrusion of SGS with dilatation of salivary gland narrowing.

In the second period (declared COVID-19 epidemic), the scope of our sialendoscopic work decreased significantly: a total of seven such operations were performed. Usually, eight sialendoscopic operations are performed per month during the same time period, which would amount to about 20 procedures in the time span corresponding to the time of the official declaration of the COVID-19 epidemic. During this time, sialendoscopic work had changed in terms of indications for procedures and types of anaesthesia. Three of the cases involved emergencies or complications of sialolithiasis, while the remaining four patients required elective surgery or had conditions that did not require emergent treatment, but delaying the treatment

may have had lasting consequences. The implementation of these interventions derives from the instructions of the Health Group under the Crisis Staff Unit of the Republic of Slovenia, issued on 25<sup>th</sup> March 2020 (7). These four necessary elective procedures involved two cases of complicated dilatation of the narrowed submandibular gland ducts, one case of transoral combined removal of the submandibular gland stones, and one case of SE of the parotid gland in a child with JRP. General endotracheal anaesthesia was used in all patients operated on during the epidemic. The reason for this was mainly the complexity of the surgery itself. This indication also coincided with the desire to protect better the surgical and anaesthesia care team (8). In terms of their complexity, three emergency procedures stood out: in a 60-year-old woman, after unsuccessful conservative treatment of obstructive parotitis, sialendoscopy and navigation-assisted transfacial removal of the parotid SGS was performed; two patients underwent combined sialendoscopy-assisted removal of the submandibular SGS, which caused phlegmon of the mouth floor.

In the third period, after the declaration of the epidemic was revoked on 31<sup>st</sup> May 2020, seven more SEs were performed by the end of our research. Five were elective and two were emergency procedures, with three in general and four in local anaesthesia. One of the reasons for the less frequent implementation of SE during this period is the annual decrease in the presence of anaesthesia care teams and employees of the University Department of Otorhinolaryngology and Cervicofacial Surgery Ljubljana in the

**Table 1:** Sialendoscopies at the Clinic of Otorhinolaryngology and Cervicofacial Surgery immediately before, during and after the COVID-19 epidemic.

Time period	1 <sup>st</sup> period 4 <sup>th</sup> March 2020 – 11 <sup>th</sup> March 2020	2 <sup>nd</sup> period 12 <sup>th</sup> March 2020 – 31 <sup>st</sup> May 2020	3 <sup>rd</sup> period 1 <sup>st</sup> June 2020 – 31 <sup>st</sup> August 2020
All patients	5	7	7
Urgent	0	3	2
Elective	5	4	5
Local anaesthesia	4	0	4
General anaesthesia	1	7	3
Diagnostic sialendoscopy	0	0	2
Laser lithotripsy	2	0	0
Combined approach	1	3	2
Dilatation of stenosis	2	2	1
Juvenile relapsing parotitis	0	1	0
Combined approach with navigation	0	1	2

summer months, which reduced the program of operations so that mostly emergency and oncological operations were performed.

Individual interventions by periods are shown in [Table 1](#).

The COVID-19 epidemic has reduced the implementation of mainly elective operations, most of which include SEs. The higher share of SEs performed under general anaesthesia and sialendoscopy-assisted operations after 4<sup>th</sup> March 2020 (57.89% after 4<sup>th</sup> March vs. 26.75% otherwise) was due to the reduced number of such elective operations, which are mostly performed under local anaesthesia, and additional protection of staff against COVID-19 infection.

After 4<sup>th</sup> March 2020, the personal protective equipment (PPE) used by the surgical team during SE or sialendoscopy-assisted procedures under general anaesthesia did not differ from that which is typically used. As this is an operation that requires precise tactile sensation of at least the leading surgeon, he used standard latex surgical gloves (provided that the patient was not allergic to this type of glove composition), while other members of the surgical team used double gloves, i.e. nitrile gloves and sterile latex gloves over them. Due to the possibility of the patient's saliva and tissues being contagious during SE under general endotracheal anaesthesia, FFP 2 or 3 masks were used by the surgical team members (the choice depending on the availability of PPE at the time of the procedure). Bipolar electrocoagulation, suction and other aerosol-generating procedures are used only exceptionally, so a high-performance hood powered air-purifying respirator (PAPR) is unnecessary. When in doubt about the patient's exposure, it should be emphasised that such a level of protection also protects the patient from the exhaled air of those performing the procedure.

Due to the possibility of creating aerosol with viral particles when coughing or in case of possible defensive reflexes of the patient, FFP 2 or 3 masks during local anaesthesia procedures were also used. The surgeon used only surgical magnifying glasses to protect the eyes, while other team members used ordinary safety glasses (without surgical magnifiers) or a visor. In our opinion, this level of use of PPE is sufficient for the safe performance of SE and sialendoscopy-assisted operations, provided that the patient tested negative for COVID-19 before the procedure. It is understandable that in all SEs other usual protective surgical clothing and drapes were also used.

All patients who underwent SE or sialendoscopy-assisted surgery after 4<sup>th</sup> March 2020 were tested by PCR for the presence of SARS-CoV-2 RNA virus in the nasopharyngeal mucosa before the procedure. All patients were negative. If the result was positive or not yet known, the procedure

would have been performed only in case of an emergency (e.g. threatening spread of infection), but strictly under general anaesthesia. In doing so, the PPE prescribed for operations with the possibility of aerosol formation would have been used, as written in the Slovenian national recommendations for performing emergency tracheotomy during the COVID-19 epidemic, which include the use of double gloves, a high-performance hood powered air-purifying respirator (or at least a FFP 2/3 mask and safety glasses or visor) (8), and then the patient would have been transferred to the COVID-19 ward of the University Medical Centre Ljubljana. Considering these safety measures or using these means, despite only a partial reduction in the implementation of SE or sialendoscopy-assisted operations, no transmission of COVID-19 disease has been recorded so far.

## 5 Sialendoscopy and COVID-19

It is evident that the sialendoscopic technique actually represents a new paradigm that has significantly changed the treatment of obstructive salivary gland disease. The COVID-19 epidemic presents a new challenge to the health care system of every country and puts many surgical methods of treatment to the test, especially elective ones. According to a recent study, the relative risk of COVID-19 infection for German otorhinolaryngologists was 3.67 times higher than in the general population, while the performance of surgeries itself did not prove to be a significant risk factor (9). Endoscopic sinus surgery in particular has been shown to present a high risk for transmission of COVID-19, which to some extent also applies to all surgical procedures, especially head and neck procedures (10).

We therefore wonder whether performing elective procedures in the context of head and neck surgery is justified during the epidemic period and during the relaxation of safety measures. Of course, there is a small share of SE or sialendoscopy-assisted operations that also fall under the category of urgent procedures and these are not subject to the above concerns.

The key question is whether SE or sialendoscopy-assisted procedures are really high-risk procedures for COVID-19 transmission. In a relatively short time, ACE-2 (angiotensin-converting enzyme 2) is a crucial receptor for the SARS-CoV-2 virus, which is also found in salivary gland epithelial cells, playing an essential role in salivary excretion of the virus (11) and the possibility of infection by its droplets. Furthermore, it is already clear that the SARS-CoV-2 can cause acute and chronic sialadenitis (12). SE is performed by introducing endoscopes of different diameters, either all-in-one endoscopes or modular

endoscopes, into the salivary ducts themselves. Thus, in the case of SE, there is always contact with saliva, which in patients with COVID-19 contains a high concentration of viruses, consequently, some authors even believe that a saliva examination would be more reliable than a swab of the nasopharynx (13). Therefore, the operating surgeon always protects his hands with appropriate gloves. These findings apply analogously to other viral infections (cytomegalovirus infection, mumps, Epstein-Barr virus infection and other infections), in which the concentration of viruses in the saliva is also very high (14-16). COVID-19 itself may be accompanied by signs of inflammation of the parotid glands with accompanying inflammation of the lymph nodes in the parotid glands (17). From the very beginning of the COVID-19 pandemic, the United States issued recommendations for treating patients with salivary gland diseases, based on the greatest possible use of telemedicine with imaging and action aimed primarily at identifying malignant tumours. The same authors believe that during the COVID-19 epidemic, sialendoscopic surgery should be discontinued due to the high risk of aerosol infection and direct contact with contagious saliva of the patient (18).

The risk of SARS-CoV-2 infection during SE for the surgical and anaesthesiological team comes from being exposed to the patient's saliva, aerosol, sputum from coughing, sneezing and spitting of the patient during the procedure, at induction of general anaesthesia and waking from it, especially if the procedure was performed under local anaesthesia. In this context, detailed instructions have been published several times on how to handle general anaesthesia and orotracheal intubation and similar procedures in which there is direct contact with the respiratory tract. They promote the fastest possible implementation of the procedure, participation of a minimum number of those performing it, and appropriate PPE (19). There are no detailed instructions in the literature known to us about the implementation of SE during the COVID-19 epidemic. The exception is a group from the USA, which proposes to abandon these interventions altogether until further notice (18). As part of these operations are urgent interventions and it is not known how long the situation without proper vaccination will continue, postponing elective SEs indefinitely is not possible. Recommendations of the dental profession, which operates in practically the same field as SE, can be of help. A European group of authors recommends consistent detection of SARS-CoV-2 infection in patients employing rapid antigen tests before dental procedures, of course with appropriate use of protective equipment (20). Due to the lower reliability of rapid antigen tests, we believe they are more suitable for surgical care in

a day hospital, while for major surgery or when a few days of hospital care is needed, the use of standard PCR tests on SARS-CoV-2 virus genetic material is recommended. We believe that during the prolonged second wave of the COVID-19 epidemic in Slovenia, serological tests to detect the presence of antibodies to the SARS-CoV-2 virus will have to be included in order to more fully evaluate the infection of patients before emergency and necessary elective surgeries.

Although acute sialadenitis is a contraindication for performing sialendoscopy (21), we believe that urgent sialendoscopy, which is performed within one day, is necessary in cases where the patient is at risk of complication or after unsuccessful conservative treatment. Considering our position, we performed five emergency sialendoscopy-assisted procedures during this period.

The question of the type of anaesthesia used in SE or sialendoscopy-assisted surgery is also important. We need to ask ourselves whether the possibility of infection is more significant with the use of local or general anaesthesia. According to the authors of the expert group of French anaesthesiologists, regional anaesthesia is the safest form of anaesthesia in terms of the risk of COVID-19 (22). The explanation for this view is to avoid orotracheal intubation, if at all possible, as it is a procedure with a high risk of COVID-19 transmission. In the case of SE, the situation is slightly different: correctly performed orotracheal intubation during the induction phase of general anaesthesia poses a low risk of COVID-19 transmission compared to a procedure under local anaesthesia, which cannot prevent the aerosol formation in association with reflex responses of the patient. In light of the fact that the patient's status regarding infection is known, we were able to prioritise the planned scope of surgery and the severity of the underlying disease. If the state of SARS-CoV-2 infection was unknown or in patients with confirmed infection, general anaesthesia would always have been chosen following the recommendations for other procedures (8).

By carefully determining the state of infection of a patient with SARS-CoV-2 before surgery and by using appropriate PPE, no transmission of COVID-19 during SE and in sialendoscopy-assisted surgeries has been recorded. As part of the further aggravation of the epidemiological situation, our department plans to perform only emergent and necessary elective surgeries of this type under general endotracheal anaesthesia, but with appropriate identification of possible infection of patients before surgery and the use of proper protective equipment. Given the deteriorating epidemiological situation and new findings on COVID-19, we expect that instructions and measures in this regard will change.

## 6 Conclusion

Contrary to the views of some groups of authors, the authors of this article advocate the idea that the implementation of SE and sialendoscopy-assisted surgery should be continued even during the COVID-19 epidemic. It is unknown how long we will live with different levels of COVID-19 without adequate vaccination coverage. Some of these interventions are emergent and should be carried out regardless of the epidemic, and there are elective SEs or sialendoscopy-assisted procedures that can also not be delayed indefinitely. In order to maximise the safety of medical staff when performing SE and sialendoscopy-assisted surgeries, the patient should be tested for COVID-19 with a PCR test before surgery, the designated PPE should be

consistently used and the procedure should be planned under general anaesthesia. Given that we are witnessing new publications in the professional literature every day and that knowledge about COVID-19 is rapidly upgrading, caution is recommended when performing sialendoscopic procedures during an epidemic. We believe that in the time of a manageable epidemiological situation, taking into account the relevant indications and the implementation of all proposed safety measures, sialendoscopic surgery is safe for the patient and those performing the procedure. At the same time, it is necessary to monitor research results and adapt to new findings constantly.

## Conflict of interest

None declared.

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