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Recommendations for a safe restart of elective aerosol-generating oral surgery procedures following the COVID-19 pandemic outbreak: An Italian multicenter study



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ABSTRACT

Among healthcare workers, oral and maxillofacial surgeons are some of the most exposed to coronavirus disease (COVID-19). The aim of this retrospective study was to develop suggestions for continuing the work of oral and maxillofacial surgeons using a safe protocol for elective and urgent aerosol-generating procedures that could prevent the onset of new clusters.

Based on the results obtained and a guidelines review of those Asian countries that had promptly managed the current pandemic, the following safety protocol was developed:

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- **Patient triage** – Telephonic or entrance triage, body temperature (BT) check, maximum of two patients inside the waiting room, informed consent about the increased risk of contagion.

- **Covid paths**
- **Measures for the patient** – Surgical mask, hand hygiene with sanitizing gel, personal belongings in a plastic bag or left outside, mouth rinse with 0.2% iodopovidone or 1% hydrogen peroxide. TNT gown, gloves, goggles, surgical cap, and shoe covers are suggested.

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•**Arrangement of the clinical environment** – Open windows while performing procedures and/or between patients, locked door, maximum of two operators per room (if possible), forced air ventilation ($\times 3$ air turnover) while performing aerosol-generating procedures on symptomatic or positive patients.

•**Cleaning** – Empty office for 15 min to favor the air turnover, disinfection of contaminated surfaces with 70% alcohol or 2.7–4% hypochlorite products, according to the hospital protocol.

•**Surveillance** – BT check, immediate communication of symptoms of COVID-19, tests for symptomatic operators at day zero and before going back to work, few operators and fixed teams if possible.

•**Operators' personal protective equipment** – For non-AGPs: TNT gown, FFP2 respirator, double gloves (change of the upper gloves for every patient), face shield or goggles, surgical cap. For AGPs (for every patient): rubber dam, if the treatment allows it, waterproof gown, FFP3, double gloves, face shield, surgical cap that covers the neck, shoe covers.

1. Introduction

On January 8, 2020, the Chinese Center for Disease Control and Prevention identified a new coronavirus (SARS-CoV-2) as the pathogen of COVID-19 (coronavirus disease 2019), a severe acute respiratory syndrome (Cheng et al., 2020; Li et al., 2020). Healthcare workers were the most exposed to the contagion (Izzetti et al., 2020), with the Italian Government Insurance for Public Workers (INAIL, 2020) reporting 27 341 cases of COVID-19 by that date.

In view of such a high risk of cross infection, oral and maxillofacial surgery departments in public hospitals were recommended to suspend elective treatments during the outbreak of the pandemic. Private practices were also suspended (Li and Meng, 2020). Routine oral surgery practices were delayed until further notification, according to the epidemic situation. Only emergency cases were treated, with strict implementation of infection prevention and control measures.

Quality-control centers and professional societies have published recommendations for oral services during the COVID-19 outbreak, recommending restricted use of high-speed handpieces or ultrasonic devices, while always wearing the safest PPE.

Specific operative procedures, protocols for environmental hygiene, and PPE recommendations were adopted in every hospital, in order to provide strict and effective infection control with regard to the reinstatement of elective procedures (Li and Meng, 2020). However, to date, there are no official national or international guidelines regarding routine elective oral and maxillofacial surgery procedures during this pandemic, whether for hospital departments or private practices.

This study investigated the quality of the protective measures and the SARS-CoV-2 infections recorded among the surgical staff of different oral and maxillofacial surgery departments during the first COVID-19 epidemic outbreak in the most involved Italian regions. The aim was to present suggestions for elective and urgent procedures and indications for safe operating practice during the ongoing pandemic.

2. Materials and methods

The oral and maxillofacial surgery operative protocols adopted in different Italian hospitals during the Italian lockdown period from March 9, 2020 to May 4, 2020 were retrospectively evaluated, in order to establish the key points in avoiding viral infection while

operating with high-speed handpieces or high-frequency ultrasonic instruments.

Information from public oral and maxillofacial surgery departments from different risk areas of Italy was collected. These areas were classed as red, orange, or yellow according to the number of new positive cases per day.

A 10-point questionnaire was administered to the selected departments to collect information on the following:

1. Actual days of suspension of elective procedures
2. Number of procedures per day before and after suspension
3. Triage modality
4. Arrangement of COVID paths in the department
5. PPE worn by the patient
6. PPE used by the operator in aerosol-generating procedures (AGPs) and non-AGPs
7. Arrangement of the treatment environment (e.g. the use of ventilation, films, and dental chair covers)
8. Setting hygiene (disinfection products, timing of the schedule)
9. Surveillance of professionals (frequency of nasopharyngeal swabs and serum tests)
10. Infections among healthcare workers (HCW)

The results thus obtained were evaluated and discussed collectively by all the authors. An evaluation of the effectiveness of the measures was established on the basis of the prevalence of infections among maxillofacial surgeons linked to each center.

On this basis, a proposal for guidelines to be shared among all the centers was established.

3. Results

Sixteen Italian oral and maxillofacial surgery departments were contacted for this study. A proper response was received from eight hospitals (three were located in red areas, four in orange areas, and one in a yellow area). The following data were processed for this study:

Days of suspension. An average of 57 days of elective treatment suspension during the first outbreak phase was imposed on the eight considered departments. Over that period, the number of patients treated per day was much lower than for the same period in 2019, with 2020 procedures amounting to 2.5–23% of the totals recorded in the same period of the previous year (Table 1).

Patient triage. Even for urgencies, the majority of the departments performed triage by telephone. In two cases that involved direct emergency access, the patients had to await their turn in an outdoor area. If possible, the appointments were staggered in order to have a maximum of one or two patients in the waiting room. In just one case – in an orange area – the patients could go into the waiting room 15 min before their appointment.

In all cases, body temperature was taken at the hospital entrance. The patients could only enter using surgical masks that were provided in the same area, together with hand sanitizing gel.

An anamnestic questionnaire was administered, or an operator asked questions directly about the patient's current health status, proximity to cases with suggestive symptoms or confirmed positive for SARS-CoV-2, and other risk factors for COVID-19. Only in one department were epidemiological criteria followed.

If a patient was suspected for COVID-19, oral surgery treatment was postponed for up to 14 days; in cases of real urgency, the patient was treated as positive (Table 1).

COVID paths. In three departments lacking distinctions between risk areas, safe paths for non-COVID patients were planned in order to separate them from COVID-19-positive patients. In

Table 1
Data collected from dental and oral surgery departments located in red, orange, and yellow areas

Department	Days of susp.	No. of proced., pres/prev	Patient triage	COVID paths	Patient PPE	Environment	Cleaning	Surveillance	Affected HCWs
A (red area)	59	40/250	Anamnestic, BT	No	Hand hygiene, mouth rinse with 0.2% chlorhexidine	Office door locked, window opened, plastic film on keys, displays, and handles	30' between patients, surfaces disinfected with 70% alcohol	1 NF swab	2 pos. 60 tot.
B (red area)	54	10/70	Anamnestic, BT	Yes	Hand hygiene, gloves, mouth rinse with 1% hydrogen peroxide and 0.2% chlorhexidine	Office door locked, plastic film on keys, displays, and handles; if the patient was positive/suspected positive, forced air ventilation	Surfaces disinfected with 4% hypochlorite, air disinfection if patient COVID +	No	14 pos. 3 susp. 46 tot.
C (orange area)	62	4–5/25	Anamnestic, BT; pat. can go into waiting room max 15' before	No	Hand hygiene, gloves, mouth rinse with 0.2% chlorhexidine	Office door locked, window opened	10' between patients, surfaces disinfected with 70% alcohol	NF swabs very 20 days	// 14 tot.
D (orange area)	54	25/101	Anamnestic, BT	Yes	Closed plastic bag for personal belongings, hand hygiene, TNT gown, gloves, goggles, surgical cap, shoe cover, mouth rinse with 0.12% chlorhexidine	Office door locked, window opened	15' between patients, surfaces disinfected with 4% hypochlorite if COVID +	1 NF swab	1 pos. 66 tot.
E (orange area)	55	12/120	Anamnestic, BT	No	Hand hygiene, mouth rinse with 0.2% chlorhexidine	Office door locked; plastic film on keys, displays and handles	Surfaces disinfected with 70% alcohol	No	// 32 tot.
F (red area)	58	5–10/70	Anamnestic, BT	No	Hand hygiene, gloves, mouth rinse with 0.2% chlorhexidine	Office door locked, window opened, plastic film on keys, displays, and handles	10' between patients, surfaces disinfected with 2.7% hypochlorite	No	4 pos. 38 tot.
G (orange area)	56	1–2/60	Anamnestic, BT	No	Hand hygiene, mouth rinse with 0.2% chlorhexidine	Office door locked, window opened	4.0% hypochlorite, 70% alcohol	1 NF swab	// 14 tot.
H (yellow area)	59	1–2/27	Anamnestic, BT	Yes	No personal belongings allowed in the office, hand hygiene, disposable cape, gloves, mouth rinse with 1% hydrogen peroxide and 0.2% chlorhexidine	Office door locked, window opened, plastic film on keys, displays, handles, dental chair, and lamp	20' between patients, surfaces disinfected with 70% alcohol, mid-session floor cleaning	1 NF	// 18 tot.

general, because of the low number of confirmed COVID-19 patients treated, there were no dedicated dental chairs; instead, deep cleaning and air sanitization were performed after each procedure, before letting other people enter (Table 1).

PPE worn by the patient. Every patient required additional hand hygiene with sanitizing gel while entering the office. In three hospitals they were also required to wear gloves, while in another department each patient had to put all personal belongings in a plastic bag, and had to wear TNT gown, gloves, goggles, surgical cap, and shoe covers. Mouth rinse was generally the same: 0.12% or 0.2% chlorhexidine, with 1% hydrogen peroxide used in one department (Table 1).

Arrangement of the clinical environment. Every department had its own air conditioning, so normal ventilation was assured in every location. Windows, if present, were kept opened while performing procedures or between one patient and the next. One department – in a red area – employed forced air ventilation (× 3 air turnover) while performing aerosol-generating procedures in symptomatic or positive patients. Everyone worked with the door locked, with a maximum of two operators and one patient per room (Table 1).

Cleaning. In every location, after the procedures, the staff stayed out of the office for an average of 11 min to favor the air turnover. The surfaces at risk of contamination were disinfected with 70% alcohol or 2.7–4% hypochlorite products, according to the hospital protocols (Table 1).

Surveillance. In every location, members of staff received daily body temperature checks. Any onset of symptoms or exposure to risk factors for COVID-19 were immediately reported to the occupational or public hygiene service.

All members arriving from other regions, even from congresses or other events, were isolated for 14 days or tested at day zero before returning to work. There was no conformity across all the studied departments with regard to active grid surveillance. Half of them did not perform routine swab or serum tests for all their workers. Most of the other departments tested their members only once during the whole study period, while just one department – in an orange area – tested its personnel every 20 days. When possible, rotation of staff members in shifts was reduced in all centers (Table 1).

Affected healthcare workers. Reflecting the prevalence of positive cases in the respective regions, the Departments of the yellow and orange areas had around 0–4 contagions, rising up to 17 in the most exposed red area [Table 1].

Operators' personal protective equipment. The rules imposed differed slightly from place to place. In all cases there was a different dressing protocol for non-AGPs and AGPs.

For non-AGPs, operators were required to use a TNT or waterproof gown, a surgical mask or FFP2 respirator, double gloves, face shield or goggles, surgical cap, and shoe covers (in some departments).

For AGPs, operators were required to use a waterproof gown, an FFP2 respirator (FFP3 in one case) and surgical mask on or under it, double gloves, face shield, surgical cap, and shoe covers (in three cases). A rubber dam was used for all dental procedures in just two departments. In two departments, APG procedures were not performed, with the patients referred to another hospital or private surgeons (Table 2).

Table 2
Collected data on PPE worn by operators, for non-AGPs and AGPs.

Department Operators' PPE for non-AGPs	Department Operators' PPE for AGPs
A (red area) TNT gown, FFP2 respirator with surgical mask on it, double gloves, face shield, surgical cap, shoe covers	A (red area) Waterproof gown, FFP2 respirator with surgical mask on it, double gloves, face shield, surgical cap, shoe covers
B (red area) Waterproof gown, FFP2 respirator with surgical mask on it, double gloves, face shield, surgical cap, shoe covers	B (red area) Waterproof gown, FFP3 respirator with surgical mask on it, double gloves, face shield, surgical cap, shoe covers
C (orange area) TNT gown, surgical mask, gloves, goggles, surgical cap	C (orange area) Waterproof gown, FFP2 respirator with surgical mask under it, double gloves, face shield, surgical cap
D (orange area) TNT gown, surgical mask, gloves, goggles, surgical cap	D (orange area) Rubber dam, waterproof gown, FFP2 respirator with surgical mask on it, double gloves, face shield, surgical cap, shoe covers
E (orange area) Waterproof gown, FFP2 respirator with surgical mask on it, double gloves, face shield, surgical cap	E (orange area) AGPs not performed
F (red area) Waterproof gown, FFP2 respirator with surgical mask on it, double gloves, face shield, surgical cap	F (red area) Rubber dam, waterproof gown, FFP2 respirator with surgical mask on it, double gloves, face shield, surgical cap
G (orange area) Waterproof gown, surgical mask, double gloves, face shield, surgical cap	G (orange area) AGPs not performed, e-consultation
H (yellow area) TNT gown, FFP2 respirator with surgical mask on it, double gloves, goggles or face shield, surgical cap	H (yellow area) Waterproof gown, FFP2 respirator with surgical mask on it, double gloves, goggles or face shield, surgical cap

4. Discussion

Among healthcare professionals, it has become clear that oral and maxillofacial surgeons are some of the most exposed to the risk of SARS-CoV-2 infection, since the routes of transmission are contact, droplets, and aerosol (Li et al., 2004; Cheng et al., 2013). To our knowledge, the present study was the first to attempt to calculate the incidence of COVID-19 in this particular subpopulation.

According to an Italian Government Insurance for Public Workers (INAIL, 2020) report, from March 18 to May 4, 2020, 27 341 healthcare workers in Italy were infected with COVID-19 – 7.1% of the country's healthcare worker population, according to the Italian Ministry of Health (INAIL, 2020; Ministero della Salute, 2020). Our study compared these data with the ratio calculated for oral and maxillofacial surgeons (OMFS) in the included centers. The total number of OMFS was 288, which included 24 confirmed COVID-19 cases. This incidence was 8.3% – slightly higher than that reported by INAIL for all healthcare workers. The Fisher exact test was used to compare the two groups, giving a result of $p = 0.4$, which was not significant at $p < 0.05$.

It is important to note that the Italian healthcare workers population included professionals who suspended all their activities, in order to reduce the risk of contracting COVID-19. Moreover, the studied oral and maxillofacial surgery departments mostly belonged to high-incidence COVID-19 areas.

Our study suggested that the prevalence of infections among OMFS was comparable to that across all healthcare workers. This was probably because the OMFS interviewed used full PPE equipment and other protective measures, as suggested by international guidelines during the pandemic. Moreover, patient PPE and environmental treatment would also have contributed to lowering the risk of infection.

The main guidelines for medical professionals developed in China, Hong Kong, Singapore, Taiwan, and other eastern countries for safely approaching aerosol-generating procedures during the very first outbreak of the pandemic were really important in reducing the spread of infection. These guidelines clearly indicated the triage of patients, the measures to be taken to sanitize the clinical environment, the operative procedures, and the PPE to be worn by the operator during treatments that do or do not generate (Cheng et al., 2020; Li and Meng, 2020; NHC, 2020a; NHC, 2020b; NHC, 2020c).

In Europe, although studies focusing on the reduction of surgical activities and on triage protocols have been published (Allevi et al., 2020; Salzano et al., 2020; Barca et al., 2020; Zimmermann and Nkenke, 2020; Parara et al., 2021; Robiony et al., 2021), no study

has had the objective of identifying guidelines that affect all aspects of maxillofacial surgical practice. This is reflected in the fact that, to date, no Italian maxillofacial or odontoiatric organization has issued official guidelines, with the decision on which practices should be implemented being left to the individual centers.

An important recommendation has been to postpone all non-urgent procedures, but it is now clear that we will have to coexist with this virus for an undetermined period and that, albeit gradually, elective activities and procedures need to be restored in order to guarantee oral health and to prevent many potentially life-threatening oral diseases. Although many international and regional oral and maxillofacial surgery organizations, the Italian Ministry of Health, and the National Federation of Medical Doctors and Dentists have provided operative guidelines during the COVID-19 outbreak, there remained no official consensus on elective activity during the second wave (ISS, 2020; Izzetti et al., 2020).

The guidelines and recommendations were so effective during the most dangerous period – the first outbreak – that they should also be applied during the current phase of the SARS-CoV-2 pandemic. Even with confirmed COVID cases on the rise again globally, further complete suspension of elective oral surgery procedures cannot be considered because of the large number of patients whose treatments were postponed and/or who were undiagnosed during the first wave. However, an increase in oral and maxillofacial AGPs would represent a potential threat of new clusters (Li et al., 2004; Manchein et al., 2020; Lee et al., 2021; Deiana et al., 2021). For this reason, it is important to recommend and adopt rigid protocols of admission and care in oral and maxillofacial surgery settings that can be defined as 'safe' if the risk of infection among operators is comparable to that for other healthcare workers.

Based on the data collected, the results obtained, and a review of the guidelines adopted by the Asian countries that promptly managed the first wave, the following protocol could be suggested during the control phase, when elective outpatient treatments begin again:

Patient triage. Telephonic or entrance triage is required (Table 3). Appointments should be scheduled in order to have a maximum of two patients inside the waiting room, with waiting time reduced to a few minutes for each patient. Body temperature should be taken at the entrance. The patient needs to be well informed about, and accept, the increased risk of infection.

COVID paths. COVID paths are suggested in oral and maxillofacial surgery settings. If this is not possible, it could be appropriate to schedule a confirmed or suspected COVID-19 patient at the end of the session.

Table 3

Patient anamnestic triage questionnaire to be administered by telephone or on arrival.

Patient anamnestic triage questionnaire
Do you have fever or have you experienced fever within the past 14 days?
Have you experienced a recent onset of breathing difficulties or symptoms such as cough, cold, asthenia, sore throat, diarrhea, nausea or vomiting, muscular or joint pain, or loss of smell or taste in the past 14 days?
Have you come into contact with a patient with a confirmed COVID-19 infection within the past 14 days?
Have you come into contact or do you live with people with recently documented fever or respiratory problems within the past 14 days?
Have you recently participated in any gathering, meetings, events or had close contact with many unacquainted people?

Measures for the patient. Every patient should wear a surgical mask to enter the building or the office. Hand hygiene with sanitizing gel should be mandatory (Cheng et al., 2019). All personal belongings should be placed in a plastic bag or left outside the office. Mouth rinse should include 0.2% iodopovidone or 1% hydrogen peroxide as oxidant agents – chlorhexidine has been reported as ineffective (Peng et al., 2020). TNT gown, gloves, goggles, surgical cap, and shoe covers are suggested, but not compulsory.

Arrangement of the clinical environment. Each department normally has its own air conditioning. Windows, if present, should be kept open while performing procedures or between appointments, and the door should be locked, with a maximum of two operators and one patient per room. Forced air ventilation ($\times 3$ air turnover) while performing aerosol-generating procedures in symptomatic or positive patients is suggested, if possible.

Cleaning. Between patients, staff should stay out of the office for 15 min to favor air turnover. Surfaces at risk of contamination should be disinfected with 70% alcohol or 2.7–4% hypochlorite products, according to the hospital protocols.

Surveillance. The body temperature of every member of staff should be checked daily. The onset of symptoms or exposure to risk factors for COVID-19 has to be reported immediately to the occupational or public hygiene service. Any sick staff should be tested at day zero and before going back to work. Operators should be kept to a minimum, with no more than two per chair, and teams should be fixed if possible.

Operators' personal protective equipment. For non-AGPs, the operators should wear a TNT gown, FFP2 respirator with surgical mask on it if the respirator has an expiratory valve, double gloves, face shield or goggles, surgical cap. This PPE can be retained for different patients in the same session, if there is no evident contamination, while gloves need to be changed after hand hygiene for every patient.

In case of AGPs, a rubber dam is recommended, if the treatment allows it, along with a waterproof gown, FFP3 respirator and surgical mask on it if the respirator has an expiratory valve, double gloves, face shield, surgical cap that covers the neck, shoe covers. It is strongly recommended that all PPE is changed after each AGP. For this reason it is suggested that AGPs are scheduled at the end of the session.

Our study had several limitations. First, due to the retrospective nature of the study, it was not possible to ensure that the guidelines proposed in each center were strictly applied throughout the pandemic period. Second, although the inclusion of hospitals in areas of differing pandemic severity may have provided an overall picture that encompassed all possible scenarios, the incidence of infection among HCWs is likely to have been influenced by that in the general population of that region. Third, the study was conducted before the introduction of vaccination. This last measure represented a paradigm shift in the prevention of infection, and will need to be considered in future guidelines on safety in maxillofacial surgery departments.

5. Conclusions

The SARS-CoV-2 pandemic has profoundly influenced the activity of oro-maxillofacial surgery departments, which represent some of the highest-risk environments for spreading infection, due to the nature of the treatments that are applied. For this reason, it is essential to have shared guidelines based on the previous experiences of the individual departments. According to the results of this study, the triage of patients, the use of PPE, and the continuous testing of HCWs and patients, represent the first line of prevention to be implemented.

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