



TIMING OF ORAL SURGICAL PROCEDURES FOLLOWING SARS-COV-2 INFECTION

Maxillofacial Surgery

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ABSTRACT

The novel coronavirus disease 19 (COVID - 19) caused by severe acute respiratory syndrome coronavirus 2 (SARS CoV 2) is a worldwide crisis for global health & economy. The spread of COVID - 19 has had a significant impact on surgical services worldwide & posed several challenges. A significant number of patients who were previously infected with the virus might need surgical extraction of teeth and other maxillofacial surgeries. The disease has greater potential for multisystem involvement, hence, to ensure a safer surgery - the exact timing of surgery must be planned. However, the clarity on when the surgery should be done is found lacking. Surgery should not be done during the active phase of the infection. Surgery in patients who recovered from COVID - 19 should be timed to ensure the safest delivery of perioperative care as it may cause a multisystem disease with both short & long-term sequelae which may have an impact on postoperative recovery. Thus, shared decision-making regarding the timing of the surgery after SARS CoV 2 infection is highly critical and must account for multiple factors. In this article, we discuss considerations to be factored in while planning the elective surgery such as the complexity of the surgery, the severity of the initial infection, ongoing symptoms of COVID-19, comorbid and operational status, clinical priority, and disease progression.

KEYWORDS

INTRODUCTION

In December 2019, a spate of acute atypical respiratory infections wreaked havoc worldwide. The causative microorganism of these unusual infections was termed the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), a novel coronavirus belonging to the family Coronaviridae. [1] It was seen to be highly analogous to the SARS coronavirus (SARS-CoV), which was responsible for the respiratory pandemic during the 2002–2003 period. On March 11, 2020, the World Health Organization proclaimed COVID-19 as a pandemic. [2]

SARS-CoV-2 virus predominantly affects the respiratory system, even though other organ systems are also infected. Earlier studies show that the incubation period may be ranging from 4 to 7 days and that patients may become symptomatic 2 to 14 days after getting exposed to the pathogenic organism. It is also believed that the patient may be asymptomatic, but contagious during the incubation period. [3] In the initial stages of the disease progression, patients report symptoms including fever, dry cough, and dyspnea suggestive of lower respiratory tract infection. Patients also reported dizziness, generalized weakness, headache, body ache, diarrhea, and vomiting. [4]

However, it is now well recognized that these respiratory symptoms are exceptionally heterogeneous, ranging from mild symptoms to serious hypoxia with Acute respiratory distress syndrome. A study conducted [5] on COVID-19 patients showed that the most of patients succumbed due to multi-organ failure as respiratory failure, shock, and Acute Respiratory Distress Syndrome were seen in 94%, 81%, and 74% of cases, respectively. It was also observed that most of the deaths related to COVID-19 in the middle age group (30-50 years) population were noticed among patients who also suffered from other medical diseases such as chronic obstructive pulmonary disease, asthma, diabetes, hypertension, cardiovascular disease, renal disease, liver disease, immunocompromised patients, and patients with malignant conditions.

Patients with SARS-CoV-2 infection can experience a range of clinical manifestations, from no symptoms to critical illness. In general, adults with SARS-CoV-2 infection can be grouped into the following severity of illness categories; however, the criteria for each category may overlap or vary across clinical guidelines and clinical trials, and a patient's clinical status may change over time.

Clinical Spectrum Of The Disease

Asymptomatic or Presymptomatic Infection:

Individuals who test positive for SARS-CoV-2 using a virologic test (i.e., a nucleic acid amplification test [NAAT] or an antigen test) but who have no symptoms that are consistent with COVID-19.

Mild Illness:

Individuals, who have any of the various signs and symptoms of COVID-19 (e.g., fever, cough, sore throat, malaise, headache, muscle pain, nausea, vomiting, diarrhea, loss of taste and smell) but who do not have shortness of breath, dyspnea, or abnormal chest imaging.

Moderate Illness:

Individuals who show evidence of lower respiratory disease during clinical assessment or imaging and who have an oxygen saturation (SpO₂) ≥94% on room air at sea level.

Severe Illness:

Individuals who have SpO₂ <94% on room air at sea level, a ratio of arterial partial pressure of oxygen to fraction of inspired oxygen (PaO₂/FiO₂) <300 mm Hg, a respiratory rate >30 breaths/min, or lung infiltrates >50%.

Critical Illness:

Individuals who have respiratory failure, septic shock, and/or multiple organ dysfunction. [13]

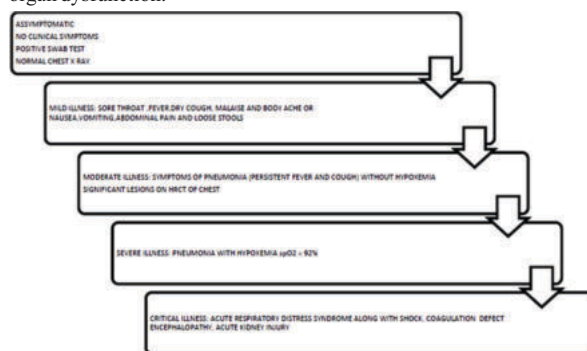


Fig 1 : schematic representation of clinical spectrum of disease

Postoperative pulmonary complications that occur in most patients with peri-operative SARS-CoV 2 infection are associated with high mortality. Hence it is advisable to postpone elective surgeries and to promote non-operative treatment to delay or avoid the need for surgery.

Recently, there are increasing reports of cerebrovenous thrombosis as one of the potential complications of this deadliest viral disease. A clinical report also reported this [8]. It was observed that a 55-year-old male patient who recovered uneventfully from mild COVID disease three months back underwent tooth extraction one week ago and

developed progressive facial swelling involving the left side first then progress to involve the whole midface with eyes proptosis and reduced vision and later was diagnosed as cerebrovenous thrombosis.

On the clinical and radiological evidence, a provisional diagnosis of cavernous sinus thrombosis secondary to dental extraction was made and the patient was treated aggressively with high dose triple antibiotics (Meropenem 500 mg bid, Rocephin 2g three daily, and Vancomycin 1.5g bid), high dose of heparin (8000 IU OD) and steroids. Unfortunately, his condition deteriorated very fast (within 72 hours) and succumbed to the disease complications.

Furthermore, a new disorder is known as “post-COVID syndrome,” describes patients that no longer have a viral infection, but still retain the residual side effects of the illness including deconditioning and inflammation. Like many well-described viral illnesses, these post-viral symptoms can include profound fatigue, headaches, memory disturbances, difficulty with concentration, and depression. For example, chronic post-SARS side effects, characterized by fatigue, myalgia, weakness, depression, and poor sleep, were described in 2011 after the 2003 outbreak (Moldofsky and Patcai 2011). Similarly, there are reports^[9] of patients experiencing symptoms like chronic fatigue syndrome after mononucleosis infection, with memory and concentration deficits and profound exhaustion after exertion.

Many inflammatory syndromes and responses have been described in recovered COVID patients as well, with patients suffering from neurologic complications such as seizures, Guillain-Barre syndrome, and acute disseminated encephalomyelitis (Carroll et al. 2020; Chan et al. n.d.; Novi et al. 2020).

Auto-inflammatory diseases such as idiopathic thrombocytopenic purpura and autoimmune hemolytic anemia in adults, and pediatric inflammatory multisystemic syndrome, have been reported to have developed among patients after recovery from COVID-19 (Zulfikar et al. 2020; Galeotti and Bayry 2020; Lazarian et al. 2020).

General Protocols

Most concerns about performing surgery in recovered COVID -10 patients are related to the uncertainty of the post-symptomatic infectious period. Several studies have demonstrated prolonged or intermittent viral shedding in otherwise recovered, asymptomatic patients.^[9] Accordingly, the Central Disease Control agency in the United States recently extended the time that recovered COVID-19 patients should remain isolated. Specifically, recovered patients should isolate for at least 10 days rather than 7 days after onset of symptoms and for at least 3 days after recovery. The risk of postoperative complications in newly recovered COVID -19 patients is another major concern in deciding the timing of surgery

A prospective cohort study^[10] was conducted on patients undergoing elective or emergency surgery during October 2020. This study compared surgical patients with pre-operative COVID infection with those without previous COVID infection and observed that chances of mortality were high among patients with a history of the infection than those without a history of pre-operative COVID infection. This study suggested that all elective surgeries must be postponed for a minimum of 6 weeks.

In one study^[10], cardiac surgery during influenza was an independent risk factor for the development of ARDS, the duration of mechanical ventilation was also significantly longer than in non-influenza season. Another study demonstrated that acute respiratory infection in the month preceding surgery was an independent risk factor for postoperative pulmonary complications. Finally, airway hyperactivity following an upper respiratory infection may last 2-6 weeks and can contribute to surgical complications.

The most common factors predicting the risk of a negative post-anesthetic outcome in case of a perioperative COVID19 infection are Age (over 65 years), American Society of Anesthesiologist (ASA) level (3 or higher), emergency surgeries, arterial hypertension, cerebral vascular disease, ischemic and valvular heart disease, cardiac arrhythmia, diabetes mellitus, final-stage kidney disease, COPD/asthma, and obesity.

We suggest that the procedures may be prioritized based on the severity of the disease and the timing of surgery.

The treatments may be classified into 5 categories:

1. Emergency procedure
2. Urgent & Minimally invasive procedures (without aerosol production)
3. Urgent & invasive procedures (with aerosol production)
4. Not urgent
5. Elective

Table 1 : classification of the treatments

Category	Procedures
Emergency procedures	All the procedures that is life threatening or that may cause disability are grouped into this category: • Displaced fractures of the maxillofacial skeleton (may compromise the airway) • Uncontrolled post-operative hemorrhage • Infection of the facial spaces which lead to further complications like sepsis, bacteremia, airway obstruction, meningitis
Urgent and minimally invasive procedures	All the procedures that are urgent but are minimally invasive that do not generate aerosol are grouped into this group: • Minimally displaced or undisplaced fractures of maxillofacial skeleton which may be managed conservatively without surgery • Localized periodontal or dental abscess which may be treated without aerosol generation. • Dental trauma with avulsion/luxation that can be minimally managed without aerosol generation. • Fractured orthodontic appliances causing soft tissue laceration • Pericoronitis or third-molar pain that can be managed without aerosol generation. • Surgical postoperative osteitis or dry socket that can be managed without aerosol generation. • Severe dental pain from pulpal inflammation or fracture of vital tooth that requires tooth extraction • Biopsy of malignant and potentially malignant lesions • Management of lock jaw • Suturing of lacerated wounds
Urgent ,but invasive procedures	All the procedures that are urgent but are invasive i.e. aerosol generating is grouped into this category: • Open extraction of teeth • Deboned fixed prosthesis cleaning and temporary cementation • Dental trauma with avulsion/luxation that need invasive/Aerosol Generating Procedures • Periodontal or periapical surgeries • Biopsy with aerosol generation
Not an urgent procedure	Procedures those are not urgent and grouped under this group: • Management of asymptomatic chronic irreversible pulpitis • Chronic periodontal disease • Management of fractured tooth (asymptomatic)
Elective surgeries	• Initial or periodic oral examination & recall visit • Esthetic procedures • Extraction of asymptomatic teeth • Dental implant surgery

Pre-operative Assessment

Once the treatment is planned a complete evaluation of the patient must be conducted, which includes:

- Eliciting proper past and current medical history: which includes a course of the infection, medications, signs, and symptoms of any potential subclinical complications.
- Complete evaluation of the patient must be conducted including (but not limited to): The patient's exercise capacity -metabolic equivalents, The American Society of Anesthesiologist (ASA) level, cardiopulmonary function, coagulation status, markers of inflammation, and nutritional status. Patient's taking chloroquine or azithromycin are known to increase QT intervals which may lead to arrhythmia
- Chest computed tomography (CT) scan -showing changes consistent with pneumonitis secondary to SARS-CoV-2 infection.
- Persistent symptoms suggest long COVID.
- Increased risk of comorbidity
- Patients treated with steroids, and monoclonal antibodies.

Specialist advice to be sought.

- High chance of fungal infection.
- Preference should be given for local anesthesia over general anesthesia.
- If intravenous sedation is used in combination with regional anesthesia for hemodynamic stability and/or patient comfort, only conscious sedation must be attempted to avoid respiratory depression and cough^[6].

Timing Of Surgery

The Anesthesia Patient Safety Foundation (APSF) and the American Society of Anesthesiologists (ASA) have issued a 2022 joint statement on elective surgery after COVID-19 infection, with general guidelines on timing of elective surgery based on the severity of symptoms at the time of infection, ongoing symptoms, comorbidities, and complexity of surgery.

The joint statement recommends delaying elective surgery for seven weeks after a diagnosis of COVID-19 in unvaccinated patients, and extending that delay in patients with ongoing COVID-19-related symptoms at the planned time of surgery. The statement notes that there is insufficient evidence to make recommendations in patients who have COVID-19 after having been vaccinated.

To determine the appropriate timing of elective surgery, two widely accepted strategies must be considered: THE ASA protocol and the CDC non-test-based strategy.

ASA Protocol

- **Four weeks** for an **asymptomatic** patient or recovery from only mild, non-respiratory symptoms.
- **Six weeks** for a symptomatic patient (e.g., cough, dyspnea)- no hospitalization.
- **Eight to 10 weeks** for an asymptomatic patient who is diabetic, immunocompromised, or **hospitalized**.
- **Twelve weeks** for a patient who was admitted to an **intensive care unit** due to a COVID-19 infection.

CDC non-test-based strategy

- 1) Mild- moderate:
 - a) At least 24 hours since the resolution of fever without the use of fever-reducing medications and improvement in respiratory symptoms and, at least 10 days since symptoms first appeared severe.
- 2) At least 10 days and up-to 20 days have passed since a symptom onset and,
- 3) at least 24 hours since the resolution of fever without the use of fever-reducing medications and improvement in respiratory symptoms, and c) Symptoms (e.g., cough, shortness of breath) have improved.

Recovery from COVID-19—

The time to resolution of symptoms and complete recovery from COVID-19 varies widely. Young healthy patients with mild COVID-19 may recover completely within several weeks, while patients with comorbidities or severe infection may have a more prolonged recovery of eight weeks or longer. Some patients have protracted changes in pulmonary function, multiorgan system involvement, including stroke, myocarditis, and kidney dysfunction. fatigue, and psychologic or cognitive problems. Similar to other viral illnesses, decisions about the timing of elective procedures should be based on the type of procedure to be performed, patient comorbidities, and residual symptoms, including exercise tolerance relative to baseline.

Infectivity

Both the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) have provided recommendations for determining when a patient diagnosed with COVID-19 is no longer infectious. They provide options based on testing or time since resolution of symptoms, or for patients who were asymptomatic, time since confirmatory test was performed.

For discontinuing the precaution to prevent infections in patients with SARS CoV 2 infection the CDC has proposed two types of strategies:

- **Test based**
- **Non test based**
- Non test based strategy is most commonly followed nevertheless;

the ideal strategy would depend upon the patient population and the severity of disease.

It Involves:

Improvement in symptoms and or specific time intervals on the contrary test based strategy requires 2 RTPCR (Reverse transcription polymerase chain reaction) tests for SARS-CoV 2 on sequential nasopharyngeal and oropharyngeal swab specimens collected more than or at least 24 hours apart.

If patients are ready to be discharged home prior to meeting criteria for discontinuation of precautions, they can be sent home with instructions to self-isolate until they meet criteria.

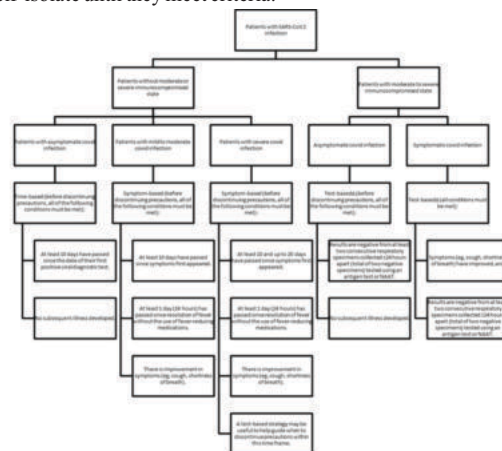


Fig 2: flowchart depicting the management of patients with SARS-CoV2 INFECTION

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