



**ORIGINAL RESEARCH PAPER**

**Maxillofacial Surgery**

**A PATIENT CENTRIC ALGORITHM FOR MANAGEMENT OF MAXILLOFACIAL TRAUMA DURING PANDEMICS AFFECTING THE RESPIRATORY SYSTEM**

**KEY WORDS:** Maxillofacial Trauma Algorithm, Pandemic, COVID 19, Infection control

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**ABSTRACT**

Amidst any pandemic, numerous protocols in the management of maxillofacial trauma would be suggested. In this context, AOCMF international task force has given guidelines for operating during this pandemic (COVID 19). The recommendations are based mostly on personal communication, guidelines put forth by various national and international societies, and peer reviewed data when possible. Hence, based on practical experience of treating maxillofacial trauma during the pandemic, practicality and brain storming sessions with anaesthesiologists a logical algorithm to surgically treat maxillofacial trauma during any pandemic is suggested from both the treating doctor and patient's perspective.

**INTRODUCTION:**

As on august 1<sup>st</sup> 2022, almost 57.7 people all over the world have been infected by the SARS COV2 and while close to 64 lakhs have died globally. In India, almost 4.4 crore people affected and more than 5.26 lakh people have died<sup>2</sup>. Amidst this rising numbers of affected patient data, the disease is of concern for a clinician for 2 reasons. One, it has high rate of transmission and the other is that of distinctive clinical concerns, especially with respect to gross non uniformity of hypoxia related clinical features amongst affected patients<sup>3</sup>. Guidelines for performing surgical treatment during this pandemic have also been provided by various bodies. This paper intends to discuss certain clinical concerns arising out of the recently published AOCMF operating guidelines for treatment of craniomaxillofacial trauma during this pandemic. A practical algorithm to manage patients with maxillofacial trauma during any infectious disease pandemic such as this current COVID 19 is suggested.

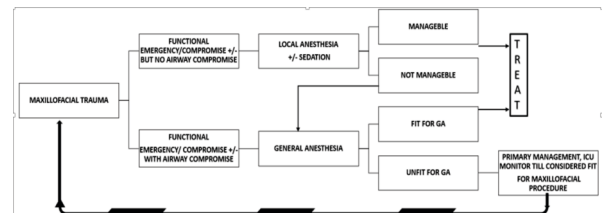
**AO CMF International Task Force Recommendations on Best Practices for Maxillofacial Procedures during COVID-19 Pandemic<sup>4</sup> – 22.4.2020.**

To help out the maxillofacial surgeons during this pandemic, various national and international bodies have laid down guidelines to be followed while treating patients amidst this pandemic caused by SARS COV2. In this context, AOCMF international task force has given guidelines for operating during this pandemic. The recommendations are based mostly on personal communication, guidelines put forth by various national and international societies, and peer reviewed data when possible.

The world in the near future has to accept to live in a 'new' normal environment. Maxillofacial surgeons need to be prepared for Pandemics as It is hypothetical to accept that not all cases of maxillofacial trauma, even if all are presumed infected/affected, are emergencies. Hence certain guidelines are required to treat such patients which should be easy to follow, safe for the health worker and without compromising on the time-tested surgical protocols. Standard infection control measures to be adopted by health care workers and institutions have been well explained by various national and international bodies. Hence, presuming that those infection control protocols have been adopted, a logical algorithm to surgically treat maxillofacial trauma during a pandemic is suggested from patient's perspective.

We suggest that as far as possible recommended method of treating a patient based on existing scientific evidence should not change. The protocol towards administration of

recommended treatment could change only based on the logistics availabilities and difficulties in the health care administration.



**Algorithm for management of patient with Maxillofacial trauma during pandemics (COVID 19) (figure 1)**

Irrespective of patient's infective status, all healthcare workers inside the operatory room should be covered with PPE and all necessary infection control protocols be adopted. Every patient entering the operatory room is tested for their infective status as per the existing pandemic protocols. It is preferable to have a separate operatory room for patients with infectious diseases during pandemics, with a separate entry and exit path to minimise the risk of transmission of the disease. Any maxillofacial trauma for which the management can be potentially delayed without compromise in the overall outcome (trauma causing aesthetic problems, not having major functional or airway compromise), could be delayed for a minimum incubatory period of the prevailing pandemic to rule out symptoms.

Assessment of the patient and decision making regarding the required plan to treat a particular case of maxillofacial trauma is dependent on clinician's experience and skills. The doctor treating the patient would be in the best possible situation to categorize and channelize the patient towards the right treatment plan. The algorithm categorises functional and airway compromise as the main categories. Threat to life due to airway compromise is considered a greater priority to manage than functional compromise. A patient is considered to have an airway compromise if fracture of midface or mandible is displaced resulting in difficulty in breathing with clinical signs of hypoxia. Bleeding is considered an emergency when it is not controlled with closed local measures. Functional compromise needs to be differentiated from a functional emergency. A potential loss of vision if unoperated, is a functional emergency whereas a functional compromise is reported in the situations when there is marked restriction of eye movements with diplopia in primary gaze, marked malocclusion or hindrance in mouth opening causing difficulty for oral intake, or patient has

severe pain which cannot be managed with pain killers.

The surgery under local anaesthesia +/- sedation and general anaesthesia are two channels for the clinician to decide. Surgery is preferred under local anaesthesia whenever possible as cardio pulmonary risks involved in general anaesthesia are avoided and infection transmission risk is minimal when compared to GA. The decision regarding fitness of a patient for a surgery under general or local anaesthesia is dependent on the investigative parameters, comorbidities, nature of associated injuries, hemodynamic stability and clinical characteristics of the prevailing pandemic. Manageability to perform surgery under LA is subjective and varies with the situation. The factors which could matter in performing the surgery under local anaesthesia with or without sedation are patient's cooperation, neurological and hemodynamic stability, operator skills and available armamentarium.

**DISCUSSION**

Turning the pages of history, pandemics have created unprecedented loss of life globally. COVID 19 has not been an exception either. The rate of transmission and distinctive clinical features make pandemics a threat to humanity and a great risk to healthcare workers who are in the front line of disease exposure. Maxillofacial surgeons and otolaryngologists are at the greatest risk of disease exposure due to the vicinity of nasal and oral cavity, the gateway of virus entry into the respiratory system.

Performing head and neck surgeries during this pandemic phase of the disease cannot be avoided but can be channelized towards a logical and a rational path in the best interest of the patient and operator. In case of operating on maxillofacial trauma, we recommend that all patients needing surgery are investigated for pandemic prevailing. Positivity or negativity to the virus should only be taken as a precaution for institutional infection control protocols but not for changing the routine time-tested surgical protocol of treating maxillofacial trauma as much as possible. The investigation parameters and clinical presentation of the disease symptoms would only be suggestive of the timing of the surgery and not on the change in method of treatment unless the patient is deemed unfit for any procedure under LA or GA. The suggested algorithm is a net result of brainstorming sessions with maxillofacial surgeons and anaesthesiologists to channelize the management of the patient. It is based on practical experience, practicality and clinical knowledge of pandemics without compromising the recommended surgical protocol as much as possible. Although, the assessment parameters and clinical concerns to define the fitness of a patient to undergo the surgery might differ from disease to disease, the algorithm intends to be a practical guide to decision making in the treatment of maxillofacial trauma amidst any infectious disease pandemic.

**Effect of maxillofacial trauma on the airway**

Normal Pulmonary function is vital for a human homeostasis. The pulmonary functions are a measure of lung volume, capacity, rates of flow, and gas exchange. Spirometry assesses the integrated mechanical function of the lung, chest wall, and respiratory muscles by measuring the total volume of air exhaled from a full lung to maximal expiration. If there is reduction of amount of forceful exhalation of air in the first second of the forced exhalation (FEV1) it indicates reduction of lung inflation which could be due to obstruction of the airways [5].

It is hence important to presume the added effect of maxillofacial trauma on the airway of humans when the risk of inflammatory lung injury is expected to be high because of any future pandemic similar to COVID 19. COVID 19 commonly affects the upper respiratory tract initially and then progresses towards the lower respiratory tract. It leads to

inflammatory lung injury and ARDS. The rate of disease progression depends on the host immunity (comorbidities) and the viral load of inoculation [6]. Patients would show a gross ventilation/perfusion mismatch because of severely compromised gas exchange leading to severe hypoxia stimulating a compensatory increase in minute ventilation by an increase in tidal volume causing extreme hypocapnia [3].

The Maxillofacial skeleton and its muscle attachments anatomically plays a major role to keep the airway patent. Patients with multiple midface or lower mid face fractures causing posterior displacement of maxilla or mandible may compromise the airway. The effects of altered consciousness secondary to either effects of alcohol intake or any intracranial injury may worsen the situation. Hence from a patient's perspective, the importance of airway compromise is prioritized during the design of algorithm and the priority to restore the airway is given importance irrespective of the infective status of the patient.

The effect of closed reduction on patients during this pandemic is to be debated on two issues. One that the effect of MMF on respiratory system and the other is the fact that open reduction and internal fixation is avoided. The only advantage the closed reduction has is that it avoids surgery.

The effect of MMF on pulmonary functions has been studied for more than two decades. Most studies have shown a clinically significant reduction in the values of the pulmonary functions in the acute postoperative period after maxillomandibular fixation [7-10]. The pulmonary functions gradually return to normalcy only after 4 to 6 weeks postoperatively. Hence, it would be conclusive to assume that the patient's pulmonary functions are compromised during the immediate post-operative period after closed reduction with maxillomandibular fixation. Hence in such patients, it is better to have an unhindered mouth opening with a stable maxillofacial fixation which does not compromise the airway rather than a compromised airway by closed reduction.

**CONCLUSION:**

Surgical protocols for operating on maxillofacial trauma are aimed at stable fixation and early rehabilitation of a patient without much of functional compromise whenever possible. The proposed algorithm is intended to be a generalised guideline in the management of all maxillofacial trauma cases during pandemics. The panic of disease transmission during a pandemic should not be considered the only factor to modify an already existent scientific evidence based surgical protocol. Understanding the disease and its clinical progression should be the guide for comprehensive management of maxillofacial trauma.

**REFERENCES**

1. Chan JF, Kok KH, Zhu Z, et al. Genomic characterization of the 2019 novel human-pathogenic coronavirus isolated from a patient with atypical pneumonia after visiting Wuhan [published correction appears in *Emerg Microbes Infect.* 2020 Dec;9(1):540]. *Emerg Microbes Infect.* 2020;9(1):221-236. doi:10.1080/22221751.2020.1719902
2. [https://en.m.wikipedia.org/wiki/Template:COVID-19\\_pandemic\\_data](https://en.m.wikipedia.org/wiki/Template:COVID-19_pandemic_data)
3. William Ottestad, Signe Sovik. COVID 19 patients with respiratory failure: What can we learn from aviation Medicine? doi:10.1016/j.bja.2020.04.012
4. Grant M, Schramm A, Strong B, et al. AO CMF international task force recommendations on best practices for maxillofacial procedures during COVID-19 pandemic. 2020. Available at [https://aocmf3.aofoundation.org/-/media/project/aocmf/aocmf/files/covid-19/ao\\_cmf\\_covid-19\\_task\\_force\\_guidelines.pdf?la=en&hash=C2B89E1E6E9AB72EBF386C747D3BC74CF1009C1E](https://aocmf3.aofoundation.org/-/media/project/aocmf/aocmf/files/covid-19/ao_cmf_covid-19_task_force_guidelines.pdf?la=en&hash=C2B89E1E6E9AB72EBF386C747D3BC74CF1009C1E)
5. Kevin McCarthy. Pulmonary function testing <https://emedicine.medscape.com/article/303239-overview>
6. Gattinoni et al. *Critical Care* (2020) 24:154 <https://doi.org/10.1186/s13054-020-02880-z>
7. JG Williams et al. *Int J Oral Maxillofac Surg.* 1990 Apr;19(2):76-8 doi:10.1016/s090
8. Masaki Kohno, Tamio Nkajima et al. Effects of Maxillomandibular Fixation on Respiration. *J Oral Maxillofac Surg.* 1993;51:992-96.
9. Akhiwu, Saheeb DB et al. The effects of maxillomandibular fixation on ventilatory functions in adult Nigerians. *J Health Res Rev* 2017;4:84-7.
10. Famurewa BA, et al. Effects of maxillomandibular fixation and rigid internal fixation on pulmonary function in patients with mandibular fractures. *Int J Oral Maxillofac Surg* (2020). DOI: <https://doi.org/10.1016/j.ijom.2020.01.027>