

Technical note

Aerosol prevention in osteosynthesis for maxillofacial trauma — a technical note

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In light of the COVID-19 pandemic, many governing bodies have hurried to provide guidelines on the risk posed to healthcare workers in the line of their duties. With regard to oral and maxillofacial surgery in the UK this has resulted in a contraction of general elective surgical work and brought into question the safety and necessity of many routine operations.¹ This has been particularly troublesome with regard to maxillofacial trauma cases that require fixation in a defined period of time but are not necessarily emergent (life or limb saving).

Aerosol-generating procedures in which aerosolised particles are emitted from the infected patient's aerodigestive tract are thought to put workers at most risk. Firstly because that is the suspected method of transmission in most cases of COVID-19 and also because there is evidence to suggest that inoculation with a high initial viral load (such as might occur when a patient coughs directly into the face of a physician at close range, for example during intubation) may result in a more severe pattern of infection for that individual.^{2,3}

This has led to some centres suggesting alternative methods of management - and with regard to fracture fixation of the tooth-bearing portion of the facial skeleton, there is an argument that mandibular-maxillary fixation (MMF) under local anaesthetic be used as an alternative to the gold standard of open reduction and internal fixation (due to aerosol generation caused both by the necessity for intubation and by water cooling of the drill). However, experience teaches us that in many cases MMF is difficult in terms of patient compliance and can result in adverse outcomes.



Fig. 1. Still photograph of aerosol generation from a standard handpiece with inbuilt irrigation at 60000 RPM.

We suggest an alternative method of drill activation with the drill tip fully submerged in saline which vastly reduces, if not entirely eliminates, aerosol generation and can be achieved with relative ease in the oral cavity. The operative field is fully submerged with saline before drill activation instead of the built in irrigation system and subsequently suctioned away before screw placement.

Since the advent of the high speed drill, necessitating water cooling, in the 1950s there have been concerns about viability and spread of microbes in the aerosol generated from such instruments. Eight multiple studies have demonstrated that aerosol (with added microbes) can be detected both in the air and on surfaces at substantial distance.^{3,4} Once contaminated, COVID-19 may remain viable on the surface of personal protective equipment (PPE) for a significant duration and can be transferred to the skin during doffing.^{3,5}

The authors have found submerged drilling most efficacious in reducing aerosol generation without the need for

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Fig. 2. Still photograph of the same handpiece activated whilst submerged.



Fig. 3. Still photograph of aerosol generated in simulated miniplate fixation of the mandibular body using the inbuilt irrigation.

specialist equipment and whilst this would not negate the need for proper PPE it would certainly reduce the risk of contamination to the outer layer of PPE. Given the significant (25%–67%) chance of selfcontamination when doffing PPE this is most certainly advantageous.⁴

This technique has been used to successfully manage all trauma cases requiring ORIF during the COVID-19-related restricted clinical activity in our supra-regional centre.

This effect is demonstrated in Figs. 1–3 and Video S1.

Ethics statement/confirmation of patients' permission

Not applicable.

Conflict of interest

We have no conflicts of interest.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.bjoms.2020.04.043>.

References

1. https://www.baoms.org.uk/professionals/baoms_and_covid-19.aspx.
2. Liu Y, Yan LM, Wan L, et al. Viral dynamics in mild and severe cases of COVID-19. *Lancet Infect Dis* 2020;(March).
3. Peng X, Xu X, Li Y, Cheng L, Zhou X, Ren B. Transmission routes of 2019-nCoV and controls in dental practice. *Int J Oral Sci* 2020 Mar 3;12(1):1–6.
4. Verbeek JH, Rajamaki B, Ijaz S, et al. Personal protective equipment for preventing highly infectious diseases due to exposure to contaminated body fluids in healthcare staff. *Cochrane Database Syst Rev* 2020;(4).
5. Kampf G, Todt D, Pfaeder S, et al. Persistence of coronaviruses on inanimate surfaces and its inactivation with biocidal agents. *J Hosp Infect* 2020;(February).