

Emerging Evidence on COVID-19

Evidence Brief of Aerosol Generating Procedures in Dental Care Settings

Introduction

What is the existing evidence of SARS-CoV-2 transmission in dental settings, and the infection transmission from Aerosol Generating Procedures (AGP) use in dental care?

AGP can increase risk of infection transmission from an infected patient to a healthcare worker due to close proximity and generation of aerosols in large volumes. This evidence brief summarizes the available literature and guidance on aerosol generating procedures (AGP) in dental care settings as they relate to SARS-CoV-2 transmission and can be used with the evidence summary on aerodynamics of SARS-COV-2 dated May 28, 2020, which summarizes the evidence on aerosolization of SARS-COV-2 - available through the [PHAC emerging sciences secretariat](#).

Key Points

- No published reports of COVID-19 transmission, clusters, or outbreaks in dental care settings could be identified.
- SARS-COV-2 aerosolization:
 - Air samples collected from hospital care settings treating COVID-19 cases have demonstrated SARS-COV-2 RNA contamination, likely from aerosols and small respiratory droplets (Guo et al., 2020; Liu et al., 2020; Santarpia et al., 2020). SARS-CoV-2 is found to remain viable in aerosols for up to 4 hours, but neither the infectiousness or the infectious dose of these particles has been established (van Doremalen et al., 2020).
 - Dental procedures can induce gag reflexes leading to increased saliva secretion and coughing in patients. High speed dental instruments can create high volumes of aerosols containing water, saliva, blood, microorganisms and other debris (Ather, Patel, Ruparel, Diogenes, & Hargreaves, 2020; Jamal et al., 2020; Sales, Sales, & Da Hora Sales, 2020).
 - A recent publication by Workman et al., reports on cadaver simulations where aerosolization risks linked to endonasal procedures were assessed (Workman et al., 2020). The study concludes high-speed surgical drill procedures resulted in substantial aerosol contamination in all tested conditions. These findings may be extended to dental drills and procedures that are considered aerosol generating.

- Guidance Documents:
 - Published guidance indicates confirmed and suspected COVID-19 patients should NOT be treated in routine dental practice settings, and only be managed in negative-pressure infection isolation rooms (AIIR). (Ather et al., 2020; Jamal et al., 2020)
 - Reviews of multiple COVID-19 dental guidance documents indicate that some procedures and equipment used are associated with increased risk of aerosol generation and should be either avoided or modified during the COVID-19 pandemic (Table 1). Specific guidance linked to aerosol generating procedures and instruments from these publications are summarized below.
 - Intraoral Radiographs should be avoided and replaced with extraoral imaging such as panoramic radiography or cone-beam computed tomographic imaging when intraoral imaging is unavoidable (Ather et al., 2020; Jamal et al., 2020; Meng, Hua, & Bian, 2020).
 - Use of a rubber dam to minimize splatter generation is the standard of care for nonsurgical endodontic treatment. Recommendations suggest it may be advantageous to place the rubber dam so that it covers the nose (Ather et al., 2020; Jamal et al., 2020; Sales, Sales, & Da Hora Sales, 220). Also, when the rubber dam is applied, extra high-volume suction for aerosol and spatter is recommended along with regular suction (Peng et al., 2020).
 - Ultrasonic instruments such as triplex syringes, high-speed hand pieces, ultrasonic scalers, air abrasion devices, and intra-oral sandblasters are identified to be associated with increased aerosolization risk that should be avoided or the use minimized (Ather et al., 2020; Jamal et al., 2020; Meng et al., 2020; Sales et al., 220). If the use of such equipment is unavoidable, the application of high volume saliva ejectors are recommended alongside applicable instruments (Ather et al., 2020; Jamal et al., 2020; Meng et al., 2020).
 - To minimize the risk of dental aerosols, it is recommended that hand instruments, low-speed hand pieces, instruments without water spray and hand piece with an anti-retraction valve or other anti-reflex technology are used where possible (Ather et al., 2020; Jamal et al., 2020).
 - Peng et al., suggest the use of dental hand pieces without anti-retraction function should be prohibited during the epidemic period of COVID-19. Instead, anti-retraction dental hand piece with specially designed anti-retractive valves or other anti-reflux designs are strongly recommended as an extra preventive measure for cross-infection. It is important to note these recommendations are based on previous evidence from Hepatitis B infection transmission in dental care settings (Peng et al., 2020).

Overview of the Evidence

Currently, there is no published reports of COVID-19 clusters or outbreaks linked to dental care settings. No published simulation studies have specifically assessed droplet dispersion or aerosol generation of any dental procedures since the emergence of COVID-19. The designation of AGP in dental setting is largely based on evidence from medical procedure based simulations or national guidance from various dental associations. The available body of evidence from medical procedures is small, largely theoretical, and does not consider the infectiousness of SARS-CoV-2 aerosols specifically, yet the evidence does not appear to be of low quality.

Aerosol Generating Procedures (AGP) and COVID-19 transmission in dental care are understudied topics with substantial knowledge gaps. These areas would benefit from additional research and reporting that focus on COVID-19 pandemic experiences in dentistry.

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COVID-19 GUIDANCE FOR DENTAL CARE SETTINGS

Table 1: Five reviews describe aerosol generating dental procedures, the underpinning evidence and available guidance on minimizing aerosols from dental procedures.

Reference	Key Features
Ather et al., 2020	Provides a brief overview of the epidemiology, symptoms, and routes of transmission of COVID-19, as well as specific recommendations for dental practice during the current pandemic. These recommendations are informed by the emerging evidence on SARS-CoV-2 and past experiences from SARS-CoV transmission in healthcare settings.
Jamal et al., 2020	Reviews and summarizes COVID-19 guidance published by multiple national dental associations, including guidelines from American Dental Association, Scottish Dental Clinical Effectiveness Programme, New Zealand Dental Association and International federation of Endodontic Association - Indian Endodontic Society joint statement, and American Association of Endodontics.
Meng et al., 2020	Discusses aerosol producing procedures and techniques that were avoided at a Hospital of Stomatology in Wuhan, China during the emergence of the COVID-19 pandemic in early 2020.
Peng et al., 2020	Provides an overview of the available evidence on COVID-19 infection transmission routes, and details COVID-19 infection prevention and guidance for dental settings. The authors strongly advocate for prohibited use of dental hand pieces without anti-retraction function during the pandemic. The evidence against the use of hand pieces without anti-retraction function is from studies investigating cross infection risk from Hepatitis B virus (not a respiratory virus).
Sales et al., 2020	Examines the available literature and provides recommendations for dental care in light of the COVID-19 pandemic. Recommends the avoidance of high-speed instruments and the use of rubber dams to mitigate aerosol risk.

Methods:

A daily scan of the literature (published and pre-published) is conducted by the emerging sciences group, PHAC. The scan has compiled COVID-19 literature since the beginning of the outbreak and is updated daily. Searches to retrieve relevant COVID-19 literature are conducted in Pubmed, Scopus, BioRxiv, MedRxiv, ArXiv, SSRN, Research Square and cross-referenced with the literature on the WHO COVID literature list, and COVID-19 information centers run by Lancet, BMJ, Elsevier and Wiley. The daily summary and full scan results are maintained in a reworks database and an excel list that can be searched. Targeted keyword searching is conducted within these databases to identify relevant citations on COVID-19 and SARS-COV-2. Search terms used included: aerosol, dental

This review contains research published up to June 9, 2020.

Each potentially relevant reference was examined to confirm it had relevant data and relevant data was extracted into the review.

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