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Review

Use of mouthwashes against COVID-19 in dentistry

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Abstract

The proximity to the patient during dental care, high generation of aerosols, and the identification of SARS-CoV-2 in saliva have suggested the oral cavity as a potential reservoir for COVID-19 transmission. Mouthwashes are widely-used solutions due to their ability to reduce the number of microorganisms in the oral cavity. Although there is still no clinical evidence that they can prevent the transmission of SARS-CoV-2, preoperative antimicrobial mouth rinses with chlorhexidine gluconate (CHX), cetylpyridinium chloride (CPC), povidone-iodine (PVP-I), and hydrogen peroxide (H₂O₂) have been recommended to reduce the number of microorganisms in aerosols and drops during oral procedures. This paper therefore aims to provide a comprehensive review of the current recommendations on the use of mouthwashes against the COVID-19 pandemic and to analyse the advantages and disadvantages of most conventional antiseptic mouthwashes used in dentistry.

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Introduction

Antiseptic mouthwashes have been widely used as a standard measure before routine dental treatment, especially preoperatively.^{1,2} They have an essential role in reducing the number of microorganisms in the oral cavity.³ Recent publications have suggested that rinsing the oral cavity may control and reduce the risk of transmission of SARS-CoV-2.^{4,5} However, specific evidence for the safety and efficacy of the use of antiseptic mouthwashes in COVID-19 positive patients is lacking and unclear, so this paper aims to provide a comprehensive review of the current recommendations on the use of mouthwashes against the COVID-19 pandemic and to analyse the advantages and disadvantages of most conventional antiseptic mouthwashes used in dentistry.

Pathogenesis of coronavirus disease 2019

Coronaviruses are a group of enveloped RNA viruses that present a typical structure with the “spike protein” in its membrane envelope.^{6,7} The interaction between this protein and angiotensin-converting enzyme 2 (ACE2) receptors is responsible for the entry of the virus into cells.⁸ The distribution of ACE2 receptors in different parts of the body may indicate possible routes of infection.^{9,10} The membrane bound to ACE2 is found in different tissue cells, including mucosal tissues, gingiva, non-keratinising squamous epithelium, and epithelial cells of the tongue and salivary glands.^{8,11} A high SARS-CoV-2 viral load has also been detected in saliva,¹² and its presence has even been suggested in periodontal pockets.¹³ These findings agree with previous investigations that have suggested that virus transmission can be closely connected with saliva interactions^{14,15} making oral tissues a possible reservoir from which SARS-CoV-2 transmission may occur during coughing, sneezing, talking, and even during dental care.^{4,12,16}

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Oral antiseptics used against viral infections

Mouthwashes are widely used solutions for rinsing the mouth, especially before oral surgery, due to their ability to reduce the number of microorganisms in the oral cavity^{1,2} and colony-forming units in dental aerosols.³ Although there is still no clinical evidence that the use of mouthwashes could prevent SARS-CoV-2 transmission, the American Dental Association (ADA)¹⁷ and the Center for Disease Control and Prevention (CDC)¹⁸ have recommended the use of pre-procedural mouthwashes before oral procedures.

Chlorhexidine (CHX)

CHX is a broad-spectrum antiseptic that acts against Gram-positive and Gram-negative bacteria, aerobes, facultative anaerobes, and fungus by increasing the permeability of the bacterial cell wall, causing its lysis.^{19,20} It is used in dentistry to reduce dental plaque and treat periodontal disease.²¹

Evidence indicates an in vitro effect against lipid-enveloped viruses such as influenza A, parainfluenza, herpes virus 1, cytomegalovirus, and hepatitis B.²² Although COVID-19 is an enveloped virus, 0.12% CHX gluconate was suggested to have little or no effect against coronaviruses when compared with other mouthwashes.^{4,23,24} However, Yoon et al⁶ found SARS-CoV-2 suppression for two hours after using 15 ml 0.12% CHX once, suggesting that its use would be beneficial for the control of COVID-19 transmission.

Hydrogen peroxide (H₂O₂)

H₂O₂ has been used in dentistry alone or combined with salts since the start of the century.²⁵ As a mouthwash, it is an odourless, clear, and colourless liquid.²⁶ Lack of an adverse soft tissue effect was found in many studies of 1%–1.5% H₂O₂ used as a daily rinse over two years' follow-up.^{27,28}

An in vitro study found that 3% H₂O₂ effectively inactivated adenovirus types 3 and 6, adeno-associated virus type 4, rhinoviruses 1A, 1B, and type 7, myxoviruses, influenza A and B, respiratory syncytial virus, strain long, and coronavirus strain 229E within 1–30 minutes, discovering that coronaviruses and influenza viruses were the most sensitive.²⁹ Since SARS-CoV2 is vulnerable to oxidation, preprocedural mouthrinses containing oxidative agents such as 1% H₂O₂ have been suggested to reduce the salivary viral load.^{4,17}

Cetylpyridinium chloride (CPC)

CPC is a quaternary ammonium compound that is safe for use in humans.^{30,31} CPC 0.05% has been used to reduce dental plaque and gingivitis³² as an alternative in patients who develop mucosal irritation and stains related to CHX.³³ The antiviral effect of CPC has been demonstrated in influenza patients, significantly reducing the duration and severity of

cough and sore throat.^{31,34} Hypotheses about a possible action over SARS-CoV-2 are based on its lysosomotropic mechanism of action and its ability to destroy viral capsids.³⁵ These findings indicate that CPC could be effective against other enveloped viruses such as coronaviruses.

Iodopovidone

Povidone-iodine (PVP-I) is a water-soluble iodine complex that has been widely used as a pre-surgical skin antiseptic and as a mouthwash.³⁶ It is typically used in a 1% concentration³⁷ for mucositis, prophylaxis of oropharyngeal infections, and prevention of ventilator-associated pneumonia. Its antimicrobial action occurs after free iodine dissociates from polyvinylpyrrolidone, then iodine rapidly penetrates microbes to disrupt proteins and oxidises nucleic acid structures causing microbial death.^{38,39} Previously studies have shown that PVP-I has higher virucidal activity than other commonly used antiseptic agents, including CHX and benzalkonium chloride.⁴⁰ It is safe, reporting a prevalence of 0.4% allergy cases,⁴¹ does not produce tooth or tongue discolouration or taste disturbances⁴² and, unlike alcohol-based products, can be used when using electrocautery.⁴³ Its effectiveness has been well demonstrated through many in vitro studies against multiple viruses, including SARS-CoV, MERS-CoV, and influenza virus A (H1N1).^{36,40,44} Recent investigations have proposed that 0.23% PVP-I mouthwash for at least 15 seconds before procedures may reduce salivary viral load,⁴⁴ indicating its use in COVID-19-positive patients.^{4,38,45,46}

Suggested recommendations

Gently gargle for 30 seconds in the oral cavity and 30 seconds in the back of the throat with: 1.5%¹⁷ or 3%⁴⁷ H₂O₂ 15 ml; PVP-I, 0.2%,¹⁷ 0.4%,⁴⁵ or 0.5%^{46,48} 9 ml; 0.12% CHX 15 ml;⁶ or 0.05% CPC 15 ml.^{31,35}

Conclusions

Within the limitations of this brief review and despite little clinical evidence, we suggest the use of preprocedural mouthwashes in dental practice to reduce SARS-CoV-2 viral load from previous dental procedures and to reduce the cross-infection risk while treating patients during the pandemic. Clinical studies, including control subjects and in large scale, are required to evaluate the efficacy of antiseptic mouthwashes on SARS-CoV-2. Research is urgently needed to determine its potential for use against this new virus.

Conflict of interest

We have no conflicts of interest.

Ethics statement/confirmation of patients' permission

Not applicable.

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