

Reviewing Infection Control in Prosthodontic Practice with a Case of Herpes Simplex in the Times of a Corona Virus Pandemic

Bandar M.A. Al Makramani^{1,4}, Fuad Al Sanabani^{2,4}, Khurshid A Mattoo^{3*}

^{1,4} Assistant Professor, Department of Prosthetic Dental Sciences, College Of Dentistry, Jazan University, Jazan 45142, Saudi Arabia; makramani@yahoo.com,

^{2,4} Assistant Professor, Department of Prosthetic Dental Sciences, College Of Dentistry, Jazan University, Jazan 45142, Saudi Arabia; fuad_ali2000@yahoo.com,

³ Assistant Professor, Department of Prosthetic Dental Sciences, College Of Dentistry, Jazan University, Jazan 45142, Saudi Arabia; drkamattoo@rediffmail.com

⁴ Assistant Professor, Department of Restorative Dentistry, College Of Dentistry, Sana á University, sana'a 1247, Republic of Yemen

Address for Correspondence: drkamattoo@rediffmail.com (Assistant Professor, Department of Prosthetic Dental Sciences, College Of Dentistry, Jazan University, Jazan 45142, Saudi Arabia)

ABSTRACT

In preparation for treating a case of a facial herpes simplex patient during the times of coronavirus pandemic, the authors appraised the infection control protocols given by various national and international regulations. However, specific information was mislaid which prompted the evolution of the objective of this case report, which is to review infection control in general Prosthodontic practice. An adult male aged 24 years reported for crown placement for an endodontically treated mandibular right first molar. Clinical examination revealed presence of a combination of a soft and hard scab lesion starting about 5 mm below the vermillion border of the lower lip near the right tubercle. The lesion extended about one and a half centimeters vertically with a 1 cm horizontal spread. Histological picture was confirmatory of a healed facial herpetic lesion and regular treatment was done following a strict infection control protocol. The report discusses management and prevention of facial herpes in Prosthodontic practice.

Keywords (covid 19, disinfection, herpes simplex, RNA virus, sterilization)

Introduction

Without startling anyone, it is a fact that since the beginning of this millennium (2000 year onwards), the world has witnessed a total of 71 outbreaks, many of which have been epidemics, while the covid 19 has been a declared pandemic. A large majority of these outbreaks have been viral in nature [1]. The potential of the virus can be gauged by the ongoing pandemic in terms of the human toll, spread and economic destruction of countries. The efficiency of protection against coronavirus can be gauged by the fact, that despite the first case of human infection by coronavirus being discovered in 1961 [2], there is still no effective evidence based measure (vaccine) that would neutralize the impact of the disease caused by such virus. The only proven and effective measure against such microbes are preventive in nature. Facial herpes, is a layman's scientific term, commonly known as cold sore, herpes labialis, fever blisters and Orofacial herpes. The disease is caused by a common viral infection known as herpes simplex virus-1 (HSV) [3]. Although familial difference between the herpes and coronavirus exist, it has been stated that without the help of HSV-1, the covid-19 virus cannot be lethal in humans and that prophylactic treatments that contain HSV-1 can prove vital to fight covid 19 [4]. HSV-1 primarily occurs during childhood during which symptoms are severe, while it surfs in adolescence (recurrent) when the symptoms are milder and shorter. The symptoms include a prodromal phase characterized by fever, sores, gingivostomatitis while the primary lesion progresses from a papule to a vesicle followed by healing with a soft or a hard scab depending on

duration [5]. In any of its stage the condition is highly infectious and is transmissible by either direct or indirect contact which makes it an occupational hazard in medical and dental practice. Contact with the patients who have active facial herpes can result in two clinical conditions, herpetic whitlow and ophthalmic keratitis [6],[7]. While dentists have been reported to contract due to neglectful touching of the lesion, the dental hygienist has been reported to contract the herpetic whitlow of neck due to aerosol [8].

A prosthodontist is involved in various rehabilitation procedures that range from dental to maxillofacial prosthesis across all ages, which makes him more vulnerable to the risk of contracting any viral infection. There are hardly any dental patients who do not need a prosthodontist's service. Treatment options offered by a prosthodontist to their patients vary depending upon the clinical status of the dentition. The treatment option of fixed partial denture (like a single crown / implant) renders a prosthodontist more vulnerable to percutaneous injuries since the procedural steps for their fabrication involves the use of sharp instruments. While most of us are mentally occupied with social distancing and wearing masks, the authors find this a high time to review the standard recommended precautions along with advances in infection control through presenting this clinical case report of HSV-1.

Case report:

A young male patient aged 24 years was referred to the department of prosthetic dental sciences from the department of oral diagnosis for restoration of an endodontically treated first molar with a single crown. The patient was pre-diagnosed in the department of oral medicine with established case of recurrent facial herpes (third time during the year). Medical, social, familial and drug history did not point to any negative findings. Less intake of fruits was revealed during history taking. The patient dental history revealed that he had developed caries in mandibular right first molar following which he had not sought any treatment, till he had developed pain. A diagnosis of irreversible pulpitis prompted the pulpectomy procedure which was done about 12 weeks back. Patient gave history of using tooth brush and a paste once every day. The patient did not use any other aids of oral hygiene measures. Extra oral examination presented a lesion roughly 15mm by 10 mm in the region just 5 mm below the tubercle of the right mandibular lip (**Fig 1 a**). Close clinical examination of the lesion revealed isolated regions of papules superiorly while the major portion of the lesion presented to pupils that were covered by a combination of soft and hard scab (**Fig 1 b**). The histological picture showed intradermal focal perivascular and diffuse mononuclear inflammatory infiltrates with prominent numbers of monocytes/ macrophages (**Fig 1 c**). Intra oral examination revealed dental and mucosal features, except the mandibular right first molar had gone an endodontic treatment about three months back. A comprehensive review of infection control protocol was done, that was based on national and international guidelines (**Table 1**) before starting the case. After reviewing an infection protocol for management of such patient in Prosthodontic practice, routine procedures for single crown restoration [porcelain fused to metal (Remanium CSe, Dentaaurum J.P. Winkelstroeter KG, Ispringen, Germany) with occlusal metal and buccal porcelain (VMK-95 Metall Keramik; Vita Zahnfabrik, Bad Sackingen, Germany)] was prepared. For each clinical and laboratory steps, care was taken to minimize any contamination from patient to prosthodontist, from prosthodontist to patient and from clinical care personnel to laboratory technicians. All appointments of the patient were scheduled as the last appointments of the day. The crown was cemented with zinc phosphate cement (Harvard, Germany) on the final day of treatment following which the patient was put on a follow up protocol.

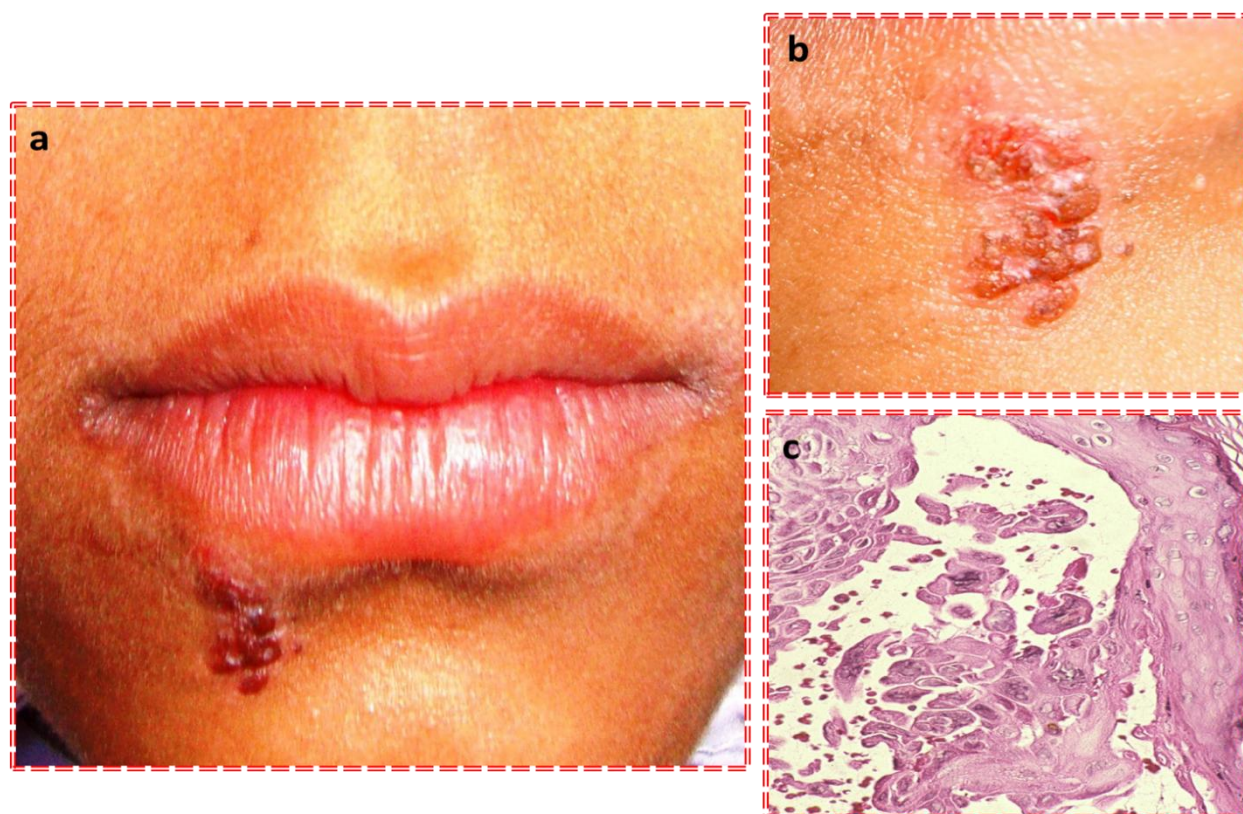


Figure 1: (a) Location and size of the lesion in relation to the mucocutaneous junction on lower lip (b) Clinical lesion in the form of papule with hard and soft scab (c) Histopathological cellular response

Discussion

The recurrences of herpes simplex viral infection are mediated by a dormant phase wherein the dormant virus remains latent in the sensory nerve cell body. A stimulus such as febrile illness or immune compromising conditions migrates the hidden virus back to the sensory neuron and begins a new infection process. Research indicates that apart from 40 % of the people who have recurrences, the remaining 60% of people have several silent recurrences in which the infection is controlled by cluster of differentiation T cells (CD8+) and (CD4+) [9]. Patients with active lesion always pose an occupational hazard to a prosthodontist in the form of herpes keratitis and herpes whitlow [7], [9]. From patients view point, risk of spread of the lesion and associated discomfort should be considered by the prosthodontist. Whenever an open lesion is encountered, risk to prosthodontist is greatest which is why various regulations [10], [11] and literature recommend work restriction till healing takes place. Other work restrictions which a prosthodontist should follow in viral and other infections [12] are enumerated in Table 1 (general recommendations). Transmission may occur as a result of simply touching the lesion. Since the virus is highly contagious, it is sensitive also to the use of soap and warm water. This makes use of PPE and hand hygiene (Table 1) a significant preventive measure to prevent herpes transmission. Another under estimated transmission vector in the prosthodontist clinic is the aerosolized saliva/herpes/blood mixture especially in fixed partial denture procedures. Role of PPE is utmost to prevent transmission vector through it.

Risk management strategy in prosthodontic practice

Universal precautions as given by various regulations like CDC [11] (center for disease control and prevention) and ADA [13](American dental association) are mentioned as the primary guidelines, however, little information that is specific to the facial herpes as occupational hazard to a prosthodontist and his team are not addressed. A review of these guidelines as applied to prosthodontic practice is presented in Table 1 [14].

Conclusion

Most viral infections are contagious and prosthodontist's are vulnerable to the risk of such infections being transmitted to him and his team that includes the laboratory technician. However following a stringent infection control protocol reduces such risks and prevents such occupational hazards.

Acknowledgement

This article is dedicated to those technicians who make our working environment safer and build our reputation in patient management.

Disclosure

Authors have no conflict of interest with any individual, representative or agent of any company during the conductance of the study or while publishing the actual study.

References

- [1] List of epidemics. In Wikipedia, the Free encyclopedia. Available from: https://en.wikipedia.org/wiki/List_of_epidemics. (Last accessed 26th May,2021)
- [2] Mattoo KA, Jain S. Managing prosthodontic (geriatric) patients during the SARS-CoV-2 pandemic. *J Int Oral Health* 2020;12:S69-75.
- [3] Miller C, Redding S. Diagnosis and management of orofacial herpes simplex virus infections. *Dent Clin North Am* 1992;36(4):879–95.
- [4] Bond P, Ethnicity and the relationship between covid-19 and the herpes simplex viruses. *Medical Hypotheses*, 2021; 146: 110447.
- [5] Essman J. The many challenges of facial herpes simplex virus infection. *J Antimicrob Chemother* 2001;47:(Topic T1):17–27.
- [6] Lewis M. Herpes simplex virus: an occupational hazard in dentistry. *Int Dent J* 2004;54:103–11.
- [7] Leggat P, Kedjarune U, Smith D. Occupational health problems in modern dentistry: a review. *Ind Health* 2007;45:611–21.
- [8] Browning WD, McCarthy JP. A case series: herpes simplex virus as an occupational hazard. *J Esthet Restor Dent*. 2011;24(1):61-6.
- [9] Mark K, Wald A, Margaret A, et al. Rapidly cleared episodes of herpes simplex reactivation in immunocompetent adults. *J Infect Dis* 2008;198(8):1141–9
- [10] HHS, 2020. U.S. Government COVID-19 response plan. Available from: <https://int.nyt.com/data/documenthelper/6819-covid-19-response-plan/d367f758bec47cad361f/optimized/full.pdf>. [Lastaccessed on 2021, May1]
- [11] Kohn WG, Collins AS, Cleveland JL, et al. Centers for Disease Control and Prevention (CDC). Guidelines for infection control in dental health care settings: 2003.MMWR Recomm Rep 2003;52(RR-17):16–7.
- [12] Jain S, Mattoo KA, Makkar S. Acute buccal space infection hampering mastication. *International Journal of Research in Medical Sciences and Technology* 2015;1(2):3-4.

- [13] Council on Scientific Affairs and ADA Council on Dental Practice. Infection control recommendations for the dental office and the dental laboratory. J Am Dent Assoc 1996;127:672–80
- [14] Recommendations from the guidelines for infection control in dental care settings -2017. Available at <https://www.cdc.gov/oralhealth/infectioncontrol/pdf/recommendations-excerpt.pdf>. [Last accessed on 2021, May1]

Table 1: Infection control protocol in Prosthodontic practice for viral and other associated infections

<p>General recommendations :</p> <ol style="list-style-type: none"> 1. Referral arrangements with qualified health care professionals including post exposure management with medical follow up 2. A written health care program for all DHCP which should be implemented and followed 3. Educate DHCP and provide appropriate content regarding principles of infection control 4. Immunization of (DHCP) (includes hepatitis B, influenza, measles, mumps, rubella and varicella). All dental health personal should undergo a baseline TST (two step) before employing 5. All DHCP having acute or chronic medical conditions are susceptible to opportunistic infections and should consult their physicians regarding their ability to safely perform their duties. DHCP with known occupational contact dermatitis and latex allergy should seek definitive diagnosis from qualified health care professionals 6. Carpet and cloth furnishings should be avoided in clinical area due to difficulty in cleaning of blood spills and body substances 7. Sterilization area, collection of instruments and storage of instruments should be well defined 8. Medical waste should be regulated according to recommendations 9. Handpiece that bypass the dental unit to deliver sterile water/solutions using single used disposable or sterilizable tubing should be installed 10. In the laboratory, develop separate receiving, decontaminating and disinfecting areas 11. Imply work restriction on those who are infected or exposed to major infections (like pediculosis, pertussis, rubella, staphylococcus aureus infections, tuberculosis, varicella, zoster, and viral respiratory infection. 12. In case of active disease (HSV) that is transmissible, one should limit treatment to emergency care only while elective procedures should be delayed till healing takes place .
<p>Prevention of exposure to blood and OPIM</p> <ol style="list-style-type: none"> 1. Identify new safe devices with engineered safety features like safer anesthetic needles, blunt suture needles, retractable scalpel, needleless IV systems 2. Use puncture resistant gloves and disposable carriers 3. Practice single handed scoop technique 4. Develop and practice waste management program that follows standard regulations 5. Color coded or labeled containers which have closing mechanism
<p>Hand hygiene</p> <ol style="list-style-type: none"> 1. Hands hygiene should include hand wash, hand antisepsis and during surgery a surgical hand antisepsis followed by alcohol based hand rub 2. Soap for hand washing should be stored in closed containers (liquid soap preferred) 3. Use of alcohol based hand rub, antimicrobial soap and antiseptics, bead sterilizer, 4. Frequent handwashing results in chronic irritant contact dermatitis for which lotions are recommended to ease dryness of skin. Monomer methacrylate also known to have a similar effect of contact dermatitis. Petroleum jelly should be avoided as it weakens the latex gloves thus increasing its permeability 5. Fingernails should be short with rounded edges for thorough cleaning and preventing tearing of gloves

6. Although nail polish does not increase microbial flora if fingernails are short, however a chipped nail polish binds to harbor added bacteria
7. All hand or nail jewellery should be removed (rings, finger nail)

PPE

1. Use of personal protective equipment (full gown, jackets, apron, scrubs) covering arms, protective eyewear, surgical gloves and surgical mask, face shields). This should include removal of PPE before leaving the patient care area. Eyewear and face shield can be reused after cleaning with soap and water followed by disinfection. General work clothes are not considered PPE
2. Mouth masks (e.g. N95, N99 or N100)
3. Glove usage (latex sensitivity, personal should be familiar with the signs and symptoms of their allergy). Gloves are task specific therefore Examination gloves should not be used while working for a particular procedure. All gloves are meant for single use and should not be used again. For long procedures (30 min to 3 hours) use of multiple gloves is recommended as studies have shown that frequency of perforations in surgeons gloves ranging from 6 to 16% thus demonstrating awareness of DHCP.
4. Integrity of latex, vinyl, nitrile and other synthetic gloves get compromised by contact with disinfectants, antiseptics, composite resin, bonding agents, vinyl polysiloxane impression material which makes it mandatory for prosthodontist to consult glove manufacturer regarding chemical compatibility of glove materials.
5. Wicking is a condition that results if latex gloves are washed with plain soap or alcohol, which is characterized by micropuncturing of gloves and should be avoided. Therefore, after application of alcohol hand rubs one should dry the hands first and then wear the gloves
6. Double gloving during implant surgery have demonstrated lower frequency of inner glove penetration and visible blood on surgeon's hands. Use of glove liners is highly recommended

Sterilization and disinfection

1. Use regulated medical, dental devices, chemicals, procedures for sterilization and disinfection of patient care items
2. Cleaning first, followed by heat sterilization should be the principle
3. Use single use disposable alternatives whenever and wherever possible
4. Practice barrier protection for both dentist and patient areas
5. Minimize handling of loose contaminated instruments or materials during transport
6. Use automatic cleaners (ultrasonic cleaner, washer, disinfectant) to remove debris
7. Workers should use PPE, wear puncture and chemical resistant heavy duty gloves during instrument cleaning
8. Before packing use internal/ external/mechanical/ chemical indicators while wrapping should be compatible with sterilization process
9. Most prosthodontic materials fall into the category of semi critical instruments, therefore they can be sterilized unwrapped after following special precautions in handling
10. Sterilization monitoring by mechanical, chemical and biological monitors ensures effectiveness of sterilization and should be used for each sterilization load. They also indicate whether processing of instruments is adequate or inadequate. In case of a positive spore test, one should remove the sterilizer from service.
11. For environment cleaning use disinfecting products that are approved while avoiding chemical sterilizers

Clinical procedures

1. Any device connected to the dental air/water system (handpiece, scaler) should be run to discharge air and water for a minimum of 20 to 30 seconds after each patient to eliminate the potential for retracting oral fluids into their internal components
2. Don't use fingers for cheek retraction and be aware of the patient's reaction to pain. Sudden unwanted movements from the patient increase risk of prosthodontist as well as patient to injury.
3. Ultrasonic cleaner to remove cement debris by cavitation process
4. Percutaneous injuries can occur due to burs (use of bur shields), trimmers, syringe needles (self sheathing), laboratory knives, blades, sharp instruments and use of finger guards, blunt suturing needles and butterfly

needles during suturing
5. Minimizing potentially uncontrolled movements of patients and the instruments
6. Aerosol control is achieved by using dental dams and high velocity air evacuation system
7. Heat tolerant accessories for intra oral radiographs should be used after heat sterilization
8. All DHCP should provide written information regarding the methods used to clean and disinfect special materials (impression material, appliance, prosthesis or stone model)
9. Appliances and prostheses delivered to the patient should be free of contamination.
10. All prosthodontic related materials should be thoroughly cleaned (e.g., occlusal rims, dentures, bite registrations) followed by disinfection with a registered hospital disinfectant (with at least a tuberculocidal claim) .
11. Do not use water from the public water drinking system for dental treatment, the chairs must use distilled water
Post exposure management:
1. Puncture wounds should be washed with soap and water, mucous membrane to be flushed with water only. No evidence that squeezing blood or application of antiseptic reduces the risk of blood borne pathogens to be transmitted
Abbreviations:
DHCP – dental health care personnel, TST – tuberculin skin test, OPIM – other potentially infectious material , PPE – personal protective clothing