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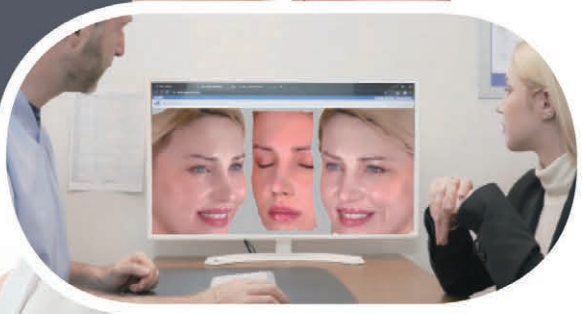

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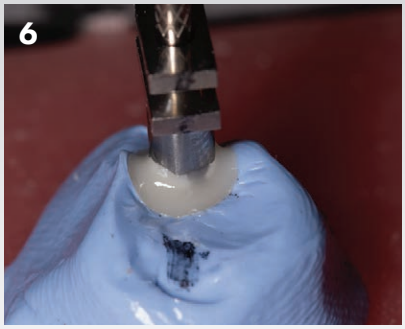

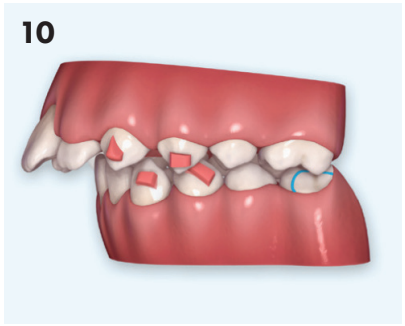

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Introducing a new Masterclass series - and Covid continues

Professor Andre W van Zyl
MChD (Oral Medicine & Periodontics)

It is with great envy that I have watched the vaccination roll-out in the UK. We trust that we will all receive the vaccine soon. Until then we need to stay vigilant and practice safe dentistry and use the appropriate PPE correctly. Part 3 of the Covid series deals with the risk we face as health care workers in our daily practices and is important knowledge to survive this. We have lost colleagues to Covid over the past year, so it is certainly something to be taken very seriously.

On a more positive note we are introducing a new Masterclass series which will be a regular feature from now on. This series will transfer knowledge of single skills that will improve clinical practice and is aimed specifically at those who may not have had the chance to further their clinical training through practical postgraduate courses.

I will coordinate the Masterclasses in Periodontics, Implant Dentistry, Prosthodontics/Restorative dentistry and other topics. We are pleased to announce that Prof Peet van der Vyver will coordinate the Masterclass in Endodontics. However, we cannot do this without input from you, our colleagues out there who battle and find solutions to clinical challenges on a daily basis.

I want to again extend an invitation to you to contribute on this exciting new platform by sharing your clinical skills with us. Have a look at the first Masterclass in this edition as a guide to the format. The idea is to have 1-2 pages, explaining a procedure with clinical images to guide the process. We look forward to receive your input.

Take care and stay safe.

Andre

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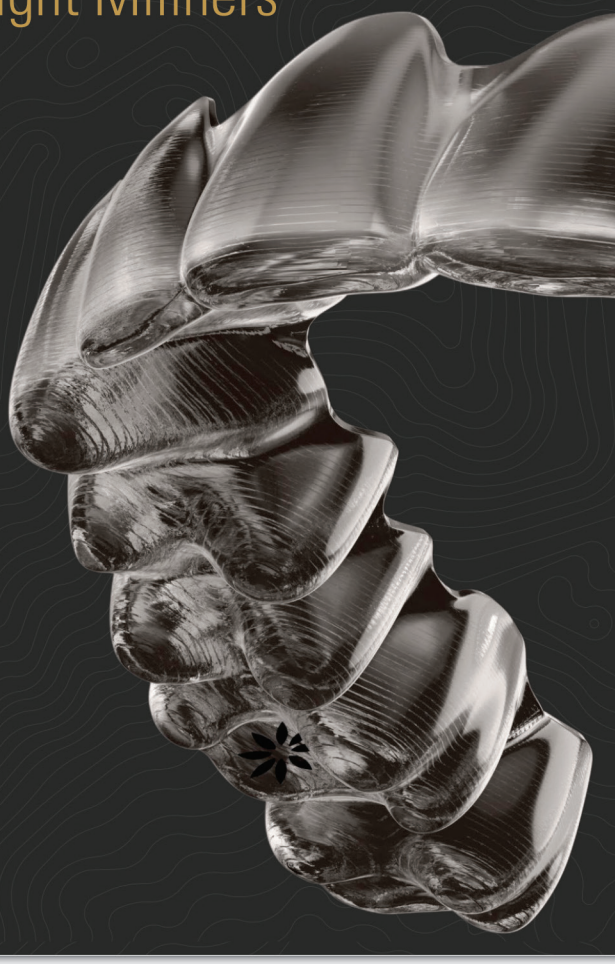

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Masterclass in Clinical Practice

Implant Dentistry
with
Prof Andre W van Zyl
Dr Johan Hartshorne

Anatomic implant impression technique: Transferring soft tissue contour to the lab

Gingiva is anchored to a tooth by junctional epithelium and more importantly, by dento-gingival fibres. This will ensure that there is minimum distortion of the gingiva when taking an impression, giving the dental technician a precise impression of the dento-gingival complex. The dental technician has further guidance from the shape of the tooth in creating the perfect emergence and shape of the final crown.

However, when taking an impression of a dental implant, especially in the aesthetic zone, we have no fibre attachment and the shape of the implant plays no role in determining the shape of the crown. To create the ideal aesthetics with an implant crown, one should use a provisional crown to guide the soft tissue. This may take weeks and in extreme cases months.

Within seconds of removing a healing abutment or provisional crown for the impression, the gingiva starts sagging inward, losing its shape. In order to transfer the exact soft tissue contour to the lab, an impression of the soft tissue is needed, with no distortion. However, when a conventional impression is taken, the tissue sags inward as described and is then distorted by the pressure from the impression material and pushed outward. In the aesthetic zone this may be worse than posterior as we often have 4-5mm of unsupported buccal gingiva with no fibres keeping it in place- thereby exacerbating the distortion. When taking a digital impression, one may also lose the exact shape of the gingiva within seconds as it sags inward, and it may impact on the accuracy of soft tissue contour.

The described technique enables an exact transfer of the soft tissue contour according to the shape of the provisional crown. This guides the dental technician in preventing a buccal over contoured crown, which in turn may lead to recession of the buccal gingiva with resultant aesthetic complications.

Step by step procedure for an anatomical impression:

- **Step 1** is the use of a correctly shaped provisional crown to achieve ideal gingival contour (Figure 1). Before removing provisional crown from the mouth, mark the gingival margin for reference (Figure 2).
- **Step 2** is to use the provisional crown to create a customized impression post by using an implant analog embedded in plaster/ acrylic as shown (Figures 3-7).
- **Step 3**. The impression post is placed in the mouth. This will create a slight pressure due to the collapse of soft tissue in the minutes it takes to customize the impression pin. It will however not distort the tissue as it will push it back to where it was before removing the provisional crown (Figure 8).
- **Step 4** is to take a conventional impression. As no impression material will be pushed into the subgingival space, no distortion of tissue is possible (Figure 9-10).

Conclusion

The lab should be instructed to follow the subgingival component exactly to ensure no tissue distortion is done. In Figure 11 we see over contouring of a crown which may have been caused by the impression material pushing the gingiva buccally. The technician has no way of knowing how much distortion has taken place and will have no choice but to follow the impression, thereby creating an over contoured crown.

Figure 1: Provisional crown with flowing lines mimicking the natural tooth

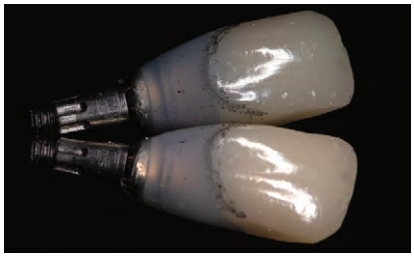


Figure 2: Before removing crown from mouth, mark the gingival margin with a pencil

Figure 3: An analog is embedded in acrylic with 2 mm of analog protruding. Crown is placed on analog and the buccal is marked on the acrylic with a pen

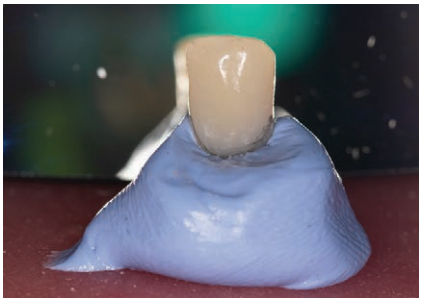


Figure 4: Impression or lab putty is adapted to simulate gingiva around provisional crown up to pencil marking

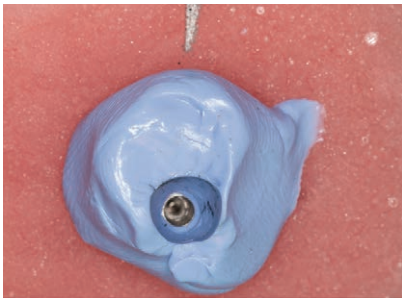


Figure 5: An exact copy of the gingiva as it is in mouth is now obtained. Note marking for buccal on acrylic

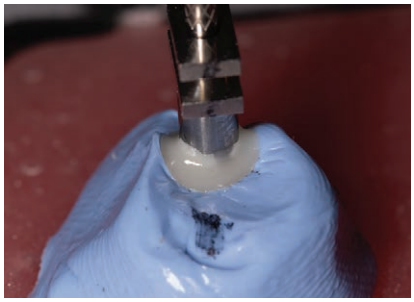


Figure 6: Composite is flowed into the space between impression post and "gingiva" just up to the crest. The difference between this and in the mouth is that putty cannot distort, thereby creating an exact copy of provisional crown/gingiva

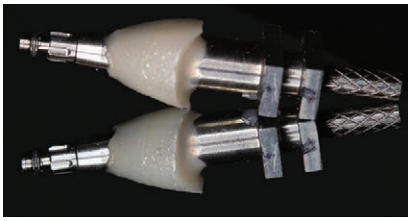


Figure 7: Before removing the impression post from analog, mark buccal of impression post with permanent marker as shown

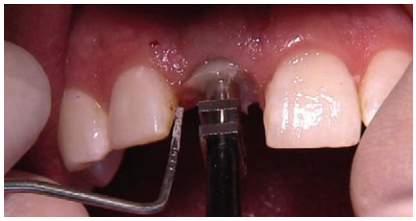


Figure 8: Impression post is in position with no distortion or pressure on gingiva. Ensure that buccal markings are positioned correctly

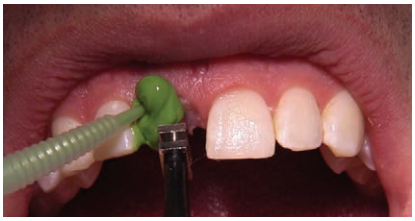


Figure 9: Impression material is flowed around impression post in the usual manner

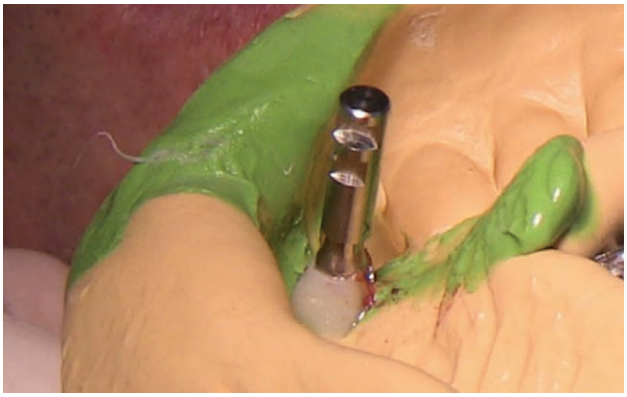


Figure 10: Final result with composite making up the subgingival part of impression where it is essential not to distort soft tissue

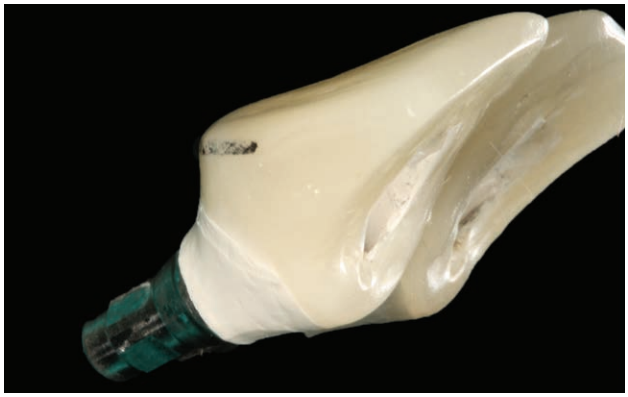


Figure 11: Over contouring of crown on buccal may be due to distortion of gingiva during impression taking

Masterclass in Clinical Practice

Endodontics

with

Prof Peet van der Vyver
Dr Martin Vorster

Identification and management of Radix Entomolaris

Scan to view video of Case Report 1

References 1-15 are available on request from:
Email: dentsa@iafrica.com
Website: www.moderndentistrymedia.com

Introduction

According to Swartz, Skidmore and Griffen, mandibular first molars have a significantly lower success rate compared with other teeth.[1] Missed canals and the failure to remove all the microorganisms and pulp remnants from the root canal system are probably the main reasons for persistent infection around endodontically- treated molars. It is therefore important that clinicians have an awareness and good understanding of the variations in root canal morphology of the mandibular first molar.

Permanent mandibular first molars in Caucasian populations are generally two rooted teeth (one mesial and one distal root) with two mesial and one distal root canals.[2] The two mesial root canals can end up in two distinct apical foramina or they can merge together at the root tip end into one apical foramen.[3]

The number of roots for the mandibular first molar teeth may also vary. Carabelli[4] was the first to report on mandibular first molars with supernumerary roots. The third root was located on the disto-lingual side and was called Radix Entomolaris (RE). In very rare cases, the mandibular first molar can also present with an additional root at the mesio-buccal side and is called Radix Paramolaris.[3]

Prevalence of RE

The presence of RE in the mandibular first molar is associated with certain ethnic groups. In populations with Mongoloid traits (for example Chinese, Eskimo and American Indians) the frequency can range from 5-30%.[5-10] However, in Eurasian and Indian populations it is less than 5% and in African populations less than 3%.[11] Radix Entomolaris can be found on first, second and third mandibular molar teeth, occurring least frequently on second molars. Studies have also reported a bilateral occurrence with a frequency of 50-67%.[12]

Morphology of RE

The coronal third of the disto-lingual root of RE can be fixed partially or completely to the distal root. Based on the curvature in a buccal-lingual orientation, the separate RE variants can be classified into three types according to De Moor et al.[13] Type I refers to a straight root/root canal. Type II refers to an initially curved entrance, which continues as a straight root/root canal. Type III refers to an initial curve in the coronal third of the root canal and a second curve beginning in the middle and continuing to the apical third.[13]

Radiographic Diagnosis of RE

A major limitation of conventional radiographic images is to compress three-dimensional (3D) anatomy into a two-dimensional (2D) image or shadow- graph. In an attempt to overcome this drawback of conventional radiography in order to detect the presence of RE, it is helpful to take additional exposures changing the horizontal angulation of the main x-ray beam. Wang et al.[14], demonstrated that 25-degree mesial radiographs were significantly better than 25-degree distal radiographs for RE visibility and determination of optimum diagnosis.

According to Clark's rule (Also known as SLOB rule or Waltons projection), an object that moves in the same direction as the cone is located toward the lingual.[15] Conversely, an object that moves in the opposite direction from the cone is located towards the buccal. Therefore, the RE image that moves distally is superimposed on the distobuccal root image that moves towards the mesial, when taking radiographs with small distal angulations.

Cone-Beam Computed Tomography (CBCT) provides dentistry with a practical tool for non-invasive and 3D reconstruction imaging for the use in endodontic applications and morphologic analyses. CBCT imaging allows for visualizing a new dimension, eliminate superimpositions, provide additional information for diagnosis and therefore enables a more predictable management of complex endodontic conditions compared with intraoral radiographs alone. CBCT imaging allows ascertaining the identification, exact location, curvature and angulation of the RE in order to prevent iatrogenic events that might occur in relation

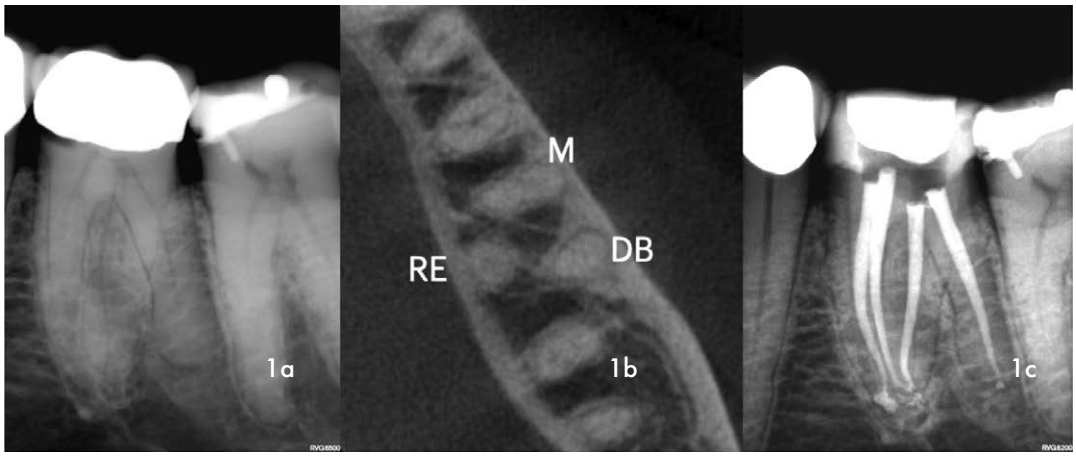


Figure 1: (a) Pre-operative radiograph of mandibular, left first permanent molar that was restored with a ceramo-metal crown, showing evidence of decay on the mesial gingival margin (b) CBCT- midroot axial view revealed the presence of a mesial root (M), distal (D) and Radix Entomolaris on the lingual aspect (RE) (c) A 30 degrees, mesial angulated view of the four obturated root canal systems.

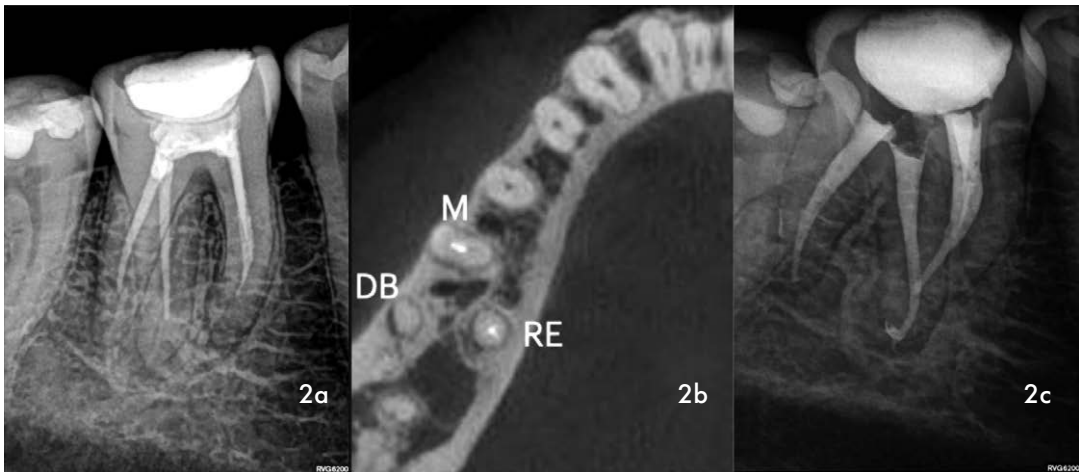


Figure 2: (a) Pre-operative radiograph of mandibular, right first permanent molar that was poorly root treated 2 years previously (b) CBCT- midroot axial view shows the presence of a mesial root (M), distal (D) and Radix Entomolaris on the lingual aspect (RE) (c) A 30 degrees, mesial angulated view of four obturated root canal systems.

to canal curvature like instrument separation, perforation and ledge formation.

Case Report 1

The patient, a 45-year-old female presented with pain and discomfort on her mandibular left first molar, previously restored with a ceramo-metal crown. A pre-operative radiograph revealed evidence of extensive decay on the mesial margin as well as unusual root morphology (Figure 1a). The ceramo-metal crown was removed, caries excavated and a temporary crown placed. A CBCT, axial coronal slice confirmed the presence of two roots (mesial and distal)(Figure 1b). A CBCT, axial coronal slice confirmed the presence of two roots (mesial and distal) (Figure 1b). Another axial slice in the midroot area, revealed the presence of distal root bifurcating into two separate roots. The additional root, branching off on the lingual aspect, confirmed the presence of Radix Entomolaris (Figure 1c). Note the curvature in the apical part of the RE that was maintained during canal preparation and obturation.

Case Report 2

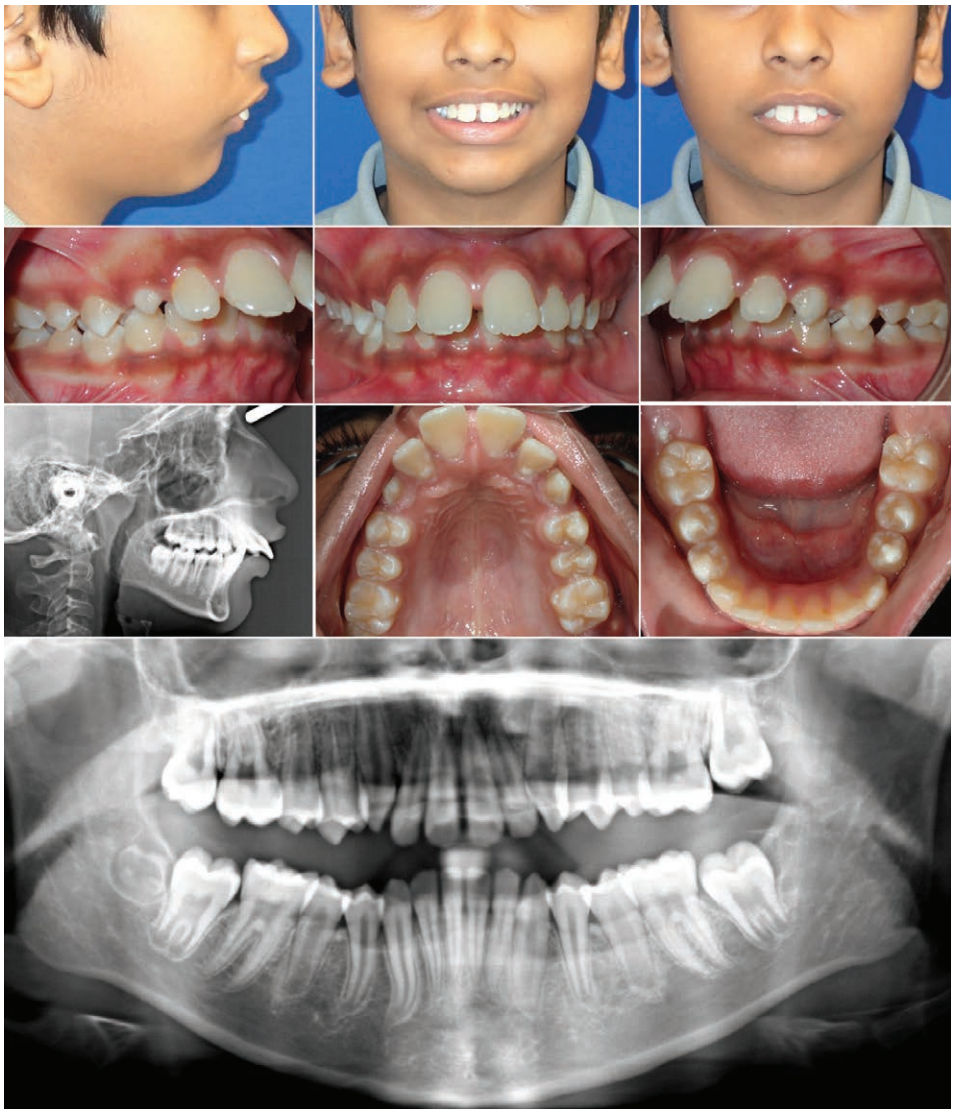
The patient, a 38-year-old female presented with discomfort on her mandibular right first molar that was root canal treated approximately 2 years ago. A periapical radiograph revealed an incomplete root canal treatment and evidence of an additional distal root (Figure 2a). A high resolution CBCT scan confirmed the diagnosis of Radix Entomolaris (Figure 2b). Figure 2c depicts the final result after re-treatment. Note again the curvature in the apical part of the Radix Entomolaris root.

Conclusion

CBCT technology as well as proper angulation when acquiring radiographic images proves helpful in locating canals in especially first mandibular molars with a high incidence of anatomical variations. A thorough understanding of the prevalence of RE, its anatomical variations as well as radiographic diagnosis will provide the clinician with a better understanding of its complexity in order to ensure successful treatment outcomes.

Class II orthodontic treatment of a growing patient using aligner treatment with mandibular advancement

Bart Iwasiuk[1]



Initial records

Patient

Age: 11 year, 8 month-old male. **Chief concern:** Upper front teeth sticking out

[1] Dr. Bart Iwasiuk
Toronto, ON, Canada

Cephalometric values

Measurement	Value	Norm	StDev
SNA	82.7	82	3
SNB	71.3	79	3
ANB	11.4	3	2
U1-SN	116.2	103	6
L1-MP	95.5	90	5
Interincisal angle	108.8	135	11
FH-MP (FMA)	30.3	24	3

Diagnosis

- Permanent dentition
- Convex facial profile
- Severe Class II, division 1 bite relationship on the right and left side
  - 11-12 mm overjet
  - Retrognathic mandible
  - Protruded upper and lower incisors
- Deep impinging bite (8 mm overbite)
- Moderate upper anterior spacing with a midline diastema
- Mild lower anterior spacing
- Agenesis of UR8, UL8, and LL8

Treatment goals

1. Correct the bite to Class I molar and canine without extractions.
2. Reduce the incisor proclination.
3. Close all the spaces.
4. Correct the deep bite.
5. Maintain good oral hygiene during and after orthodontic treatment.

Treatment plan

1. Open the bite with an initial series of Invisalign aligners (pre-mandibular advancement phase).
2. Begin to retract and upright the upper incisors during this pre-mandibular advancement phase, using Class II elastics for maximum anchorage.
3. Advance the mandible using aligners with precision wings (no interarch elastics).
4. Detail and finish with additional aligners as needed.
5. Retain the teeth with a bonded lingual wire on upper 2-2 and lower 3-3. Add a clear retainer for night-time wear to the upper arch around 45 days later, once the teeth have settled and the occlusion has stabilized. Form lingual bite ramps into the upper clear retainer if deep bite relapse is noted.*

* Vivera® retainers can now be ordered with precision bite ramps as a feature.

Invisalign aligner features used

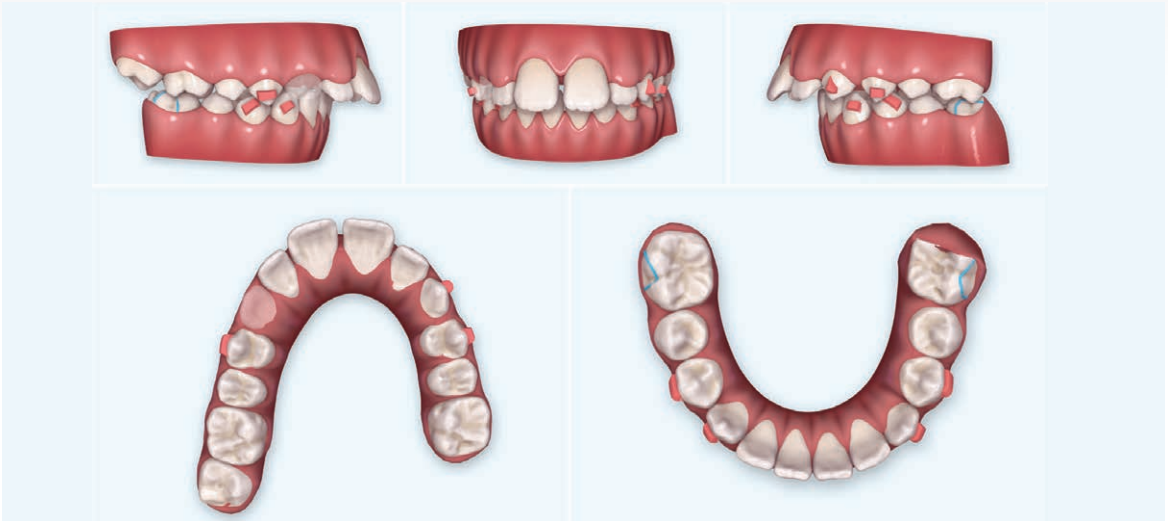
- Eruption compensation feature for the permanent upper right canine.
- Optimized and conventional attachments.
- Precision cut-outs for the lower first molars (during the pre-MA phase only).
- Precision wings for mandibular advancement.
- Precision bite ramps (during the additional aligners phase for detailing).

ClinCheck® software set-up and staging

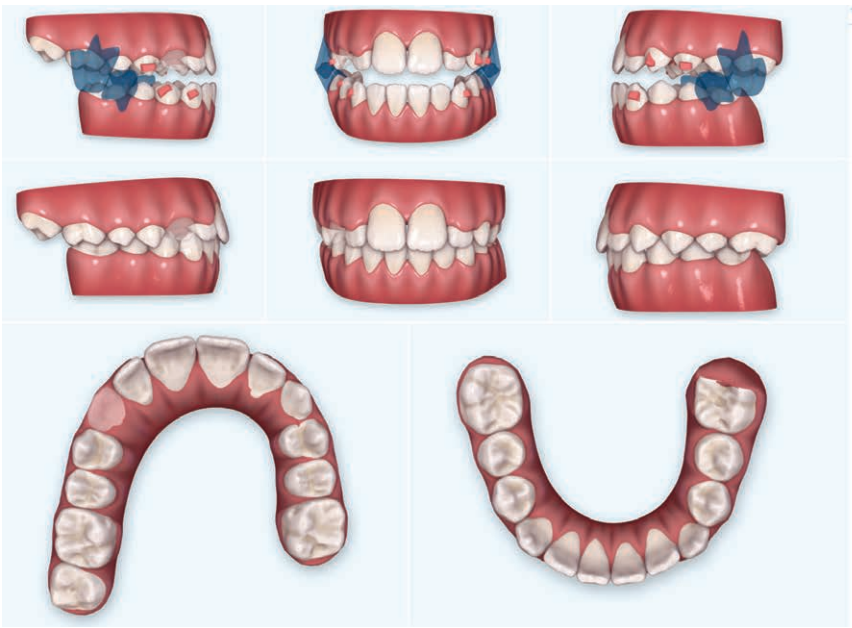
The pre-mandibular advancement aligner phase was designed to level the lower arch to reduce anterior interferences before initiating mandibular advancement. In the upper arch, the molars were derotated and the incisors retracted, intruded, and uprighted. During the mandibular advancement phase, the incisor retraction and arch leveling continues, to avoid anterior interferences while the overjet is being corrected. Precision bite ramps for vertical control can be added to the upper aligners once the overjet is sufficiently reduced.

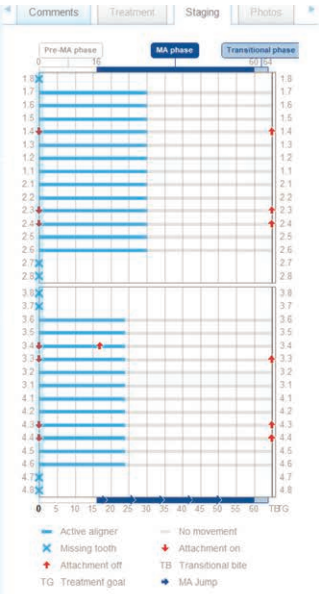
Pre-mandibular advancement phase treatment goal (Stages #1-16). Notice that the upper incisors do not need to be fully retracted before mandibular advancement begins. The plan is to begin advancing the mandible as soon as possible in order to give the patient more time in the mandibular advancement phase to capture their jaw growth.

Pre-mandibular advancement goal



Mandibular advancement goal





Left: Mandibular advancement phase treatment goal (Stages #17-60). The set-up with the precision-wing feature and attachments visible (top row) and without (middle and bottom rows).

*Right: Staging pattern for the pre-MA and mandibular advancement (MA) aligners (an automatic transition between the pre-MA and MA aligners is the default setting, so an additional scan/impression is not required in-between phases). Due to aligner fit problems, a new scan was required after aligner #40 (stage #24 of the MA-phase), at which point lingual attachments were manually added to the lower first molars for improved appliance retention before taking the mid-course correction scan (see clinical discussion for details).**

** Since this case has been treated, lingual attachments have now become available and can be requested in special instructions in prescription form on molars or premolars for Invisalign treatment with mandibular advancement. One attachment per quadrant is recommended to provide sufficient retention.*

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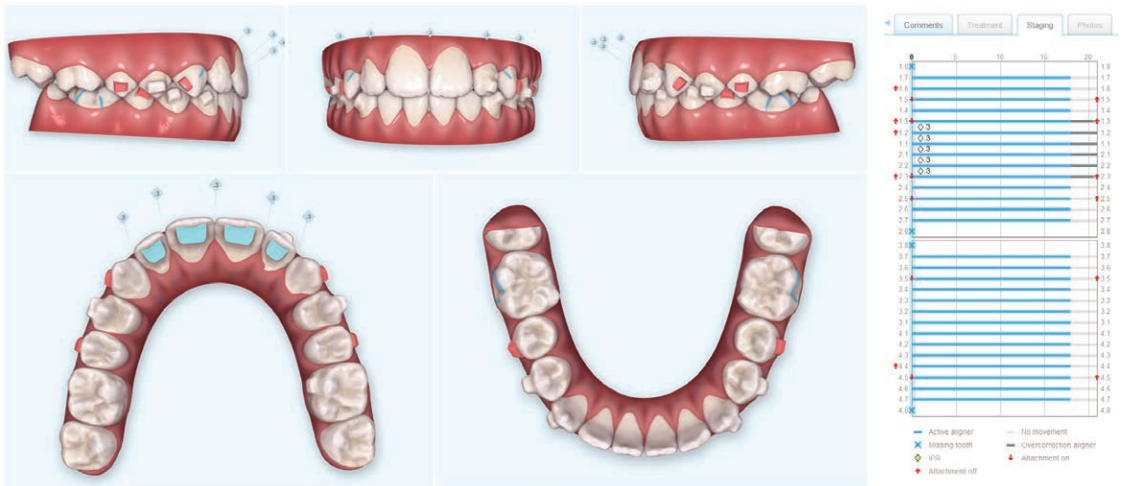
Progress records

Progress photos after the mandibular advancement (MA) phase was completed.



Treatment goal and staging for the detailing phase with additional aligners. IPR of 0.3 mm per contact was added to the upper anterior teeth to further reduce the overjet due to an existing Bolton discrepancy (excessive tooth mass in the upper anterior). Class II elastics were added to maintain the A-P correction achieved. Precision bite ramps were added to the upper aligners for vertical control.

Additional aligner scan after the mandibular advancement (MA) phase was completed. At the end of the MA-phase, the posterior occlusion was allowed to settle for 8 weeks using sectioned aligners during the last 4 stages. The patient was then instructed to discontinue all appliance wear for 1 month of additional bite settling before taking this scan for additional aligners for detailing.

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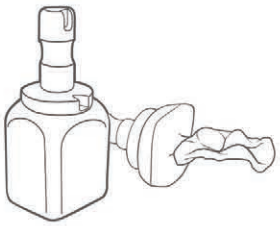

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Final photos

After the detailing phase with 18 U/L additional aligners, a solid Class I occlusion was achieved, along with ideal overbite and overjet. No final radiographs were taken due to a lack of medical justification for these per Canada's guidelines on dental radiographs.

Treatment summary

- Number of aligners used:
  - Upper: 40 of 64 aligners (16 pre-MA, 24 MA) + 30 of 32 additional aligners as a mid-course correction (MA) +18 additional aligners for detailing.
  - Lower: 40 of 64 aligners (16 pre-MA, 24 MA) +30 of 32 additional aligners as a mid-course correction (MA) +18 additional aligners for detailing.
- Aligner change interval: weekly, except stages #27-30 of the midcourse correction series (2 weeks each).
- Treatment time: 18 months of active aligner treatment. This time does not include 1 month to order the mid-course correction aligners, 2 months of wearing aligners with no precision wings (cut to 4-4 only) followed by 1 month of not wearing any aligners at the end of the MAphase for passive eruption of the posterior teeth, and 1 month to order the additional aligners for detailing (i.e., 23 months of calendar time from initial aligner delivery to retention).
- Appointment scheduling:
  - After the initial aligner delivery, the patient was seen at week 8 and at week 16 (since there were 16 pre-MA aligners).
  - For the MA aligners with precision wings, we saw the patient every 8 weeks (i.e., before every bite jump increment), in order to ensure proper patient engagement of the precision wings at each new jump. At aligner #40, the precision wings were not engaging on the left side and the aligners were not capturing the upper left lateral incisor, so additional aligners as a mid-course correction were ordered (at no additional lab cost or charge to the patient). The 8-week appointment intervals continued throughout the mid-course correction MA aligners.
  - After the MA-phase was completed, the patient wore aligners that were trimmed short with scissors (4-4). These were worn for 2 months, followed by no aligners

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for 1 month, to give the occlusion time to passively erupt and stabilize before taking the scan for post-MA aligners for detailing.
  - During the detailing phase, the patient was seen after 14 weeks (aligners #1-14) and then again a month later (after aligners #15-18). Bonded lingual retainers were then placed on upper 2-2 and lower 3-3.
  - An upper clear retainer was made for the patient 5 weeks after the bonded retainers were placed (worn at night only). No other appliances were worn during this 5-week period, in order to give the occlusion the flexibility to settle into place.
- Since the upper incisors were severely proclined initially, buttons for Class II elastics were bonded to the permanent upper lateral incisors and the aligners trimmed short gingivally. The permanent canines had not erupted enough to allow for precision cuts, and engaging precision cuts on the first premolars would have created an undesirable short vertical vector on the first premolars. In the lower arch, buttons were bonded to the lower 6s. 1/4" 4.5 oz. Class II elastics were worn full time during the pre-MA phase.
- 3/16" 4.5 oz. Class II elastics were used full-time during aligners #1-14 of the detailing and finishing phase to help detail and maintain the A-P changes achieved during the mandibular advancement (MA) aligner phase.

Example of an alternative way we engage elastics for patients with an interdental space present.[1] The elastic can be "lassoed" around a pontic, interdental ridge, or eruption compensation feature instead of a button or precision-cut aligner hook.

[1] *This technique is not recommended in cases where interdental space is inadequate to accommodate an elastic and its forces, as aligner breakage may occur.*

Clinical discussion

The patient's severe Class II malocclusion was successfully corrected to Class I using Invisalign aligners with precision wings for mandibular advancement. The severe deep bite and excessive overjet were also corrected to ideal. The patient's cooperation was excellent throughout treatment. However, one of the early challenges in this case was that the patient was extremely compliant with his elastics, and the retentive surface area of the aligner around the upper lateral incisors was reduced to accommodate the bonded buttons. As a result, the upper lateral incisors rotated distally out of the aligner, and tracking was lost. For aligners #17-24, we had the patient connect an elastic from upper lateral to upper lateral to mesially rotate them back into the arch. The patient was able to continue with the MA phase up to aligner #40 of 64. By then, however, the lower left first molar was dumping and the precision wing was not engaging anymore. At this point, the upper diastema was closed and the anterior spacing was also closed. The patient was 1/3 cusp Class II on the right and 1/2 cusp Class II on the left. Today, instead of bonding buttons to the upper lateral incisors, we would lasso the Class II elastics around the upper aligner and have the elastics engage the eruption compensation feature on the right, and around the ridge of the interproximal space between the lateral incisor and canine on the left, because avoiding cuts and cutouts in the aligner creates greater aligner plastic adaptation around the teeth for tooth movement control.

To improve the retention of the additional MA aligners for mid-course correction, we manually added a lingual composite attachment to the lower first molars before taking the scan and request on the prescription that these attachments be left alone during the digital detailing process. This was accomplished by modifying the last fitting aligner with thermoforming pliers to create an attachment well, but today we can order lingual attachments for precision wings on molars or premolars (one attachment per quadrant is sufficient) via prescription. By doing this slight modification, the mid-course correction MA aligners were more retentive, and we experienced positive precision- wing engagement.

A lateral open bite from the MA phase was resolved by sectioning aligners #26-30 distal of the 4s to remove the precision wings. For aligners #27-30, the patient wore the "short" 4-4 aligner sections for 2 weeks each. The patient then wore no appliances for 1 month prior to the additional aligner scan for even further bite settling by giving the posterior teeth the overhead clearance needed to erupt

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[2] Ivoclar Vivadent, Scientific Report IPS e.max_Vol.3, *Study Report,* 2018

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into occlusion. No bonded buttons, vertical elastics, or sectional appliances were needed to resolve the open bite (see special clinical section at the end of this case report for additional details).

After the MA-phase was completed, a new scan was taken for additional aligners for detailing, after which lingual retainers were bonded, and another month without appliances was given for the teeth to settle even more and for the curve of Wilson to flatten through daily chewing function. After 1 month, a clear retainer was made for the upper arch to be worn at night only. By creating an environment for the teeth to naturally recover, and by not being too eager to jump in with buttons, vertical elastics or sectional appliances, we were able to efficiently produce an excellent result for a severe Class II patient using Invisalign aligners in a growing teenage patient.

Special clinical section: Managing lateral open bites in growing patients treated with mandibular advancement aligners

When the mandible advances from Class II to Class I, the depth of the curve of Spee can become visibly obvious, particularly if the lower arch is not yet fully leveled. A posterior open bite during mandibular advancement treatment can be a common phenomenon with twin block therapy.[1,2] Nevertheless, seeing this happen during treatment can be alarming to those not familiar with how best to manage this common side effect.

Do not be too eager to correct the situation with vertical elastics and buttons or with sectional fixed appliances. Instead, leverage the fact that the occlusion of growing patients is quite adaptable at this stage. Most teeth are still capable of erupting at a rapid but physiologically healthy rate. The key here is to give the dentition the overhead clearance necessary for the bite to naturally settle into place. Instead of jumping in with an orthodontic solution, our preferred approach is to not interfere with the natural ability for the teeth to erupt on their own. This is accomplished by leaving the teeth uncovered once the desired overbite and overjet have been achieved.

To do this, we will trim the last 4 or 5 aligners of the mandibular advancement (MA) series with crown and bridge scissors to remove the precision wings (often times, these are the passive transitional stages at the end of the series). Each "short" aligner section spanning 4-4 will be worn for 2 weeks each, for a total of 8-10 weeks with the molars uncovered and therefore free to erupt and close the bite. Any retention attachments present

on 4-4 should adequately keep the aligner secured in place. After the last "short" aligner, the patient will discontinue all appliance wear for 1 month. During this month, the teeth will have additional freedom to settle into a more stable position.

At the end of the month, we will scan their teeth for additional aligners for detailing. When these aligners are finished, we will bond a lingual wire 2-2 in the upper arch and 3-3 in the lower arch. The patient will discontinue wearing any appliances for another full month in order to let the bite settle even more. When the patient returns to our office after a month, we will order them an upper clear retainer for night-time wear.

References

1 Clark, W., Design and Management of Twin Blocks: Reflections after 30 Years of Clinical Use, J Orthod, Sep 2010, 37(3):209-16.

2 Singh, H. et. al., Modified Occlusal Settling Appliance in Twin Block Therapy, J Clin Diag Res, 2016 Sep; 10(9): ZH01–ZH02. Published online 2016 Sep 1. doi: 10.7860/JCDR/2016/20028.8467.

Disclaimer: The experiences, results and opinions in this article are those of the author in his orthodontic practice and not necessarily of Align Technology Inc. The author was paid an honorarium by Align Technology Inc. for his time to develop this article.

Case example

The patient's bite at the start of the mandibular advancement phase.

The patient's bite 8 months into the MA phase. The overjet and overbite have improved, but a slight opening on left side is now present.

The patient's bite 11 months into the MA phase. Significant improvement to the overbite and overjet has been achieved, but a large opening on the left side is now present, and the right side is also opening.

Lateral open bite resolved. This is the patient's bite 3 months after the posterior segments were given adequate overhead clearance to recover (14 months since the start of the MA phase). This was accomplished by trimming the last 4 aligners distal to the first premolars to create a trimmed 4-4 aligner. Each of these aligner segments were worn for 2 weeks each instead for 1 week. After this, the patient wore no appliances at all for 1 month before a new scan was taken for detailing and finishing aligners. No vertical elastics or sectional fixed appliances were used to close the posterior open bite.

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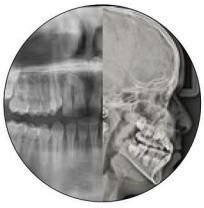
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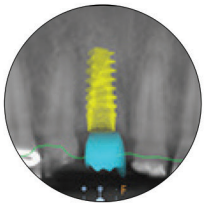
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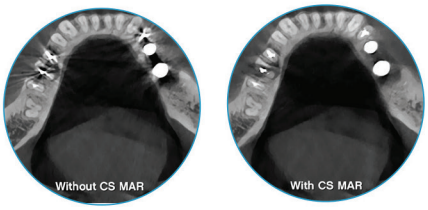

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COVID-19 risk management in dental practice. Part 3: Are dental healthcare workers at greater risk of COVID-19 than other health professionals or general population?

Johan Hartshorne[1] and Andre van Zyl[2]

Keywords: coronavirus, COVID-19, SARS-CoV-2, dental health care workers, dentists, occupational risk, health care workers, risk exposure, aerosol generating procedures, aerosols, respiratory droplets

Executive Summary

Rationale

• Dental practitioners are perceived to be at greater risk of occupational exposure and infection with SARS-CoV-2 due to close contact and prolonged contact with respiratory droplets and/or saliva contaminated aerosols from potentially infectious asymptomatic or pre-symptomatic patients.
• Part 3 of this review investigates the current available information on: (i) the global burden of COVID-19 on health care workers and in particular dental health care workers, (ii) why the dental practice setting is regarded as a 'high occupational risk' setting, and (iii) are dental health care workers and their families at increased risk of COVID-19 compared to the general population.
• This information is necessary to enhance dental health care workers (DHCWs) knowledge, awareness and appreciation of the importance of appropriate infection control and prevention measures to protect their safety, as well as patients, staff and public visiting their premises during the pandemic.

Key points

- DHCWs will increasingly be challenged: physically, psychologically and financially, in an uncertain economic and health care environment resulting from the COVID-19 pandemic.
- In South Africa alone, COVID-19 infections (n=27369) (5%) and COVID-19 related mortality rate (n=240) (0.9%) among HCWs has compounded the shortage of workers in the health sector.
- Overall COVID-19 infections amongst HCWs in South Africa (5%) are well below the global average of 10%.
- Dentistry is regarded or perceived as a very high risk occupation and environment because clinical dental practice exposes the dental team and patients to infectious airborne pathogens during aerosol generating procedures (AGPs).
- No studies were found on occupational risk of COVID-19 in DHCWs.
- Current media reports and social polls may bias towards perceptions of very high risk, increase morbidity, and maladaptive coping, enhancing anxiety and distress.
- The available evidence show that COVID-19 cases among frontline HCWs reflect

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that of community exposure and that the risk of COVID-19 infection among HCWs are overall similar or lower than the population based risk.

- COVID-19 positivity rates among categories of symptomatic HCWs were not significantly different between "high-risk HCWs (high patient contact, high-risk AGPs) , 'medium-risk HCWs (moderate patient contact, no AGPs) and low-risk HCWs (no patient contact).
- Lack of, and inappropriate use of PPE, prolonged exposure to infected patients, work overload, poor infection control, age, and pre-existing medical co-morbidities are risk factors that potentially contributed towards COVID-19 infection amongst HCWs.
- All HCWs are at some risk for exposure to COVID-19 during wide-spread community transmission, whether in the workplace, at home, or in the community.
- HCWs experienced a lower infection rate than their families, and did not represent a main transmission risk for relatives due to the controlled environment (PPE) in the workplace setting.
- There is no evidence available that suggests or proves conclusively that observed COVID-19 infections or deaths among HCWS are necessarily caused by occupational exposure.
- COVID-19 mortality rates among HCWs (0.3%) was also significantly lower compared to mortality rates in the general population (2.3%).
- HCWs who reused PPE or had inadequate access to PPE had a significantly increased risk of COVID-19
- DHCWs are not at increased risk of COVID-19 infection compared to the general population, provided that appropriate PPE are used and the necessary enhanced infection control and prevention precautions are adhered to.
- Occupation is not the only factor determining risk of infection, severity and death from COVID; it's a complex but delicate dance between occupation, behaviour, genetics, age, various underlying systemic health conditions and environment.

Practice implications

- Healthcare workers, including dentists and their nurses, play a central and critical role in providing essential services that promote health, prevent diseases and deliver accessible and quality health care services to individuals, families and communities they serve.
- Healthcare workers are not immune to injury of illness, therefore also have a moral and legal obligation to protect themselves and the healthcare system by ensuring that all the required infection control and prevention precautions and protocols are followed.
- Healthcare workers however, not only have an obligation to ensure consistency in access to and quality care, but also have an ethical and legal obligation to their staff and the patients they care for.
- The only safe, realistic and controlled approach towards infection prevention and control is to consider all patients as infectious and the universal application of the principles of standard and enhanced precautions.
- One of the major challenges faced by DHCWs in controlling SARS-CoV-2 infection is the extreme shortage of PPE and inadequate training on the use of PPE.

The importance of health care workers within the context of COVID-19

Healthcare workers, including dentists and their nurses, play a central and critical role in providing essential services that promote health, prevent diseases and deliver accessible and quality health care services to individuals, families and communities they serve.[1] Oral health care is integral to overall health and dentistry is essential health care because of its role in evaluation, diagnosing, preventing and treating oral diseases, which can affect systemic health and therefore a potential risk for COVID-19 severity.[2]

The healthcare industry however is one of the most hazardous and stressful environments to work in due to exposure to biological, chemical, physical (radiation), and ergonomic hazards for long periods of time.[3] Healthcare workers however, not only have an obligation to ensure consistency in access to and quality care, but also have an ethical and legal responsibility to protect themselves, their staff, and the patients they care for.

In addition to being exposed to infectious diseases such as COVID-19 at the workplace,[4] non-communicable diseases such as diabetes and hypertension, as well as cardiovascular diseases and their modifiable risk factors are highly prevalent among HCWs.[5-7]

The most commonly reported comorbidities reported among hospitalized HCWs were hypertension (65.2%) and diabetes (43%).[7] The most commonly reported modifiable risk factors reported among HCWs were unhealthy diet, tobacco use, harmful alcohol use, physical inactivity, overweight and obesity.[6]

All health care workers (HCWs), though vital for the functioning of healthcare services during this global pandemic are unequivocally exposed to increased risk of exposure to SARS-CoV-2 infection during wide-spread community transmission, whether in the workplace, at home,

or in the community.[8] Healthcare workers are not immune to injury of illness, therefore also have a moral and legal obligation to protect themselves and the healthcare system by ensuring that all the required infection control and prevention precautions and protocols are followed.

Globally, there is a lack of information on the occupational risk of exposure to COVID-19 among DHCWs and a paucity of information on HCWs.

Purpose and literature search methodology

The purpose of Part 3 of this review is to investigate the current available information on: (i) the global burden of COVID-19 on dental health care workers , (ii) why the dental practice setting is regarded as a 'high occupational risk' setting, and (iii) are dental health care workers and their families at increased risk of COVID-19 compared to the general population.

Emerging literature on COVID-19 is rapidly evolving and scattered over various sources, is characterized by lack of, or incomplete or uncontested evidence-based data and by a plurality of voices within the health care, academic, environmental research community and media making it difficult to clearly and rapidly synthesize and articulate scientific evidence. There is need for timely evidence to inform and update dentists on emerging COVID-19 infections and infection prevention and control practices. Due to the time-sensitive nature of the review and the need to report the most up-to-date information for an ever-evolving situation, there were no restrictions on language, information sources utilised, publication status, and types of sources of evidence.

A comprehensive literature search of multiple bibliographic databases was conducted, including Medline PubMed, Embase, the Cochrane Collaboration and Google Scholar. COVID-19 repositories with lists of grey literature sources (e.g., LitCOVID, COVID-END and WHO-COVID-19) and pre-print servers or repositories for biological and medical sciences (e.g., medRxiv, bioRxiv) were also included in the search strategy. It should be noted that preprints are preliminary reports of research and have not been certified by peer review. Information derived from preprints thus have to be interpreted with caution. Studies and reviews in all languages were considered for inclusion. Search keywords used in this review include: COVID-19, SARS-CoV-2, exposure, occupational risk, health care workers, dental health care workers, doctors, dentists, nurses, frontline workers, and Boolean search terms AND/OR. Electronic databases were searched to August 31, 2020. Reference lists of full text articles screened were searched for relevant studies.

The global burden of COVID-19 on healthcare workers (HCWs)

• Health burden of COViD-19 - Morbidity and mortality

Since the start of the coronavirus pneumonia outbreak in December 2019 a total of 152,888 COVID-19 related infections and 1413 deaths among healthcare workers have been reported globally.[9] Infections were mainly in women (71.6%) and nurses (38.6%), but deaths were mainly in men (70.8%) and doctors (51.4%).

In South Africa the overall COVID-19 infection rate among HCWs was 5% (n= 27369 HCWs).[10] A total of 1644 (6%) of these HCWs were doctors, 14143 (52%) nurses, 28 (<1%) port health workers, and 11545 (42%) from other categories of HCWs. A total of 22% (n=6027) of COVID-19 cases among HCWs were in the private sector and 78% (21333) from the public sector. The recovery rate among HCWs as at 4 August 2020 is 58% (n=16005).[10] As at August 7, 2020, there were 7500 registered active cases, of which 751 (10%) were being hospitalized, 6557 (87%) were in self isolation and 192 (3%) were being isolated at a facility. The median age of COVID-19 HCW admissions was 49 years, 382 (17.2% were 60 years and older. A total of 1598 (72% were female.[10] Among 1613 (72.7%) HCW admissions with data on comorbid conditions, 45% had at least one comorbid condition and 36.4% had more than one comorbidity reported. The most commonly reported comorbid conditions were hypertension (65.2%) and diabetes (43.0%). There were 13.5% HCWs who were HIV positive, 1.9% with active tuberculosis (TB) and 0.7% with previous history of TB. A total of 149 (6.7%) HCWs had severe disease defined as receiving treatment in high care or intensive care unit (ICU) or ventilated or diagnosed with acute respiratory distress syndrome (ARDS)

Overall COVID-19 infections amongst HCWs in South Africa (5%) is well below the global average of 10%.[10]

The mortality rate among HCWs was (0.9%) (n=240) – 37 (15.4%) from the private sector and 203 (84.6%) from the public sector.[10] Among those that died 65 (36.3%) had more than one comorbidity and 78 (43.6%) were 60 and older.

Overall, the global loss of HCWs to COVID-19 has further compounded the shortage of workers in the health sector.

• Psychological and physical burden of COVID-19

The recent spread of COVID-19 globally has led to considerable anxiety and concern amongst health care workers.[4] HCWs, including DHCWs are at risk for caring for asymptomatic or pre-symptomatic and symptomatic

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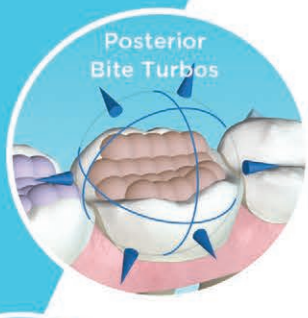

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infected patients. They understandably worry not only about becoming infected but also infecting co-workers, patients and family members.[4] Furthermore, COVID-19 has introduced psychological distress into the healthcare environment including stress from using strict infection control and prevention measures, physical strain from wearing protective equipment, need for constant awareness and vigilance, strict procedures and protocols to follow, physical isolation, increased demands for safety by patients in the workplace setting, reduced capacity to use social support due to physical distancing and stigma and insufficient knowledge and experience on appropriate use of PPE. Common PPE related complaints were constrained breathing, inability to speak properly and fogging of goggles. Prolonged PPE usage led to cutaneous manifestation and skin damage with the nasal bridge.[11]

A review of the literature (10 articles) revealed that frontline HCWs are at risk of physical and mental consequences, directly as a result of providing care to patients with COVID-19.[11] A meta-analysis of studies showed that HCWs experience high levels of depression, anxiety, insomnia and distress.[11]

Risk factors that were most commonly associated with physical and mental consequences of COVID-19 on HCWs were: (i) working in a high-risk workplace setting, (ii) positive diagnosed family member, (iii) Improper hand hygiene before and after patient contact, (iv) improper PPE usage, (v) close contact with patients (>12/day), (vi) long daily contact hours, and (vii) unprotected exposure.[11] Furthermore, healthcare providers are afraid they might affect their family members and live-in relatives.[12] Still in many workplace setting it is being reported that HCWs are working in fear of the virus and under poor conditions, without adequate protection or life insurance.[13]

• Economic burden of COViD-19 on dentistry

Globally, COVID-19 and associated policies have profound economic effects and has become a major challenge for dental practices.[14] These effects range from reduced or altered utilization of services, mean income reduction, and altered supply chain of materials. In addition the dental health care workers are facing financial and emotional hardship due to closure of their practices. Major economic challenges that dentists have to face include practice sustainability, financial security, insurance, declining turnovers whilst practice overheads stay the same, increasing operational costs, cashflow problems, labour issues and debt relief.[15] It is also suggested that as employees lose their jobs, many individuals will lose their employer sponsored medical aid/dental insurance, with many at risk of losing access to dental care and decreasing demand for dental care.[16] Dental practices and the dental industry will increasingly be challenged in an uncertain economic and health care environment as it resumes care delivery.

• Ethical burden on dental practices

The restrictive COVID-19 related policy measures imposed on oral healthcare workers, associated fear and anxiety, and social stigma of becoming infected with COVID-19, poses many potential ethical and legal implications and challenges. Consequences include -disruption and discontinuity of essential care, neglect, inappropriate use of medication and procedures, misdiagnosis, non-diagnosis, malpractice, misconduct under the protection of restrictive legislation.

A recent study[17] that examined dentistry and the global context of the pandemic highlighted the moral status of dental health-care personnel in balancing care for patients and personal welfare.

Dental professionals felt a moral duty to reduce routine care for fear of spreading COVID-19 among their patients and beyond, but were understandably concerned about the financial consequences.[17]

Why is dentistry considered a potential high risk for exposure to SARS-CoV-2?

The Occupational Safety and Health Administration places DHCP in the very high exposure risk category, as their jobs are those with high potential for exposure to known or suspected sources of the virus that causes COVID-19 during specific procedures.[18]

The practice of dentistry and its unique working environment exposes dental health care professionals and patients in everyday practice to infectious airborne disease pathogens. This is due to close contact during clinical care, as well as the infectious aerosols from most dental procedures.[19,20] The risk of exposure is considered to be higher in dental practices than in other health care settings mainly because there is (i) close and prolonged contact between the provider and the patient with increased risk of virus spreading through respiratory droplets and/or aerosols, (ii) most dental procedures generate aerosols that are potentially contaminated with a patients' blood and saliva, other secreta or tissue particles, (iii) direct contact with the oral cavity and saliva, a recognized reservoir and portal of exit and entry for SARS-CoV-2 , and (iv) DHCWs have no idea whether patient is asymptomatic or pre-symptomatic.[20-23]

• Asymptomatic carriers

SARS-CoV-2 spreads mainly through symptomatic or asymptomatic persons and effectively through breathing (the airborne route).[21,24-26] For this reason, it has been reported that healthcare professionals, family members, friends and patients who are in close contact with COVID-19 persons are at risk of getting infected or spreading the virus.[27,28]

Dentistry is considered as a risk for COVID-19 due to face-to face exposure with patients over extended periods in circumstances where patients or dental health care workers may be asymptomatic or pre-symptomatic carriers of the coronavirus.[22] Protection of dental patients and oral health care workers during COVID-19 is challenging due to the existence of patients who are infectious yet asymptomatic.[29] According to the Center for Evidence Based Medicine there is not a single reliable study to determine the prevalence of asymptomatic patients.[30] What we do know is that between 5% and 80% of people testing positive for SARS-CoV-2 may be asymptomatic, that symptom-based screening will miss a lot of these cases, some asymptomatic cases will become symptomatic over following weeks (so called pre-symptomatics), and both children and young adults can be asymptomatic.[30]

Close contact with positive patients, whether symptomatic or not, exposes health care workers to a higher risk of infection.[31] "There are more infections that we don't know about (60% completely asymptomatic) , than what we actually know about"

Approximately 40-45% of SARS-CoV-2 infections are likely to be asymptomatic and they can transmit the virus to others for an extended period, perhaps longer than 14 days.[32] Lee and co-workers also reported that many individuals with SARS-CoV-2 infection remained asymptomatic for a prolonged period, and that the viral load was similar to that in symptomatic patients.[33]

Even though the majority of patients seen by dentists are systemically healthy, they may be asymptomatic carriers of SARS-CoV-2, therefore the appropriate preventive measures should be taken to protect healthcare workers and patients. The disturbing reality is that we have no idea who among us is spreading the disease. This extreme evasiveness of SARS-CoV-2 makes it harder to control.

• Direct and close contact with the mouth and saliva reservoir

Dental care professionals are exposed to pathogenic microorganisms that infect the oral cavity and respiratory tract, both because they work in the oral area, and they cannot maintain an advised global 1-meter public distance.[24] In light of the current Coronavirus Pandemic (COVİD- 19), health professionals working in this area are subject to considerable risk of contamination with SARS-CoV-2 due to face-to-face interactions and contact to saliva, blood, other secretions, and use of aerosol generating procedures. Inhalation of aerosols and airborne particles, especially during applications using ultrasonic and high-speed dental handpiece, poses an additional higher risk of contamination for COVID-19.[24] Current evidence suggest that the coronavirus originating from infected saliva from asymptomatic patients is a potential source of infection that should not be ignored.[34] The practice of dentistry produces aerosols and droplets, involves direct contact with potentially infected saliva and mucosa, and comprises procedures that may induce gagging or coughing of patients, all carried out in close proximity to the patients mouth and nose.[35]

SARS-CoV-2 is primarily transmitted between people in close contact and most often by aerosolized virus containing respiratory droplets and aerosols as small as 5-10μm produced during procedures or when a patient or dental health care provider is talking, sneezing or coughing.[21,22,36] Clinical dental procedures exposes the dental team and patients to infectious airborne diseases due to close and prolonged contact during clinical care, and the potentially infectious aerosols from most dental procedures.[20] Close contact within the first 1.5m creates high exposure to both large droplets and droplet nuclei.[37]

Biological and clinical evidence supports oral mucosa as an initial site of entry and reservoir for SARS-CoV-2.[29] The main host cell receptor ACE2 is highly expressed on the epithelial cells of the oral mucosa, especially in the tongue and floor of the mouth,[38] suggesting that the oral cavity could be a high risk for SARS-CoV-2 infection,[38,39] and transmission-based precautions should be taken in the dental clinic. Since many viruses including SARS-CoV-2 can be detected in saliva,[40,41] the risk of transmission of viruses through droplets or aerosols are critical in the dental setting.[22,39] Close and prolonged contact between provider and patients, and direct contact with the oral cavity and risk of exposure to potentially contaminated saliva, splatter and aerosols makes this a high risk environment for exposure to SARS-CoV-2.[20,35]

The highest risk occur from splatter and droplet transmission to the midface of the dentist and/or dental assistant, such as the inner part of the eyes as well as the nasal area.[42] SARS-CoV-2 has a predominantly respiratory transmission through aerosols (5 micron and droplets <50 micron).[23] It

is therefore reasonable to assume that any method for reducing the viable bacterial or viral load in saliva and/or oral environment and/or limiting the effects of viral diffusion could lower the risk of cross-contamination and therefore critically important for infection control.[23]

- Aerosol generating procedures

The generation of aerosols in dentistry is practically an unavoidable part of most dental treatments. Dental aerosols produced from AGPs (e.g. ultrasonic scaler, high speed dental handpiece, air/water syringe, air polishing and air abrasion) has led to a new controversy during the COVID-19 pandemic, namely that it could facilitate the transmission of SARS-CoV-2 virus , thereby increasing the risk of exposure by dentists and dental assistants. However, to date there are limited data available to evaluate the scope and extent of AGPs that may generate potentially infectious aerosols, and a lack of expert consensus on whether AGPs represent and infection transmission risk for DHCWs.

Dental health care workers using AGPs are likely at greater risk of inoculating themselves and their patients from contaminated airborne salivary transmissions, splatter or respiratory droplets produced during AGP's.[42]

Most dental procedures generate aerosols or splatter that are contaminated with a patients saliva, blood, other secreta, or tissue particles,[43] exposing both dental health care workers as well as patients and staff to airborne, aerosol, contact and contaminated surface transmission of SARS-CoV-2.[21,22,39]

Biologic risk of SARS-CoV-2 inhalation transmission is extremely high when performing AGPs, which favours the diffusion of aerosol particles of saliva, blood and secretions.[22]

AGPs facilitate contamination of the patient, dentist environment (instruments, dental equipment, surfaces and floor.[21-23] Given the direct contact transmission, the mucosa of the oral cavity has been recognized as a potentially high-risk route of SARS-CoV-2 infection,38 as well as contaminated hands, which could facilitate virus transmission to patients.[23]

The water coolant from a high-speed handpiece could generate aerosols during restorative, prophylaxis and surgical procedures.[44] When combined with bodily fluids in the oral cavity, such as blood and saliva, contaminated bioaerosols are potentially created.[45] These bioaerosols are commonly contaminated with bacteria, fungi, and viruses, and have the potential to float in the air for a considerable amount of time and be inhaled by dentists and patients.[46-48]

Use of ultrasonic scalers, dental handpieces, air polishers, air abrasion units and 3-in-1 syringes produce the most visible and viable bioaerosols.[49] Ultrasonic and sonic transmission during nonsurgical procedures had the highest incidence of particle transmission, followed by air polishing, air/water syringe, and high-speed hand piece aerosolization.[43]

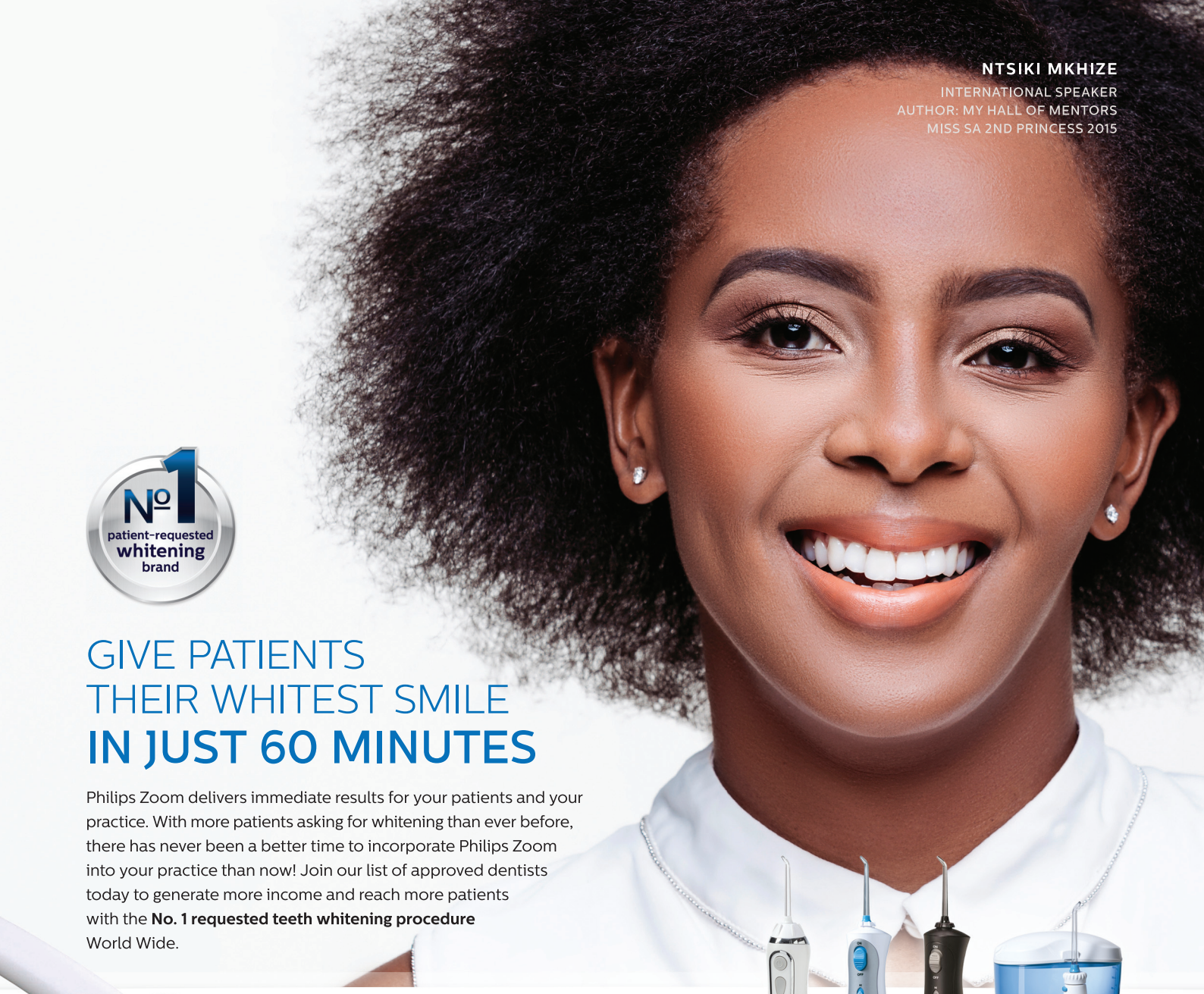
Most international sources recommend avoiding or minimizing the use of AGPs if possible, to reduce the risk of creating contaminated aerosols.[50] One has to seriously question the ethical and legal validity of these recommendations because minimizing the use of important tools such as the 3-in-1 water spray syringe, air turbine and ultrasonic scalers for instance have implications on the standard of care provided, and whether minimizing its use would be in the patients' best interest.

Minimizing or not using a 3-in-1 water-spray syringe will leave saliva on teeth and inadequate dried tooth surface resulting in poor etching and bonding. Using alternative handpieces and drill bits without water cooling will increase the risk of pulpal damage. Using hand instruments as an alternative to ultrasonic handpieces is not an option as it may create other risks of sharps injuries or damage to teeth. Instead of avoiding or minimizing the use of essential dental equipment the focus should rather be on what physical, chemical, and technical barriers and measures should be used to reduce or eliminate contaminated aerosols (e.g. pre-procedural mouth rinses, rubberdam, HVE and PPE) resulting from different AGP's.

More importantly, it seems plausible to adopts the principle of 'consider all patients as potentially infectious for air droplet /airborne disease and treat every case with equal and uniform precaution measures' as a more realistic, effective and safe approach towards infection prevention and control. Aerosols is unavoidable, however using physical, technical barriers, and chemical barriers may reduce the risk of exposure to SARS-CoV-2. These details will be described in greater detail in Part 4 of this series.

Are DHCWs at greater risk than other HCWs or general population – A summary of key evidence reports?

The risk of SARS-CoV-2 infection by healthcare workers has been a great concern since the start of the outbreak and the first person to raise concerns about the illness to the international community was Dr Li Wen-Liang, an ophthalmologist in Wuhan who sadly died of the disease that he likely contracted while at work.[51] By mid-February 2020, a large number of COVID-19 infections in medical staff had already been reported.[52] In China studies documented over 3300 confirmed cases of infected HCWs in early March.



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In the USA, as high as 19% of COVID-patients have been identified as HCWs.[53] Unmitigated, rising infection and mortality rates in HCWs, will not only paralyse a country's response to COVID-19, it is bound to have a significant long-term impact in healthcare delivery, particularly in healthcare systems already grappling with workforce shortages and geographic maldistribution.[9]

• Dental health care workers

Although dentistry is considered or perceived a high risk occupation, there is no reliable, peer-reviewed COVID-19 morbidity and mortality statistics available for dentists and their assistants to substantiate that dental health care workers are at greater risk than other HCWs or the general population. Currently there is a paucity of publications and national situation reports that provide information on the number of COVID-19 related infected HCWs and case fatalities.[8]

HCWs exposed to oro-nasal secretions such as otorhinolaryngologists, anaesthesiologists and oral maxillofacial surgeons, are especially at risk for COVID-19 infection and this group comprised 12% of all physician deaths.[54] In comparison dentists who are in close proximity to oral secretions for prolonged periods and their high-speed handpiece and ultrasonic instruments aerosolize body fluids had only 5% of the fatalities. In a recent paper from China,[22] no dentists were reported to have died from COVID-19 contracted during patient encounters.

Considering the paucity and/or lack of reliable risk data relating to DHCWs in particular, the approach of this review is aimed at analysing general trends observed among frontline HCWs relating to occupational risk of exposure to COVID-19 and how these trends compare in relation to that of the general population, and then to extrapolate from this data to DHCWs in the dental practice setting.

• The South African experience of HCW exposure to COVID-19

As of 15 August 2020, 2220 (4.3%) of the COVID-19 hospital admissions recorded on the DATCOV surveillance database, were HCWs, reported from 237 hospitals (63 public sectors and 174 private sectors in all nine provinces of South Africa.[10] The overall COVID-19 infection rate among HCWs was 5% (n= 27369 HCWs).[10] A total of 1644 (6%) of these HCWs were doctors, 14143 (52%) nurses, 28 (<1%) port health workers, and 11545 (42%) from other categories of HCWs. A total of 22% (n=6027) of COViD-19 cases among HCWs were in the private sector and 78% (21333) from the public sector. Overall COVID-19 infections amongst HCWs in South Africa (5%) is well below the global average of 10%.[10] The mortality rate among HCWs was 0.9% (n=240), with 37 (15.4%) from the private sector and 203 (84.6%) from the public sector.[10]

It is also suggested that lack of PPE, exposure to infected patients, work overload, poor infection control, and pre-existing medical co-morbidities are risk factors that potentially contributed towards COVID-19 infection amongst HCWs.[55]

• The UK experience of HCW exposure to COVID-19

A new analysis from the Office of National Statistics looking at COVID-19 related deaths between 9 March and 25 May, 2020 found that healthcare workers, including dental nurses and dental practitioners, do not have higher rates of COVID-19 deaths when compared to the general population.[56]

An independent analysis of NHS data in the UK until April 12, 2020, analysed 106 cases of deaths of UK health and social care workers from COVID-19. Of the 106 COVID-19 deaths most were nurses (33%), health care support workers (25%), and doctors (17%). Only one case of a dentist was reported.[57] This data however is unreliable because in 89 cases (84%) it could not be established whether the individual had been working during the epidemic.

In another study amongst 9809 health care employees in a UK Hospital , 11% of staff had evidence of COVID-19.[58] Staff with confirmed household contact were at greatest risk [Adjusted ODDs Ratio 4.63 (95% CI: 3.30 to 6.50)] and higher rates of COVID-19 were found in staff working in COVID-19 facing areas (21.2%) as compared to the general population (8.2%).

Dentists are generally not considered as frontline workers and not exposed to COVID-19 patients, and most dentists are for most of the time only involved in emergency care.

HCWs work very closely with patients (at arms-length and/or touching) and are exposed to COVID-19 (asymptomatic, pre-symptomatic or symptomatic) on a daily basis. Occupations involving close proximity to individuals, and those where there is potential or regular exposure to COVID-19 are generally perceived to have higher mortality rates from COVID-19. However, findings from this analysis do not prove conclusively that the observed mortality rates involving COVID-19 are necessarily caused in occupational exposure.[56] Other studies indicate that COVID-19 mortality statistics amongst HCWs (doctors and nurses) have similar statistics as that of the general population.[56]

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• Alberta Health Services COVID-19 Rapid Response Report on HCW occupational risk

In the absence of reliable peer-reviewed occupational risk data, the perception of personal COVID-19 risk in HCWs is at risk of being driven by preferential media reporting.[12] This perception that HCWs are at risk is substantiated by a recent informal social media based poll of over 500 physicians across Canada which indicated that 86% felt they had a greater than 50% chance of acquiring COVID-19 during the coming months.[12]

Key research questions addressed in the Rapid Response Report were: (i) Among countries who were past their initial peak of COVID-19 cases, what proportion of total cases were in health care workers (nurses and physicians), and what is the estimated proportion of the total number of HCWs who developed COVID-19 from presumed occupational exposure? (ii) Is there any evidence that household members of HCWs are at elevated risk of COVID-19 disease, and if so, are there guidelines for mitigating that risk.

Based on the available evidence the following key messages relating to the above-mentioned research questions were presented:[12]

(i) The evidence for occupational risk among HCWs is highly variable. HCWs make up 9.6% of Ontario's 2392 cases.[59] However, the regional COVID-19 infection rates vary widely ranging from 3.7% in Toronto to 43% in Petersborough.[59]

(ii) The current absolute occupational risk of documented COVID-19 infection in healthcare workers is 0.01%.

(iii) Overall incidence of COVID-19 infection in HCWs is higher than that of the general population.

(iv) The relative risk of documented COVID-19 for HCW, confined to the analysis of nurses and physicians was 9-11 higher than the general population.

(v) The absolute risk of documented risk of COVID-19 amongst HCWs (2.93%) remained quite low, regardless of country risk status (under 3% in high risk countries).

(vi) COVID-19 epidemic dynamics among HCWs closely follow community dynamics, representing an argument against significant occupational transmission.[60]

(vii) When contact times were under 15 minutes there was no increased risk of infection. No transmission was detected among 21 HCWs who were exposed to COVID-19 patients, despite minimal PPE.[61]

(viii) Occupational risk to HCWs could be mitigated by diligent hand hygiene and appropriate use of PPE.

(ix) COVID-19 positivity rates among categories of symptomatic HCWs were not significantly different between "high-risk HCWs (high patient contact, high-risk AGPs) , 'medium-risk HCWs (moderate patient contact, no AGPs) and low-risk HCWs (no patient contact).[62]

(x) Calgary has the preponderance of COVID-19 hospitalized cases within Alberta at this time. There has been no evidence of aerosol generating medical procedures as cause of COVID infection on any of the four Calgary "Designated COVID-19" acute care wards. This data supports that there is no SARS-CoV-2 airborne transmission in high-risk settings where infection control and prevention precautions and PPE (gowns, gloves, medical masks, and face shields or goggles in routine care and the addition of N95 respirator for AGPs) use are meticulously followed and executed.[12]

(xi) There are no reliable data on hospitalization and mortality rates for HCWs and most available data were from media reports. Within high-risk countries, these limited data suggested case fatality was substantially lower in HCWs (0.01%) than in the general population in Italy (13.9%) and Hubei (4.7%).[12]

(xii) Current data suggest that 90% of cases in HCWs in Alberta, Canada currently reflect community exposure and that the occupational risk is overall similar or lower than the population based risk of documented COVID-19.[12] This data is in keeping with the estimates of risks seen in some of the low risk countries, reflecting both a relatively low exposure risk within health care settings currently, and potentially reflecting effectiveness of recommended PPE and other infection prevention and control measures.

• A global perspective of 'low' and 'high' incidence of COVID among HCWs

Most of the data from new studies was presented as incident COVID-19 in HCWs rather than risk. Four studies reported low incidence for HCWs: United States - 2.9%[63]; China-4.4%[64]; China - 8.2%[65] and USA - 2.5%.[66]

Four studies, all from Europe, described incidence rates for HCWs at or above the global rate of 10%, namely: Lombardy (Italy) - 13.8%[67]; Sardinia - (41%)[67]; Italian average - 10%[68]; and Spain - 20%.[69] The evidence around occupational exposure risk is highly variable. Observations from Spain showed that the epidemic dynamics among HCWs closely followed community dynamics, representing an argument against occupational transmission (no increased risk compared to community risk).[60]

Early evidence from Singapore show that no HCWs developed COVID-19 after contact with 68 confirmed cases.[70]

A new pre-print study reported a 7% greater absolute

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risk (95%CI for risk difference 4.7% - 9.3%) of SARS-CoV-2 among HCWs compared to non-HCWs in a university and university hospital setting in New Jersey.[71] The highest infection rate was in nurses (11.1%), and ICU workers had a low rate of infection (2.1%) compared to those on other units (4.9-9.7%). A case study from Switzerland in a primary care hospital found that when contact times were low (less than 15 minutes), there was no increased risk of infection (no transmission was detected among the 21 HCWs who were exposed to the patient, despite minimal PPE).[61] In another study, an analysis of data from 41countries revealed 67569 cases of COVID-19 infected HCWs. The median HCW infection percentage among total cases globally was 10.04% (range 0-24.9%). The median case fatality rate among HCWs was 0.8% (range 0-18.95%).[8] The median age of HCWs who died was 62 yrs (range 24-93 years). The researchers noted that it is impossible to compare HCW infections across countries, due to different testing policies, underreporting of cases or prioritization of HCW testing and variability of the stage of the epidemic in a particular country.

A meta-analysis of 11 studies, (China n= 7; USA n= 3, and Italy n=1), consisting of 119,216 patients (including 13,199 HCWs) showed that nearly 10% of COVID-19 positive cases were HCWs. This study also revealed that the incidence of severe disease in HCWs (9.9%) was significantly lower compared to that of the general population (29.4%). Furthermore, COVID-19 mortality rates among HCWs (0.3%) was also significantly lower compared to mortality rates in the general population (2.3%).[4]

It is suggested that physicians and health care professions exposed to oronasal secretions (ENT specialist, anaethetists and dentists) may be considered a potential high risk and should therefore not be underestimated.[9]

• The UK /USA experience of HCW exposure to COVID-19 using a social media survey

A prospective observational cohort study of front-line workers (n=99795) and general population in the UK and USA (2,035,395), using a social medial platform survey between March 24 to April 23, 2020 showed an overall 0.2% COVID-19 cases in the general population compared to 2.7% COVID-19 cases among front-line HCWs.[72]

Frontline HCWs with inadequate PPE caring for patients with documented COVID-19 had a six-fold increased risk for COVID-19 compared to those HCWs with adequate PPE that have no exposure to patients with COVID-19.

Risk of frontline HCWs reusing PPE and exposed to patients with documented COVID-19 was also increased five-fold.

However, it is suggested that media reports and social polls may bias towards perceptions of very high risk, increase morbidity, and maladaptive coping.[12]

• Are family members of HCWs or DHCWs at elevated risk of exposure to COVID-19

There are no available data on the transmission of COVID-19 from infected HCWs to household members.[12] Several publications have considered the exposure risk to COVID-19 of the general population and healthcare workers. A recent and only paper available discussed the risk of exposure by family members of health care workers.[73] The conclusions made by the authors in this study was: (i) the general populations exposure to COVID-19 is less controlled than that of health care workers, (ii) healthcare workers experienced a lower infection rate than their families, and (iii) health care workers did not represent a main transmission risk for relatives.[73] This brings into question the relative risk of HCWs infection from community versus workplace exposure and is consistent with current Alberta data for HCWs infections where most are currently from the community. There were no qualitative or quantitative data sources to address transmission from HCW back to members of their household in the broad search string employed. As a result, there are no estimates of risk of transmission of infection from HCWs to household members.

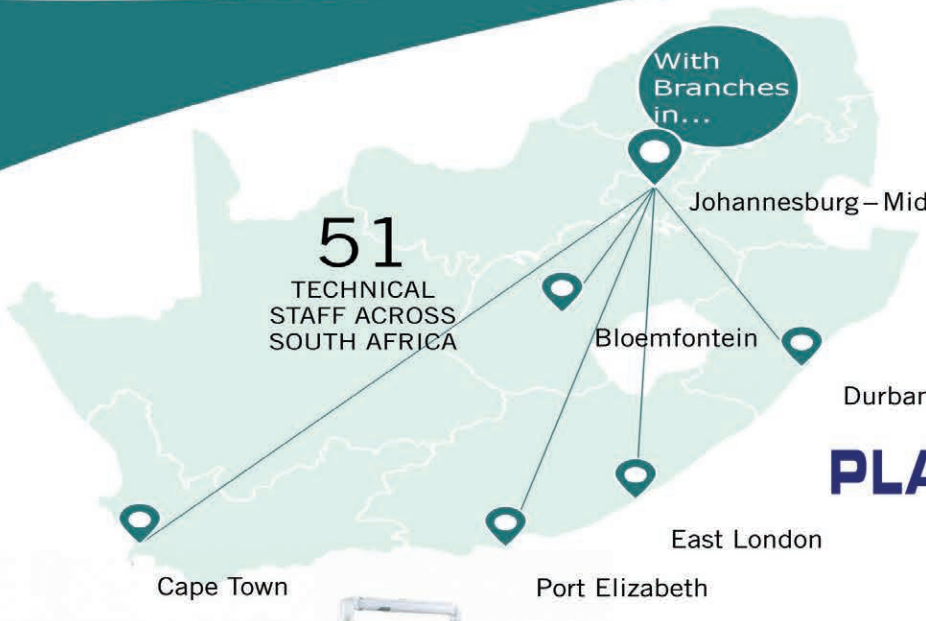
• Possible reasons that may impact on HCW exposure risk

The potential for high exposure to SARS-CoV-2 is generally higher for healthcare workers due to direct exposure and proximity to COVID-19 patients, long exposure time and failure to use effective PPE, lack of proper training how to use PPE and inadequate supervision and monitoring of infection prevention and control measures.[13] A study amongst frontline HCWs suggested that HCWs that reused PPE or had inadequate access to PPE had a significantly increased risk of COVID-19.[72]

Based on the evidence from SARS-CoV-1, risk to HCWs could be mitigated by diligent hand hygiene and careful use and doffing of PPE[74] and enhanced surface disinfection within health care settings.[12]

Although dentists and dental nurses have the highest level of proximity and potential exposure to COVID-19 on a daily basis out of all the occupations evaluated, they were most likely to be using PPE.

The use of standard infection control and prevention,



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including high levels of PPE, and dental health care workers who are specially trained in decontamination and cross-infection measures has been normalized in the dental profession over the past 40 years. However, extended precautions for preventing airborne transmission of respiratory viral infectious disease have been added to the standard precautions.

• Extrapolating the reviewed data to the DHCW population

The available evidence shows that COVID-19 cases among frontline HCWs reflect that of community exposure and that the risk of COVID-19 infection among HCWs are overall similar or lower than the population based risk. COVID-19 positivity rates among categories of symptomatic HCWs were not significantly different between "high-risk HCWs (high patient contact, high-risk AGPs) , 'medium-risk HCWs (moderate patient contact, no AGPs) and low-risk HCWs (no patient contact). HCWs where dentists and dental nurses were included in the study population, did not have higher risk of COVID-19 infection compared to the general population.

Furthermore, the available data do not prove conclusively that the observed COVID-19 cases and mortality rates are necessarily caused by occupational exposure. Abovementioned data suggest that COVID-19 morbidity and mortality epidemic dynamics among frontline HCWs follows the trend seen in general population dynamics, representing an argument against occupational transmission.

Considering that abovementioned risk % and estimated

proportions of total number of HCWs who developed COVID-19 were mostly front-line workers (nurses and physicians) exposed to COVID-19, it is reasonable to assume that dentists and their staff, who are not direct frontline workers would likely have the same or less risk of developing COVID-19. Furthermore, diligent hand hygiene, appropriate use of PPE and enhanced infection control and prevention measures would further decrease the likelihood of exposure risk among DHCWs.

It has been suggested that there is an urgent need for a registry among HCWs to establish facts, enable robust and systematic morbidity and mortality data analysis on how COVID-19 infection are impacting on individuals in the health professions during the conduct of their duty, and to enable effective mitigation practices.[57]

Conclusion

Dentistry is an essential service, therefore the safety of dental health care workers and their patients should be an urgent focus and priority to protect the integrity and effectiveness of the healthcare system in the global response to the pandemic. DHCWs will increasingly be challenged, physically, psychologically and financially in an uncertain economic and health care environment resulting from the COVID-19 pandemic. The COVID-19 pandemic has to date exerted a significant physical, psychological, and economical burden on all HCWs globally, highlighting the need for appropriate psychological support to prevent the emergence of the widespread psychological morbidity characterized by considerable anxiety and distress among HCWs.

Globally there is a paucity of research into the occupation risk of exposure to hazards such as infectious diseases like COVID-19 faced by HCWs and in particular DHCWs. Dentistry is regarded or perceived as a very high risk occupation and environment because clinical dental practice exposes the dental team and patients to infectious airborne disease pathogens due to close and prolonged contact with potentially asymptomatic or pre-symptomatic patients, and the increased risk of exposure to potentially infectious aerosols from most dental procedures. DHCWs are not only at increased risk of SARS-CoV-2 exposure but can also amplify outbreaks within their practices or at home if they become ill.

The available evidence show that COVID-19 cases among frontline HCWs reflect that of community exposure and that the risk of COVID-19 infection among HCWs are overall similar or lower than the population based risk. Furthermore, the available data do not prove conclusively that the observed COVID-19 cases and mortality rates are necessarily caused by occupational exposure but more likely incidental. It is therefore reasonable to suggest that dentists and their staff, who do not have direct contact with documented positive COVID-19 cases (except for the possibility of exposure to asymptomatic and/or pre-symptomatic cases), would likely have the same or less risk of developing COVID-19. A plausible explanation why frontline HCWs, including DHCWs, are likely to have the same or reduced risk rate of exposure to infection is because they work in a controlled environment with appropriate infection control and prevention protocols.

Considering the evidence presented in this review, it is plausible to conclude that DHCWs are not at increased risk of COVID-19 infection compared to the general population, provided that appropriate PPE are used and the necessary enhanced infection control and prevention precautions are adhered to. However, one of the major challenges faced in controlling COVID-19 is the extreme shortage of PPE and inadequate training on the use of PPE.

There is no information available on the question whether DHCWs pose an elevated risk to their relatives or family members. However, in a single available study the authors suggested that because HCWs work in a controlled environment and that the general populations exposure to COVID-19 is less controlled to that of HCWs, it was reasonable to assume that HCWs experienced a lower infection rate than their families. HCWs, including dentists, did not represent a main transmission risk for relatives.

In the absence of reliable risk data, the perception of personal COVID-19 risk with DHCWs is at risk of being driven by preferential media reporting of cases in DHCWs or social media based polls. It is suggested that media reports and social polls may bias towards perceptions of very high risk, thus further enhancing anxiety and distress among DHCWs.

A primary limitation of the data presented in this review was the quality of the data, countries were at different stages of their epidemics when reporting took place, heterogeneity of HCW classification and availability as well as the variability of testing in different countries which could have influenced infection and mortality rates among health care workers.

Occupation is not the only factor determining risk of infection, severity and death from COVID; it's a complex but delicate dance between occupation, behaviour, genetics, age, various underlying systemic health conditions and environment.

This will not be our last pandemic. DHCWs should learn how to balance their moral, legal and professional obligations towards ensuring a safe working environment. This will benefit not only themselves, but also their patients and staff. Yet, as practice owners, dentists have to face the consequences of reduced patient visits, loss of incomes, and increased costs of infection control and prevention protocols. Reconciling the conflict between risking one's life, or livelihood under the COVID-19 pandemic is not and easy choice. Dentists are ethically obliged to provide the best possible care, including the elimination of potential risks and harms. Fulfilling moral obligations, compassion and commitment towards patients, providing safe and quality care are what professionalism is all about. In acting in the ethical principle of 'doing no harm' maximum protective measures should be taken.

References

1. World Health Organization (WHO) Health professions networks. Accessed on August 29, 2020 on the Internet at: https://www.who.int/hrh/professionals/en/

2. American Dental Association (ADA) American Dental Association responds to World Health Organization (WHO) recommendation: Dentistry is essential health care. American Dental Association. August 12, 2020. https://www.ada.org/en/press-room/news-releases/2020-archives/august/american-dental-association-dentistry-is-essential-health-care

3. Joseph B, Joseph M. The health of healthcare workers. Ind J Occupational Environ Med 2016 ; 20(2) : 71-72. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5299814/?report=printable

4. Sahu AK, Amrithanand VT, Mathew R, et al. COVID-19 in healthcare workers – A systematic review and meta-analysis. Amer J Emerg Med 2020; 38(9): 1727-1731. https://www.ajemjournal.com/article/S0735-6757(20)30483-6/fulltext

5. Emannuel IA, Maxwell AO, Edith NO, et al. A survey of non-communicabble diseases and their risk factors among university employees: A single institutional study. Cardiovasc J Afr 2017; 28(6): 377-384. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5885043/

6. Coetzee A, Beukes A, Dreyer R, et al. The prevalence and risk factors for diabetes mellitus in health care workers at Tygerberg Hospital, Cape Town, South Africa: A retrospective study. J Endocrinol Metab Diabetes S Afr 2019; 24(3); 77-82.

7. National Institute for Occupational Health (NIOH). COVID-19 – Sentinal hospital surveillance weekly update on hospitalized HCWs. Update: Week 33, 2020. https://www.nioh.ac.za/wp-content/uploads/2020/08/COVID-HCW-SURVEILLANCE-Report-WEEK-33-final.pdf

8. Papoutsi E, Giannakoulis VG, Ntella V, et al. Global burden of COVID-19 pandemic on healthcare workers. ERS Open Research May 15, 2020; 6: https://openres.ersjournals.com/content/6/2/00195-2020

9. Bandyopadhyay S, Baticulon RE, Kadhum M, et al. Infection and mortality of healthcare workers from COVID-19: a scoping review. medRxiv Jun 5, 2020. https://www.medrxiv.org/content/10.1101/2020.06.04.20119594v1.full.pdf

10. Department of Health. Minister of Health COVID-10 media briefing . August 5, 2020. https://sacoronavirus.co.za/2020/08/05/minister-of-health-covid-19-update-media-briefing-5-august-2020/

11. Shaukat N, Mansoor Ali D, Razzak J. Physical and mental health impacts of COVID-19 on health care workers: A scoping review. Int J Emerg Med 2020; 13: 40. https://intjem.biomedcentral.com/track/pdf/10.1186/s12245-020-00299-5

12. Otto S, Babujee A, Neustaedter C, et al. COVID-19 risk to health care workers. COVID-19 Scientific Advisory Group Rapid Response Report. Alberta Health Services, Canada. May 4, 2020. https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-covid-19-hcw-risk-rapid-review.pdf

13. Itodo GE, Enitan SS, Oyekale AO, et al. COVID-19 among health care workers: risk of exposure, impacts and biosafety measures – A Review. Int j Health, Safety and Environment (IJHSE) 2020; 6(4): 534-0548. https://www.researchgate.net/publication/341774655_COVID-19_among_Healthcare_Workers_Risk_of_Exposure_Impacts_and_Biosafety_Measures_-A_Review

14. Schwendicke F, Krois J, Gomez J., Impact of SARS-CoV-2 (Covid-19) on dental practice.: Economic analysis. J Dent 2020; 99: 103387. https://www.sciencedirect.com/science/article/pii/S0300571220301330

15. Moraes RR, Correa MB, Queiroz AB, et al. COVID-19 challenges to dentistry in the new pandemic. medRxix preprint, June 14, 2020; https://www.medrxiv.org/content/10.1101/2020.06.11.20128744v1.full.pdf

16. Choi SE, Simon L, Riedy CA, Barrow JR. Modeling the impact of COVID-19 on dental insurance coverage and utilization. J Dent Res 2020. https://journals.sagepub.com/doi/pdf/10.1177/0022034520954126

17. Coulthard P. Dentistry and coronavirus (COVID-19) – Moral decision-making. Br Dent J 2020; 228(7): 503-505.

18. Centers for Disease Control and Prevention. (CDC August 7, 2020) Guidance for dental settings: interim infection prevention and control guidance for dental settings during the COVID-19 pandemic. Available at: https://www.cdc.gov/coronavirus/2019-ncov/hcp/dental-settings.html

19. Koletsi D, Belibasakis GN, Eliades T. Interventions to reduce aerosolized microbes in dental practice: A systematic review with network meta-analysis of randomized controlled trials. J Dent Res 2020. https://journals.sagepub.com/doi/pdf/10.1177/0022034520943574

20. Beltrán-Aquilar E, Benzian H, Nierderman R. Rational perspectives of risks and certainty for dentistry during the COVID-19 pandemic. Amer J Infect Control 2020. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7290219/

21. 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;12:9.

22. Meng L, Hua F, Bian Z. Coronavirus disease 2019 (COVID-19): emerging and future challenges for dental and oral medicine. J Dent Res 2020; https://doi:10.1177/0022034520914246

23. Izetti R, Nisi M, Gabriele M, Graziani F. COVID-19 Transmission in dental practice. Brief review of preventive measures in Italy. J Dent Res 2020; (First Alert) https://doi.org/10.1177/0022034520920580

24. Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet 2020;395:507-13. The Lancet. Emerging understandings of 2019-nCoV. Lancet 2020;395:311.

25. The Lancet. Emerging understandings of 2019-nCoV. Lancet 2020;395:311.

26. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet 2020;395:497-506.

27. Chen H, Guo J, Wang C, et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. Lancet 2020; 395:809-15.

28. Li Q, Guan X, Wu P, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. N Engl J Med 2020;382:1199-207.

29. Ren YF, Rasubala L, Malmstrom H, Eliav E. Dental Care and Oral health under the clouds of COVID-19. J Dent Res

July, 2020: 5(3): 202-210. https://journals.sagepub.com/doi/pdf/10.1177/2380084420924385

30. Heneghan C, Brassey J, Jefferson T. COVID-19: What proportion are asymptomatic: Center for Evidence Based Medicine. April 6, 2020.08.12 https://www.cebm.net/covid-19/covid-19-what-proportion-are-asymptomatic/

31. Wang D, Hu B, Hu C, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. JAMA 2020; 323(11): 1061-1069.

32. Oran DP, Topol EJ. Prevalence of asymptomatic SARS-CoV-2 infection. Ann Int Med 2020. https://www.acpjournals.org/doi/full/10.7326/M20-3012

33. Lee S, Lee, E, Lee, C, et al. Clinical course and molecular viral shedding among aymptomatic and symptomatic patients with SARS-CoV-2 infection in a community treatment Center in the Republic of Korea. Jnl Amer Med Assoc Intern Med. August 6, 2020. https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2769235

34. Xu, J, Li Y, Gan F et al. Salivary glands: potential reservoirs for COVID-19 asymptomatic infection. J Dent Res 2020. https://journals.sagepub.com/doi/pdf/10.1177/0022034520918518

35. Casamassimo P, Castellano J, Conte C, Czerepak C, Jacobson B, Lee J, Miller J, Younger L. Re-emergence Pediatric Dentistry Practice Checklist: A guide for re-entry into practice for pediatric dentists during the COVID-19 pandemic. American Association of Pediatric Dentists (28 April 2020). https://www.aapd.org/globalassets/media/covid-19/aapd-practicechecklist.pdf

36. Omer SB, Malani P, de Rio C. The COVID-19 pandemic in the USA. A clinical update. J Amer Med Assoc 2020. https://jamanetwork.com/journals/jama,fullarticle/2764366

37. Liu L, Nielsen PV, Wei J, Jensen RL. Short-range airborne transmission of expiratory droplets between two people. Indoor Air 2017; 27: 452–462, https://www.researchgate.net/publication/303914446_Short-range_airborne_transmission_of_expiratory_droplets_between_two_people

38. Xu H, Zhong L, Deng J, et al. High expression of ACE 2 receptor of 2019-nCoV on the epithelial cells of oral mucosa. Int J Oral Sci 2020; 12(1): 8.

39. Li Y, Ren B, Peng X, et al. Saliva is a non-negligible factor in the spread of COVId-19. Mol Oral Microbiol 2020; https://onlinelibrary.wiley.com/doi/epdf/10.1111/omi.12289

40. Kaczor-Urbanowicz, K. E., Martin Carreras-Presas, C., Aro, K., Tu, M., Garcia-Godoy, F., & Wong, D. T. (2017). Saliva diagnostics – Current views and directions. Exp Biol and Med, 242(5), 459–472. https://doi.org/10.1177/1535370216681550

41. To K K-W, Tsang O T-Y, Yip C C-Y, et al. Consistent detection of 2019 novel coronavirus in saliva. Clin Infect Dis 2020; 361: 1319-1326. https://doi.org/10.1093/cid/ciaa149

42. Nejatidanesh F, Khosravi Z, Goroohi H et al. Risk of Contamination of Different Areas of Dentist's Face During Dental Practices. Int J Prev Med 2013; 4(5): 611-615. (http://europepmc.org/article/med/23930175#free-full-text)

43. Harrel SK, Molinari J. Aerosols and splatter in dentistry: A brief review of the literature and infection control implications J Amer Dent Assoc 2004;135:429-437.

44. Farah R. Effect of cooling water temperature on the temperature changes in pulp chamber and at handpiece head during high-speed toot preparation. Resto Dent Endod 2018; 44 (1): e3. https://www.ncbi.nlm.nih.gov/pubmed/30834225)

45. Ge Z, Yan L, Xia J, et al. Possible aerosol transmission of COVID-19 and special precation in dentistry. J Zhejiang Uni Sci B. 2020 ; 21(5) : 361-368. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7089481/

46. Grenier D. Qualitative analysis of bacterial aerosols in two different dental clinic environments. Appl Environmental Microbiol 1995; 61(8): 3165-3168.https://aem.asm.org/content/aem/61/8/3165.full.pdf

47. Zemouri E, de Soet H, Crielaard W, Laheij A. A scoping review on bioaerosols in healthcare and the dental environment. PLos ONE 2017; 12(5): e0178007. https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0178007&type=printable

48. Jones RM, Brosseau LM. Aerosol Transmission of Infectious Disease. J Occup Environ Med 2015; 57(5): 501-508. https://pubmed.ncbi.nlm.nih.gov/25816216/

49. Araujo MW, Andreana S. Risk and prevention of transmission of infectious diseases in dentistry. Quintessence Int 2002; 33: 376-382.

50. Clarkson J, Ramsay, Aceves M, et al. COVID-19 Dental Services Evidence Review)(CoDER) Working Group. Recommendations for the reopening of dental services: a rapid review of international sources. Version 1.1 – Updated May 7th, 2020. https://oralhealth.cochrane.org/sites/oralhealth.cochrane.org/files/public/uploads/covid19_dental_review_16_may_2020_update.pdf

51. Petersen E, Hui D, Hamer DH, et al. Wenliang, a face to the fronline healthcare worker. The first doctor to notify the emergence of SARS-CoV-2, (COVID-19), outbreak. Int J Infect Dis 2020; 93: 205-207. https://www.ijidonline.com/action/showPdf?pii=S1201-9712%2820%2930111-9

52. The Novel Coronavirus Pneumonia Emergency Response Epidemiology Team. The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19) in China. Chinese J Epidemiol 2020; 41: 145-151.

53. Wu Z, McGoogan JM. Characteristics of and Important Lessons from the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72314 Cases from the Chinese Center for Disease Control and Prevention. Hcw3 J Am Med Assoc. 2020 Apr 7;

54. Edsel B, Xu A, Salimi A, Torun N. Physician death from coronavirus disease (COVID-19). medRxiv. April 8, 2020; https://www.medrxiv.org/content/10.1101/2020.04.05.20054494v1.full.pdf

55. Mhango M, Dzobo M, Chitungo I, Dzinamarira T. COVID-19 risk factors among health care workers: A rapid review. Safety and Heath at Work, June 6, 2020. https://www.sciencedirect.com/science/article/pii/S2093791120302961

56. Windsor-Shelland B, Butt A. Coronavirus (COVID-19) related deaths by occupation, England and Wales: Deaths registered between 9 March and 25 May. Office for National Statistics. Statistical Bulletin June 26, 2020.

57. Cook T, Kurumovic E, Lennane S. Exclusive : deaths of NHS staff from COVID-19 analysed. . Health Service J 2020; https://www.hsj.co.uk/exclusive-deaths-of-nhs-staff-from-covid-19-analysed/7027471.article

58. Eyre DW, Lumley SF, O'Donnell D, et al. Differential occupational risks to health care workers from SARS-CoV-2: A prospective

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observational study. medRxiv, June 29, 2020. https://www.medrxiv.org/content/10.1101/2020.06.24.20135038v2.full.pdf

59. Pelley, L. (2020). Health-care workers make up 1 in 10 known cases of COVID-19 in Ontario. CBC News. Retrieved from https://www.cbc.ca/news/canada/toronto/health-care-workers-make-up-1-in-10-known- cases-of-covid-19-in-ontario-1.5518456

60. Folgueira, M. D., Munoz-Ruiperez, C., Alonso-Lopez, M. A., & Delgado, R. (2020). SARS-CoV-2 infection in Health Care Workers in a large public hospital in Madrid, Spain, during March 2020. MedRxiv, 2020.04.07.20055723-2020.04.07.20055723. https://doi.org/10.1101/2020.04.07.20055723

61. Canova, V., Lederer Schläpfer, H., Piso, R. J., Droll, A., Fenner, L., Hoffmann, T., & Hoffmann, M. (2020). Transmission risk of SARS-CoV-2 to healthcare workers -observational results of a primary care hospital contact tracing. Swiss Medical Weekly, 2020 150, w20257–w20257. https://doi.org/10.4414/smw.2020.20257

62. Hunter, E., Price, D. A., Murphy, E., van der Loeff, I. S., Baker, K. F., Lendrem, D., … Duncan, C. J. A. (2020). First experience of COVID-19 screening of health-care workers in England. The Lancet 2020; 395(10234): https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30970-3/fulltext

63. CDC COVID-19 Response Team. (2020). Characteristics of Health Care Personnel with COVID-19 - United States, February 12-April 9, 2020. Morbidity and Mortality Weekly Report (MMWR), 2020; 69(15), 477–481. Retrieved from https://www.cdc.gov/mmwr/volumes/69/wr/mm6915e6.htm?s_cid=mm6915e6_w

64. Zhan, M., Qin, Y., Xue, X., & Zhu, S. Death from Covid-19 of 23 Health Care Workers in China. New England Journal of Medicine. 2020; Retrieved from https://www.nejm.org/doi/full/10.1056/NEJMc2005696

65. Bai, Y., Wang, X., Huang, Q., Wang, H., Gurarie, D., Ndeffo-Mbah, M., … others. (2020). SARS-CoV-2 infection in health care workers: a retrospective analysis and a model study. MedRxiv. Retrieved from https://www.medrxiv.org/content/medrxiv/early/2020/04/01/2020.03.29.20047159.full.pdf

66. Heinzerling, A., Stuckey, M. J., Scheuer, T. et al. Transmission of COVID-19 to Health Care Personnel During Exposures to a Hospitalized Patient - Solano County, California, February 2020. MMWR. Morbidity and Mortality Weekly Report, 2020; 69(15), 472–476. https://doi.org/10.15585/mmwr.mm6915e5

67. Bellizzi, S., Fiamma, M., Arru, L. et al. Covid-19: The daunting experience of health workers in Sardinia, Italy. Infection Control & Hospital Epidemiology, 2020; 1–5. Retrieved from https://www.cambridge.org/core/journals/infection-control-and-hospital-epidemiology/article/covid19-the- daunting-experience-of-health-workers-in-sardinia-italy/701E48437E557A9CE14090F66A52F830

68. Chirico, F., Nucera, G., & Magnavita, N. COVID-19: Protecting Healthcare Workers is a priority. Infection Control and Hospital Epidemiology, 2020; 1–4. https://doi.org/10.1017/ice.2020.148

69. Güell, O. Spain ranks first for Covid-19 infections among healthcare workers. EL PAIS. 2020; Retrieved from https://english.elpais.com/spanish_news/2020-04-25/spain-ranks-first-for-covid-19-infections-among- healthcare-workers.html

70. Htun, H. L., Lim, D. W., Kyaw, W. M, et al. Responding to the COVID-19 outbreak in Singapore: Staff Protection and Staff Temperature and Sickness Surveillance Systems. Clinical Infectious Diseases 2020; : An Official Publication of the Infectious Diseases Society of America. https://doi.org/10.1093/cid/ciaa468

71. Barrett, E. S., Horton, D. B., Roy, J. et al. Prevalence of SARS-CoV-2 infection in previously undiagnosed health care workers at the onset of the US COVID-19 epidemic. MedRxiv. 2020; Retrieved from https://www.medrxiv.org/content/medrxiv/early/2020/04/24/2020.04.20.20072470.full.pdf

72. Nguyen LH, Drew DA, Graham MS, et al. Risk of COVID-19 among front-line health-care workers and the general community: a prospective cohort study. The Lancet July 31, 2020.08.26 https://www.thelancet.com/action/showPdf?pii=S2468-2667%2820%2930164-X

73. Lorenzo D, Carrisi C. COVID-19 exposure risk for family members of health care workers: An observational study. Int J Infect Dis 2020 ; 98: 287-289. https://www.sciencedirect.com/science/article/pii/S1201971220305415

74. Jefferson, T., Foxlee, R., Del Mar, C et al. Physical interventions to interrupt or reduce the spread of respiratory viruses: Systematic review. BMJ, 2008; 336(7635), 77–80. https://doi.org/10.1136/bmj.39393.510347

75. Kursumovic E, Lennane S, Cook TM. Deaths in healthcare workers due to COVID-19: the need for robust data and analysis. Anaesthesia 2020; 75: 9889-992. https://onlinelibrary.wiley.com/doi/epdf/10.1111/anae.15116

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Gary Bloomfield[1]

Introduction

Making an acceptable impression in dentistry requires not only the use of precision impression material but also the use of adjunct materials to help support the accuracy of the final impression. 3M introduced a line of products that are intended to be used together to maximize the efficiency of taking an impression while offering predictablity to the clinican.

The following products were selected for this case:

- 3M™ Retraction Capsule
- 3M™ Intra-oral Syringes
- 3M™ Impression Trays
- 3M™ Imprint™ 4 Penta™ Heavy and Imprint™ 4 Light VPS Impression Material

Clinical Case

An 80-year-old male presented with a fractured and decalcified upper right canine (tooth #6). After reviewing clinical and radiographic findings it was determined that a full porcelain crown was the best treatment of choice. Initial impressions were obtained including a template for temporary fabrication, a study model and an opposing full arch mandibular impression (using 3M impression tray). After placing local anesthetic, the tooth was prepped for a full porcelain crown (Figure 1). Prior to the final impression, 3M retraction capsule (3M) paste was injected into the sulcus of tooth #6 (Figure 2). The retraction paste contains 15% aluminum chloride and is intended to provide temporary tissue retraction and enable a clean, dry and controlled sulcus. 3M retraction capsule paste material can be used alone or in conjunction with retraction cord. The soft and narrow tip of the 3M retraction capsule corresponds in size and shape to a periodontal probe; designed for direct placement in the sulcus (Figure 3).

While the retraction paste is in place, a 3M impression tray (Figure 4) is fitted. The trays come in three sizes and require no adhesive. The self-retentive strips are designed to direct the flow of the impression material, minimizing defects and voids.

The 3M intra-oral syringe is loaded with the appropriate amount of Imprint™ 4 Light (Figure 5). The syringes are single use, ergonomically designed, and can be prepared in advance (Figures 6-7). The syringe is designed for the loading of consistent amounts of wash for both single and multiple preps. There are markings and characteristics on the

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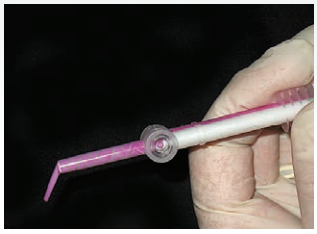
Figure 1. Prepared tooth #6.

Figure 2. 3M retraction paste in place around preparation.

Figure 3. 3M™ Retraction Capsule and periodontal probe tips are similar in size.

Figure 4. 3M™ Impression Tray

Figure 5. 3M™ Intra-oral Syringe connects easily to a cartridge.



Figures 6-7. 3M™ Imprint™ 4 Light is placed from the 3M™ Garant™ Dispenser into a 3M Intraoral Syringe, and the tip can be directed for precise application.

Figure 8. Loading 3M™ Imprint™ 4 material into the 3M™ Impression Tray using a 3M™ Pentamix™ 3 Automatic Mixing Unit.

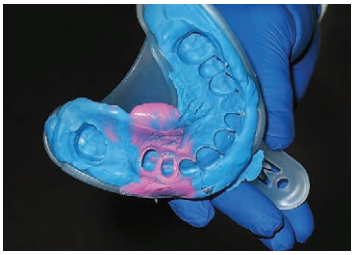


Figure 9. Full-arch final impression.

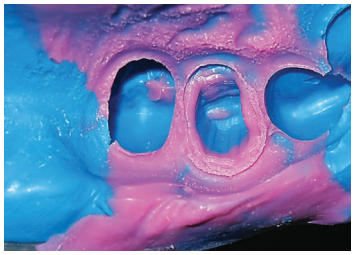


Figure 10. Detail of impression.

syringe that will accommodate specific amounts. Using the syringe is much easier than trying to guide the 3M™ Garant™ cartridge with extended mixing tips. The 3M intra-oral syringe uses less material and allows more accurate placement.

Once the Retraction Capsule material is placed, simply rinse the material at the time limit making sure no residue remains in the sulcus.

Next, Imprint 4 material is extruded from a Pentamix mixing unit into a 3M impression tray (Figure 8). Since the 3M intra-oral syringes can be prepared in advance, the material can be syringed around the prep while the tray is being loaded. The tray is gently placed and allowed to set. Imprint 4 Light (regular set material) has a maximum 1:00 minute intra-oral syringing time at room temperature. Intra-oral set time for Imprint 4 regular set material is 2:00 minutes. When the impression is set, remove it and check for blue residue and excess pieces of impression 'flash'. These may be on teeth or soft tissue. The final impression (Figures 9-10) shows excellent marginal detail. The color contrast is easy to read, crisp and accurate, with no delamination.

Worth noting: In addition to providing a precise impression medium, Imprint 4 material (3M) has an active self-warming feature that accelarates the intraoral setting time. The setting time starts after placement and speeds up with body temperature.

A temporary crown (Figure 11) is fabricated using the pre-prep impression template. The Imprint 4 impression and models were sent to the lab where an all porcelain crown was fabricated. The patient returned 10 days after the prep work for delivery of the restoration (Figure 12). No complications or problems occurred during temporization. The restoration was tried in, adjusted and bonded into place.

Figure 11. Temporary crown.

Figure 12: Final restoration.

The patient is comfortable and pleased with the final result.

Conclusion

The 3M products used in this restorative process helped create a beautiful restoration. The materials and delivery system are excellent.

These products are designed to be used sequentially and gives the clinician confidence in accuracy of both impression and final restoration.

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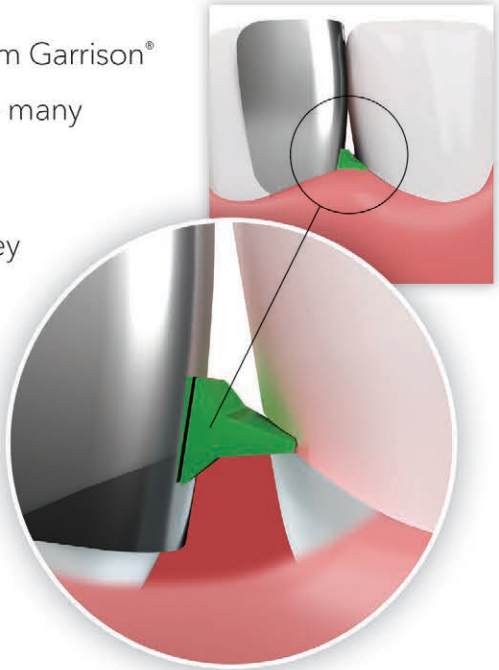

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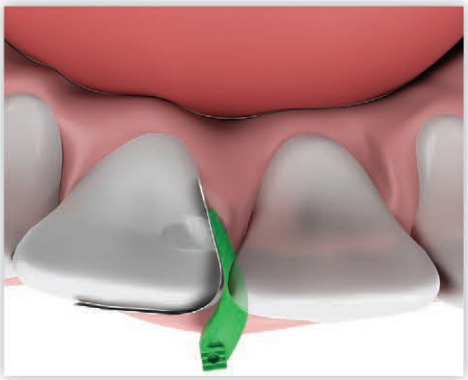

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50 tall bands
25 extra small wedges
25 small wedges
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Refills	Item	Qty.
Short	GARAN100-M	50
Tall	GARAN200-M	50

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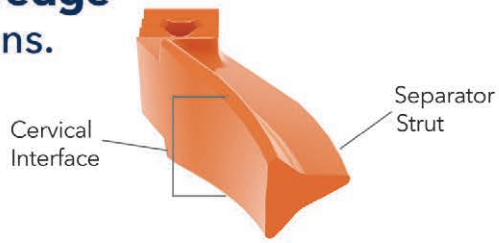

Fusion™ Anterior Wedges

Description	Item	Qty.
Fusion Anterior Wedge Kit	GARANK4-M	200

Refills	Item	Qty.
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Adding value

Understanding the psychology of the dentine hypersensitivity patient

Do patients and dentists think dentine hypersensitivity is a minor oral health issue or a chronic condition? Insight from wider sociological and psychological work suggests changing the perception of dentine hypersensitivity could help patients manage this common oral complaint and also help strengthen the dentist-patient relationship.

Is it time to think differently about dentine hypersensitivity?

Dentine hypersensitivity (DH) is estimated to affect 1 in 3 people.[1] Its ubiquity as a condition can mean that it is regarded, by both patients and dental practitioners, as a minor oral health concern. Yet, even among those with mild symptoms, coping measures to manage DH can affect their daily activities.

"We know that the impact of this condition can, for some people, result in really significant impacts on oral health related quality of life," says Professor Barry Gibson, Professor in Medical Sociology, School of Clinical Dentistry at the University of Sheffield. He added that how DH affects people can range from being very mild to becoming predictable and forming part of an "illness career."

Does this provide dentists with an opportunity to reappraise DH? "Seeing it as a chronic condition means that the dentist can see that this may well have progression. This could be something that could be long term and that needs management," adds Professor Gibson.

Understanding this health and illness journey is vital and can have longer-term benefits for the dentist-patient interaction that goes beyond the time they spend in the dentist's chair. Recognising the impact a simple dental condition can have on patients' real lives outside the surgery can help change the interaction between them and their dentist, believes Dr Koula Asimakopoulou, Reader in Health Psychology at King's College London: "It's about building a relationship, using the easy, the simple and the mild - and fixing these - to actually engender trust and confidence in the relationship with the patient."

It's not major – but it matters

Research from Professor Gibson's team suggests that DH has over the years been "displaced, trivialised and transformed into a non-problem problem".[2] Although this has been the necessary consequence of an essential public health focus on caries, he points out that now we are seeing conditions arising as a direct consequence of improved oral care, such as dentine hypersensitivity from over brushing.

From the dentists' perspective, DH is a commonly seen condition. In GSK research among dentists worldwide, 45% make a DH diagnosis at least once daily.[3] Patients who are less concerned about their DH are, unsurprisingly, less likely to seek dental advice: 42% versus 82% of those that are highly bothered.[4] Yet, even among those

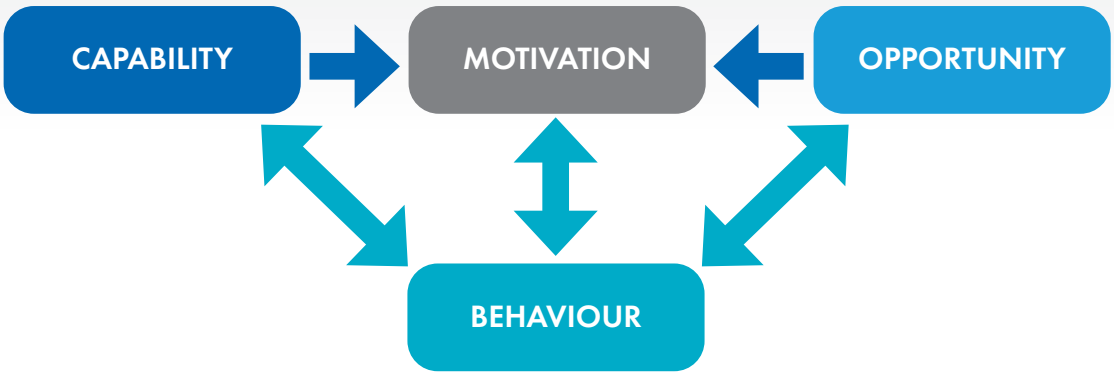

Figure: COM-B module of behaviour change (adapted from Michie, et al, 2011)[13]

patients who are less bothered about DH, nearly half will experience symptoms at least once a month, while over a third suffer weekly.[5]

Although this DH experience is broadly similar to those that are highly bothered, these 'mild' sufferers tend not to categorise themselves as being someone with sensitivity or having 'a condition', they simply experience sensitivity occasionally and have found ways to cope with it by making lifestyle adjustments.[6,7] But why should they? Professor Gibson believes dentists could be missing an opportunity to engage with a significant sector of their patient population: "Many participants [in our research] indicated that they felt dentine hypersensitivity was actually part of their life".

It's a chronic complaint but...

This emphasises the fact that DH is a chronic complaint. "I can tell you from the classic sociological literature on this, dentine hypersensitivity certainly fits the picture as a chronic condition," confirms Professor Gibson.

DH can alter the way patients act, restrict their eating habits, cause them to make adaptations to daily life and affect their social interactions, as well as having an emotional impact and affecting their personal identity.[8]

Professor Gibson acknowledges that one of the issues is a lack of understanding around DH progression. "But it can and for many people it definitely has done. And when it does, it has really significant impacts on everyday life."

...why don't people complain?

Put simply, people with DH have already learned to cope, even those that say they are less concerned have changed their lifestyle to manage the condition.[9]

"One of the fundamental indicators that you have a chronic condition is restrictions, limitations to the performance of daily tasks. Dentists and patients who don't take the condition very seriously, it's because they've adapted so quickly because pain forces you to adapt," explains Professor Gibson.

Capturing the nuances of DH's impact on quality of life has resulted in the development of the Dentine Hypersensitivity Experience Questionnaire (DHEQ), which is a validated, condition-specific measure used to evaluate responsiveness to change in oral health-related quality of life measures in DH patients.[10,11]

Research utilising the DHEQ has found that among patients with DH, these adaptive behaviours fall into four categories:[10,12]

- Avoid: 77% avoid cold drinks or foods (90% say they have problems eating ice cream); 38% have avoided hot drinks/foods
- Adapt: 81% change the way they eat or drink certain things, 79% say they make sure food doesn't touch certain teeth, 56% make sure they bite their food into small pieces
- Compromise: 41% cool foods/drinks down before eating; 73% leave cold drinks to warm up before having them
- Tolerate: 67% are careful how they breathe on a cold day; 45% wear a scarf over their mouths on cold days.

The condition also has an emotional impact. In research, 89% found DH annoying, while a similar proportion found it irritating.[10, 12]

"Dentine hypersensitivity requires a range of adaptive behaviours to avoid pain and sensitivity," explains Professor Gibson.

I'm fine – I can live without a hot cup of tea

It's the fact that DH patients have already made these changes that makes them so interesting, believes Dr Asimakopoulou. Generally changing behaviour is the hard part, but she warns DH patients could be setting up longer-term issues.

"We use the COM-B model of behaviour change to talk about capability, opportunity and motivation. These people will be ticking all three boxes for behaviour change. Only in this case, their apparent success in the short-term in solving the problem will probably mean they are less likely to want to engage with the dentist to deal with the problem in the long-term, unless the dentist brings it up and if the dentist offers a really easy solution."

Who raises the issue could be a factor. Recent GSK research among dentists worldwide found 53% believed it was their role to raise DH with their patients.[3]

However, once raised the "easy solution" that Dr Asimakopoulou refers to could simply be met by recommending a dentine hypersensitivity toothpaste. Daily use of a sensitivity toothpaste can significantly improve the quality of life impact of DH after 8 weeks, in particular the emotional impact, the restrictions around their eating habits and how they change their habits.[10-12]

Let's talk about the 'S' word

For the dental practitioner, being more DH-aware can make a significant difference to their patients. Dr Asimakopoulou believes DH offers dentists a chance to engage with the patient on a simple behaviour change model. "DH is a brilliant opportunity to do that. So, there is a problem, there is a solution in the toothpaste you are suggesting to the patient and that will make the problem more manageable. I think DH provides an opportunity for dentists to be associated with success in behaviour change."

However, research suggests that time may be a factor for dentists in raising issues, such as DH: 31% of dentists say they don't spend enough time understanding patients' oral health behaviours and around one in four say they have not spent sufficient time offering advice on these behaviours.[3]

Failing to engage with DH, however, sends a clear message to the patient. "A dentist who is dismissive about a mild condition essentially gives the patient the message that the condition is not important, it's not worth their time and attention and the patient shouldn't be concerned with it. We know that, in that case, the condition will go on in the background and it won't just disappear overnight, and it will remain a niggle rather than a huge major health concern," says Dr Asimakopoulou.

Professor Gibson agrees and raises the issue of progression, where DH becomes more bothersome for patients: "What's going to happen when that patient later has progression and the illness career really takes hold? They're going to look back at that dentist, who didn't hold that conversation, very unfavourably."

Sensitivity means success

Changing the way DH is perceived, from an inconsequential, mild condition, to a chronic complaint that can have a significant impact on patients' quality of life, presents the dentist with an opportunity to engage with the patient and be associated with an easy behaviour change success.

Not only can this help patients manage the problem better but can also enhance the dentist-patient relationship in both the immediate and long-term.

References

1. Addy M. Int Dent J, 2002; 52:367-375.
2. Gibson BJ, Paul NR. Social Theory Health, 2014;1-24.
3. GSK Data on File. Survey of 172 dentists in China, Germany, Turkey, India, UK and USA. June 2020.
4. GSK Data on File. U&A Study France 2018.
5. GSK Data on File. Omnibus research in US, Germany, China, Turkey and India. July 2019.
6. GSK Data on File. Better understanding the less bothered persona. US. 2020.
7. Davari AR, et al. J Dent Shiraz Univ Med Sci, 2013; 14(3):136-145.
8. Gibson B, et al. The everyday impact of dentine sensitivity: personal and functional aspects. In: Robinson PG, editors. Dentine hypersensitivity: Developing a person-centred approach to oral health. London: Elsevier Inc, 2015, Chapter 6.
9. GSK Data on File. RDSi Project Fit. July 2019.
10. Mason S, et al. BMC Oral Health, 2019;19:226.
11. Baker SR, et al. Clin Periodontol 2014; 41: 52–59.
12. GSK Data on File. Study 204930 (2017).
13. Michie S, et al. Implementation Sci, 2011;6:42.

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*[1]Percentage improvement in Schiff score vs fluoride-only toothpaste after 8 weeks, test 0.454% w/w stannous fluoride toothpaste vs. control fluoride-only toothpaste. The difference for tactile threshold for test toothpaste compared to fluoride-only toothpaste were 7.5 g after 4 weeks and 27.2 g after 8 weeks.

‡[2]Percentage improvement in Bleeding Index after 24 weeks, test 0.454% w/w stannous fluoride toothpaste vs. control fluoride-only toothpaste. Study also showed 19% improvement in Modified Gingival Index with the test toothpaste vs. control at Week 24. Both these measures are indicative of improvements in gum health.

References: 1. Parkinson CR *et al. Am J Dent* 2015; 28:190–196. **2.** RH01515. Clinical study report.

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Anterior matrix systems - essential to provide proper anatomical form and function to restorations

Troy Schmedding[1]

Introduction

Composite resins are, and for the foreseeable future, the most widely used direct restorative material for restorations involving anterior teeth. Today's composite materials offer practitioners tremendous physical properties but also optical properties to deliver lifelike restorations on a consistent basis. Proper finishing and polishing, together with the right occlusal scheme can provide the opportunity for these restorations to last a long period of time.

Though the handling characteristics of modern composites are vastly improved dentists still struggle with the development of good inter-proximal contacts and proper anatomical contours. Utilizing an anterior matrix system can be paramount in achieving this objective. Matrix systems in the anterior region are numerous in respect to creativity but the majority can be classified into flexible and rigid. Flexible matrices include the popular mylar strip and soft splint templates that can be challenging as they lack the ability to contour large areas leading to irregular contours and contacts. Rigid matrices include putty indexes and pre-contoured posterior sectional matrix, both viable options in certain situations but the majority of time posterior matrices are cumbersome and difficult to use when restoring multiple surfaces.

To overcome a majority of these aforementioned limitations Garrison Dental has introduced the Fusion Anterior Matrix System. A simple matrix designed to be used for anterior restorations such as class III, IV as well as composite veneers. The firm stainless steel matrix easily slides into the sulcus all while maintaining the proper shape and contour without deformation. Properly placed the ideal anatomical curvature is achieved in a gingival - incisal and facial - lingual direction. To help maintain this ideal anatomical position the Fusion Anterior Wedge is used to ensure a firm seal at the cervical margin from facial to lingual. These radically curved wedges help free up your hands to allow one to concentrate on composite placement and simplify the restorative process.

This article is a case report of a direct composite restoration on a maxillary anterior tooth where the proximal contact and incised edge position were developed using the Fusion Anterior Matrix System.

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Case Report

A 74 year old male presented with an old class III composite on the distal portion of his left lateral incisor (Figure 1). Re-current decay was noted both visually as well as radiographically. Treatment options were discussed with patient and it was decided we

Figure 1: Failing Class III composite on the distal - facial of the Maxillary lateral incisor.

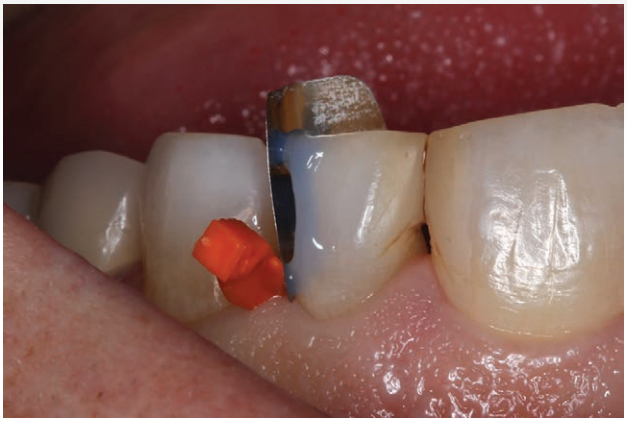

Figure 2: Fusion Anterior Matrix in place with Fusion Wedge to stabilize matrix and allow easy access for placement of phosphoric acid.

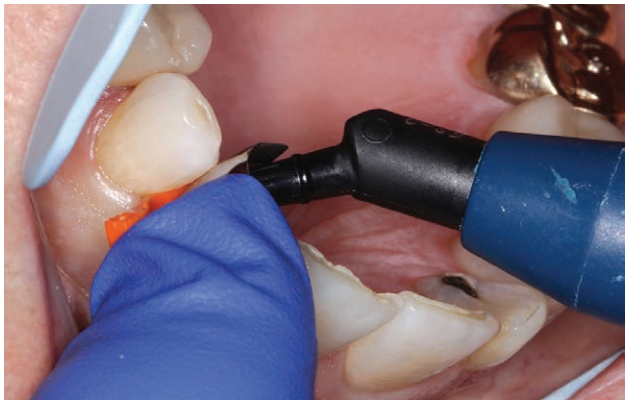

Figure 3: Fusion Matrix being held from the facial while placing composite from the lingual.

Figure 4: Instrumentation of the composite performed to push the composite against the facial side of the Fusion Matrix.

would replace the restoration with a new direct composite restoration. Small amounts of composite were placed on to the tooth and light cured to get an idea of what shade or shades would be utilized.

The patient was anesthetized with 1/2 carpule of 4% Articaine (Septodont) with 1:100,000 epinephrine. Isolation was obtained with a ComfortView® Lip & Cheek Retractor (Premier Dental). A pear shaped diamond bur (Meisinger) was used to remove the old restoration. A #2 round bur in a slow speed handpiece was used to remove all remaining decay and finally an 856 diamond bur (Meisinger) was used to bevel the facial margin and create a butt margin on the lingual. A short anterior Fusion Band (Garrison Dental) was then placed inter proximal past the finish line of the preparation and gently into the sulcus. A medium sized anterior Fusion Wedge (Garrison Dental) with its radical curvature was placed to ensure a firm seal at the cervical margin all while not distorting the anatomical contour, unlike the mesial aspect of this same tooth where a wood wedge was used to seal the margin of that particular restoration (Figure 1). A smaller wedge may have been an option in this case as you can you see the orange wedge rotated slightly when placed but due to the lack of distortion of the band and the great seal achieved I did not change. Access to both the facial and lingual of the preparation achieved a 35% phosphoric acid (K-Etchant Kuraray) was placed in a selective etch protocol and allowed to sit for 30 seconds prior to rinsing off (Figure 2). Universal Bond Quick (Kuraray) was then applied to the preparation in agitating motion for 10 seconds, air thinned and light cured for 20 seconds from both the facial and lingual to ensure polymerization. In the case of using a metal matrix that doesn't promote light

Figure 5: Application of composite continues from the lingual til preparation is sufficiently filled.

Figure 6: Removal of the matrix reveals proper contact, contours and minimal flash on the facial surface.

Figure 7: Final polished restoration with wonderful aesthetics and ideal anatomical form and function.

passage as friendly as a clear matrix I felt more comfortable taking the extra time to polymerize. The flexibility of the Fusion Matrix system allows you to sculpt composite in an open fashion where you have access from the lingual as well as the facial while still benefiting from the anatomically correct inter-proximal contours. In this particular case I took the approach of using my finger to push the matrix from the facial while adding a small increment of Majesty ES-2 Universal composite (Kuraray) from the lingual (Figure 3). Composite instrument was then used from the lingual to manipulate the composite (Figure 4) and then light cured for 20 seconds. Repeated this process (Figure 5) until the restoration was filled to completion and light curing finished from the lingual. The matrix was then peeled away on the facial side and again cured for 20 more seconds to ensure complete polymerization. Anterior Fusion Wedge and Matrix were then removed to show minimal excess composite on the facial surface as well as ideal anatomical contours (Figure 6). A fine flame diamond and a fine football shaped diamond (Meisinger) did most of the heavy refinement and adjustment of occlusion. The final polish was achieved using a two step diamond polishing system (Meisinger)(Figure 7).

Understanding the limitations of the material in every situation and adapting newer techniques should be our focus to make our restorations more predictable and durable. The case presented featured a great new product that can help you establish good contacts and contours in the anterior region where paramount importance is not just from an aesthetic but also a functional point of view.

References

1. Ayush Goyal, Vineeta Nikhil, and Ritu Singh, "Diastema Closure in Anterior Teeth Using a Posterior Matrix," Case Reports in Dentistry, vol. 2016, Article ID 2538526, 6 pages, 2016.

2. Fellippe L. A., Monteiro S. Jr, De Andrada C. A., Di Cerqueira A. D., and Ritter A. V.. 2005. Clinical strategies for success in proximo-incisal composite restorations. Part II. Composite application technique. J. Esthet. Restor. Dent. 17:11–21.

3. Flávio F Demarco, Kauê Collares, Fabio H Coelho-de-Souza , Marcos B Correa, Maximiliano S Cenci, Rafael R Moraes, Niek J M Opdam. 2015 Oct;31(10):1214-24. doi: 10.1016/j.dental.2015.07.005. Epub 201 Aug21.Anterior composite restorations: A systematic review on long-term survival and reasons for failure

4. A systematic approach to contouring and polishing anterior resin composite restorations: A checklist manifesto. Vargas MA, Margeas R. J Esthet Restor Dent. 2021 Jan;33(1):20-26. doi: 10.1111/jerd.12698. Epub 2020 Dec 25.

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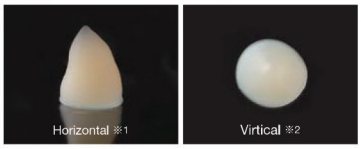


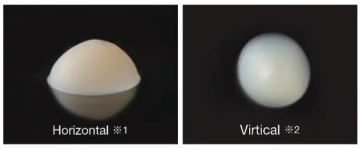
Recommended Cavities

Class I ClassII ClassIII ClassIV

Medium

High versatility
Less slumping
Less running

Flowability



Recommended Cavities

Class I ClassII ClassIII ClassIV

Incisal Margin

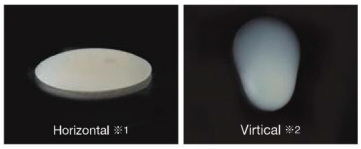
Deep Class V
Wedge-shaped defects

Shallow Class V
Small Cavity

High

Easy placement
Flow well

Flowability



Recommended Cavities

Shallow Class V
Small Cavity

Cavity Liner

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Anti-biofilm activity of oral healthcare products containing chlorhexidine digluconate and Citrox®

Jenaniy Jeyakumar[1], Anton Sculean[2], Sigrun Eick[3]

Purpose: To analyze in vitro new formulations with Citrox and chlorhexidine digluconate (CHX) regarding their antibacterial activity against planktonic bacteria and their potential to inhibit biofilm formation or to act on existing biofilms.

Materials and Methods: Five oral health care products with 0.05%–0.5% CHX formulations (four rinses and one gel) were compared with Citrox preparations and additive-free CHX solutions. The minimal inhibitory concentrations (MIC) were determined against 13 oral bacteria associated with caries or periodontitis. Further, the activity on retarding biofilm formation and on existing biofilms was analyzed; both a 'cariogenic' (5 species) and a 'periodontal' (12 species) biofilm were included.

Results: The MIC values did not differ between the CHX mouthrinse/gel formulations and the respective additive-free CHX solutions. Citrox was active against selected periodontopathogens (e.g. *Porphyromonas gingivalis*). The CHX formulations more effectively retarded biofilm formation than did solutions with the same concentration of CHX but without additives. The anti-biofilm activities depended on the CHX concentration in the formulations. Both CHX solutions and formulations (rinse and gel) were only slightly active on an already formed biofilm. Citrox did not exert any anti-biofilm effect.

Conclusion: The present in-vitro data support the anti-biofilm activity of the novel CHX, Citrox, poly-L-lysine and xylitol oral health-care formulations containing oral health care products. Further studies are warranted to confirm the present findings in various clinical settings.

Keywords: chlorhexidine digluconate, mouth rinse, periodontitis, caries, biofilm

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Introduction

Oral health-care products are widely used in prevention and therapy of biofilm-caused oral diseases. Among the antiseptics, products containing chlorhexidine digluconate (CHX) formulations are still the gold standard.[1] As recently reviewed, the beneficial effects of CHX are confirmed for reducing plaque accumulation, in dental caries, gingivitis, periodontitis.[2] Adjunctive use of CHX mouth rinses in non-surgical periodontal therapy results in additional probing depth reduction.[3] Using 0.12% CHX solution is recommended for high-caries-risk patients.[4] During fixed orthodontic therapy CHX varnishes are effective in reducing caries incidence.[5]

However, the CHX formulations have different side-effects e.g. extrinsic tooth staining, taste alterations, burning sensations.[6] To limit side-effects, CHX formulations may contain additives. In part, these additives interfere with the action of CHX. Certain in-vitro studies have reported that CHX mouth rinses containing an anti-discoloration system (ADS) were less active in comparison to other CHX preparations against planktonic bacteria[7] as well as when exposed to a growing biofilm.[8] In an vivo study, three 0.2% CHX formulation were compared: one with ADS, one with ethanol and one without ADS and ethanol. The formulation with ADS was less effective in plaque reduction and the

one with ethanol was less effective in reducing gingival inflammation .[9]

In several in-vitro-studies the cytotoxicity of CHX has been demonstrated.[10,11] The toxicity clearly depends on the concentration. Human fibroblasts and osteoblasts tolerate concentrations less than 0.02%[10] whereas 0.2% CHX showed a strong and 0.05% CHX a moderate cytotoxicity against gingival fibroblasts .[11] Thus, due to the reported adverse effects and the potential cytotoxicity, there is a need to develop formulations free of or containing a reduced concentration of CHX that might be equally effective as solutions containing 0.12% or 0.2% of CHX. Citrox® was proposed as a potential alternative or supplement. It is derived from citrus fruits, contains many different bioflavonoids and is used as an additive to commercial sanitizers[2] or in food products.[13]

In the present study, different new formulations with Citrox® and CHX in a concentration from 0.05% to 0.2% CHX were evaluated in vitro regarding their antibacterial activity against planktonic bacteria and their potential to inhibit biofilm formation or to act on existing biofilms. The biofilms included bacteria associated either with caries or with periodontal disease. The question to be answered was whether these formulations are equally or even more active as a solution with the same % of CHX and without additives.

Material and Methods

CHX formulations

In the experiment five oral health care products with CHX, four rinsing formulations and one gel (all obtained from CURADEN AG, Kriens, Switzerland) were included. The mouthrinsing formulations contained 0.2% CHX (CHX0.2C, Curaprox PerioPlus forte®), 0.12% CHX (CHX0.12C; Curaprox PerioPlus Protect®), 0.09% CHX (CHX0.09C, Curaprox PerioPlus Regenerate®) and 0.05% CHX (CHX0.05C; Curaprox PerioPlus Balance®). A gel formulation with 0.5 CHX (CHX0.5Cg) completed the tested oral health care products. Besides CHX, Citrox® and poly-L-lysine were constituents of all the formulations. Further, all the oral health care products contained xylitol and PVP-VA. Hyaluronic acid and cyclodextrin had been added to the CHX0.09C formulation, the CHX0.05C formulation was supplemented with sodium fluoride and the CHX0.5Citgel with hyaluronic acid.

As controls, two Citrox® preparations one without (Cit) and one with poly-L-lysine (CitPLL) were used. The negative control was 0.9% w/v NaCl solution and the positive controls were CHX solutions without additives in three CHX concentrations (0.2% (CHX0.2); 0.12% (CHX0.12) and 0.05 % (CHX0.05)).

Microorganisms

Fifteen different bacterial strains were used in the experiments:

- *Streptococcus gordonii* ATCC 10558
- *Actinomyces naeslundii* ATCC 12104
- *S. mutans* ATCC 25175
- *S. sobrinus* ATCC 33478
- *Lactobacillus acidophilus* ATCC 11975
- *Fusobacterium nucleatum* ATCC 25586
- *Campylobacter rectus* ATCC 33238
- *Parvimonas micra* ATCC 33270
- *Eikenella corrodens* ATCC 23834
- *Prevotella intermedia* ATCC 25611
- *Capnocytophaga gingivalis* ATCC 33624
- *Porphyromonas gingivalis* ATCC 33277
- *Tannerella forsythia* ATCC 43037
- *Filifactor alocis* ATCC 33099
- *Treponema denticola* ATCC 35405.

Except for *F. alocis* and *T. denticola*, minimal inhibitory concentration (MIC) values of the formulations and controls were determined against all other strains. 'Cariogenic' biofilm was formed of all streptococcal strains, *A. naeslundii* ATCC 12104 and *L. acidophilus* ATCC 11975. The 'periodontal' biofilm consisted of *S. gordonii* ATCC 10558, *A. naeslundii* ATCC12104, *Fusobacterium nucleatum* ATCC 25586, *C. rectus* ATCC 33238, *P. micra* ATCC 33270, *E. corrodens* ATCC 23834, *P. intermedia* ATCC 25611, *C. gingivalis* ATCC 33624, *P. gingivalis* ATCC 33277, *T. forsythia* ATCC 43037, *F. alocis* ATCC 33099, and *T. denticola* ATCC 35405. The strains were passaged on tryptic-soy agar plates (Oxoid, Basingstoke, GB) with 5% sheep blood (and with 10 mg/l N-acetylic muramic acid for *T. forsythia*). *T. denticola* ATCC 35405 was maintained in modified mycoplasma broth (BD, Franklin Lake, NJ) enriched with 1 mg/ml glucose, 400 µg/ml niacinamide, 150 µg/ml spermine tetrahydrochloride, 20 µg/ml Na isobutyrate, 1 g/ml cysteine, and 5 µg/ml cocarboxylase. All chemicals were bought from Merck KGaA, Darmstadt, Germany. All the strains were cultured at 37°C, streptococci, *A. naeslundii* ATCC 12104 and *L. acidophilus* ATCC 11975 with 10% of CO2, the other strains under anaerobic conditions.

Determination of MIC

The microbroth dilution technique was used to determine MIC values. After subcultivation of bacterial strains and

purity checking, a defined inoculum was added to Wilkins-Chalgren broth (Oxoid) supplemented with 10 µg/ml ß-NAD and defined concentrations of the formulations (starting from 10% of the final formulations). After an incubation time of 42 h (18 h for aerobes), the growth of microbes was analyzed by visual checking of turbidity (and if necessary, by subcultivation). MIC represented the lowest concentration without visible turbidity.

These experiments were made in independent replicates.

Activity on biofilms

Two different experimental designs were set, (a) the application of mouthrinse after mechanical removal of biofilm to show the influence on the formation of biofilms and (b) if there was any effect on an already formed biofilm (established biofilm).

a: Activity on biofilm formation:

The formulations and solutions were diluted to a 10% concentration with dH2O. The wells of four 96-well plates were coated with 25 µl of test substances. After 30 min of incubation, 25 µl/well protein solution (1.5% bovine serum albumin in PBS) were added for another 30 min. Bacteria were suspended each in 0.9% w/v NaCl according to McFarland 0.5. The suspensions for the respective biofilms were then mixed together, each with one part of *S. gordonii* ATCC10558, two parts of *A. naeslundii* ATCC 12104 and four parts of each other's bacterial strain. Thereafter (time 0 h) 200 µl of bacterial suspension mixed with nutrient broth (Wilkins-Chalgren broth supplemented with 10 µg/ml ß-NAD (and with 10 mg/l N-acetylic muramic acid for the 'periodontal' biofilm) in a ratio (volume 1 : 9) were added. After 6 h and 24 h of incubation in the respective atmosphere (cariogenic biofilm with 10% of CO_2, 'periodontal' biofilm under anaerobic conditions), the nutrient broth was carefully removed and the biofilms were briefly washed with 0.9% w/v NaCl. Then biofilms (one 96-well-plate each at the designated time) were scraped from the surface and suspended in 0.9% w/v NaCl and, after making a dilution series, plated on tryptic-soy agar plates. After an incubation in the respective conditions, the counts of colony forming units (CFU) were recorded. At 24h from the third 96-well-plate, quantification of the biofilms was made after staining with crystal violet according to recently published protocols.[14] From the fourth plate, the metabolic activity of the biofilm suspension was assessed with using Alamar blue as a redox indicator.[15]

b: Established biofilm

In each experiment three 96-well plates were used. The wells of the 96-well plates were coated with 25 µl/well protein solution (1.5% bovine serum albumin in PBS) for 30 min. The bacteria/nutrient broth mixture was then prepared as described above and each 225 µl were pipetted per well. The plates were incubated in the respective atmosphere for 48 h. Subsequently, in the case of the periodontal biofilm, each 10 µl of *P. gingivalis* ATCC 33277, *T. forsythia* ATCC 43037 and *T. denticola* ATCC 35405 were added per well and these plates were incubated for another 36 h. At 48 h for the 'cariogenic' biofilm and at 3.5 days for the 'periodontal' biofilm, the meanwhile established biofilms were treated with 25 µl of the test substances for 1 min after removing nutrient broth and washing briefly. After 1 min, nutrient broth (225 µl) was added and the biofilms were incubated for 1h. Analysis was then made as described above, namely for the CFU counts, biofilm mass and metabolic activity.

Statistical analysis

Statistical analysis was conducted using SPSS 26.0 (IBM (IBM, Chicago, IL, USA). These biofilm experiments were performed in two independent experiments in each independent quadruplicate. CFU counts were recorded as log10 CFU. Statistical analysis was made by first using ANOVA. For statistical significance, the post-hoc Bonferroni test was added tor record results. In the graphs (Figures 1-4) each statistically significant differences vs the controls as well as between the CHX formulation and its respective solution (CHX0.2C vs. CHX0.2, CHX0.12C vs. CHX0.12 and CHX0.05C vs. CHX0.05) are given. A p-value of 0.05 was considered to be statistically significant.

Results

MIC values

Comparing the MIC values of the CHX mouth rinsing formulations with the respective CHX solutions, the difference did not exceed one stage. The only exception was *L. acidophilus* which was more susceptible to the CHX solutions than to the CHX formulations. The Citrox® preparations were most active against *P. gingivalis* ATCC 33277, and moderately antibacterial against *F. nucleatum* ATCC 25586, *P. micra* ATCC 33270, and *C. gingivalis* ATCC 33624. Against all other strains the MICs were 5% or higher of the Citrox® formulations. There was no difference whether poly-L-lysine was added or not (Table 1).

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Table 1
Minimal inhibitory concentrations of oral health care products and CHX solutions (MIC % of the respective formulation/solution; tested in the range of 0.16% - 10%)

Strain	CHX0.2C	CHX0.12C	CHX0.09C	CHX0.05C	CHX0.5Cg	Cit	CitPLL	CHX0.2	CHX0.12	CHX0.05
Streptococcus gordonii ATCC 10558	≤0.16	≤0.16	≤0.16	≤0.16	≤0.16	>10	>10	≤0.16	≤0.16	≤0.16
Actinomyces naeslundii ATCC 12104	≤0.16	≤0.16	≤0.16	0.31	≤0.16	>10	>10	≤0.16	0.31	0.63
S. mutans ATCC 25175	≤0.16	≤0.16	≤0.16	≤0.16	≤0.16	>10	>10	≤0.16	≤0.16	≤0.16
S. sobrinus ATCC 33478	≤0.16	≤0.16	≤0.16	≤0.16	≤0.16	>10	>10	≤0.16	≤0.16	≤0.16
Lactobacillus acidophilus ATCC 11975	1.25	1.25	1.25	10	≤0.16	>10	>10	≤0.16	≤0.16	≤0.16
Fusobacterium nucleatum ATCC 25586	≤0.16	≤0.16	≤0.16	0.31	≤0.16	1.25	1.25	≤0.16	≤0.16	0.31
Campylobacter rectus ATCC 33238	≤0.16	≤0.16	≤0.16	≤0.16	≤0.16	5	5	≤0.16	≤0.16	≤0.16
Parvimonas micra ATCC 33270	0.63	0.31	0.63	0.63	≤0.16	1.25	1.25	0.31	0.31	0.63
Eikenella corrodens ATCC 23834	≤0.16	≤0.16	≤0.16	0.31	≤0.16	10	10	≤0.16	≤0.16	≤0.16
Prevotella intermedia ATCC 25611	≤0.16	≤0.16	≤0.16	≤0.16	≤0.16	5	10	≤0.16	≤0.16	0.31
Capnocytophaga gingivalis ATCC 33624	0.31	0.63	0.63	1.25	≤0.16	1.25	1.25	≤0.16	0.63	1.25
Porphyromonas gingivalis ATCC 33277	≤0.16	≤0.16	≤0.16	0.31	≤0.16	0.63	0.63	≤0.16	≤0.16	≤0.16
Tannerella forsythia ATCC 43037	≤0.16	≤0.16	≤0.16	0.31	≤0.16	5	5	≤0.16	0.31	0.63

Activity of CHX formulations on biofilm formation

According to the protocol, the final concentration in the assay was 1% of the formulation.

In the case of the 'cariogenic' biofilm, all CHX containing formulations/solutions statistically significantly reduced the CFU counts vs. control at 6 h (each $p<0.001$). The highest reductions were seen for CHX0.2C both after 6 h (-2.45 log10 CFU) and 24 h (-2.24 log10 CFU) of biofilm formation. At 6 h, the CFU counts were lower for the mouth rinsing formulations (CHX0.2C, CHX0.12C and CHX0.05C) each in comparison with their respective CHX controls (CHX0.2, CHX0.12 and CHX0.05; $p<0.001$ each). It is of interest to note that the low concentrated formulations reduced the CFU counts more than the higher concentrated CHX solutions, i.e. CHX0.09C was more active than CHX0.12 (-1.13 log10, $p<0.001$) and even more than CHX0.2 (-0.56 log10, $p=0.001$). At 24 h, only the counts after applying CHX0.2C were less than those of the control ($p<0.001$). Here also the difference vs CHX0.2 was statistically significant ($p<0.001$). The Citrox® formulations did not affect the CFU counts at any time (Figure 1A).

The biofilm mass of the cariogenic biofilm after 24 h of formation clearly depended on the CHX concentration in the formulations/solutions. Differences were statistically significant for all CHX formulations and the CHX0.2 and CHX0.12 solutions vs. control (each $p<0.001$). The biofilm mass was lower after CHX0.05C than after CHX0.05 ($p<0.001$) (Figure 1B).

The metabolic activity was reduced only after applying CHX0.2C and CHX0.5Cg ($p<0.001$ vs. control) (Figure 1C).

In the case of the 'periodontal' biofilm all formulations/solutions containing ≥ 0.09% CHX statistically significantly reduced the CFU counts vs. control (each $p<0.001$) at 6 h and 24 h of biofilm formation. After 6 h, there was also a statistically significant difference for CHX0.05C vs. control ($p<0.001$). The highest reductions were seen for CHX0.2C after 6 h (-2.42 log10 CFU) and for CHX0.5Cg after 24 h (-4.16 log10 CFU) of biofilm formation. At 6 h, the CFU counts were lower for the mouthrinsing formulations CHX0.12C

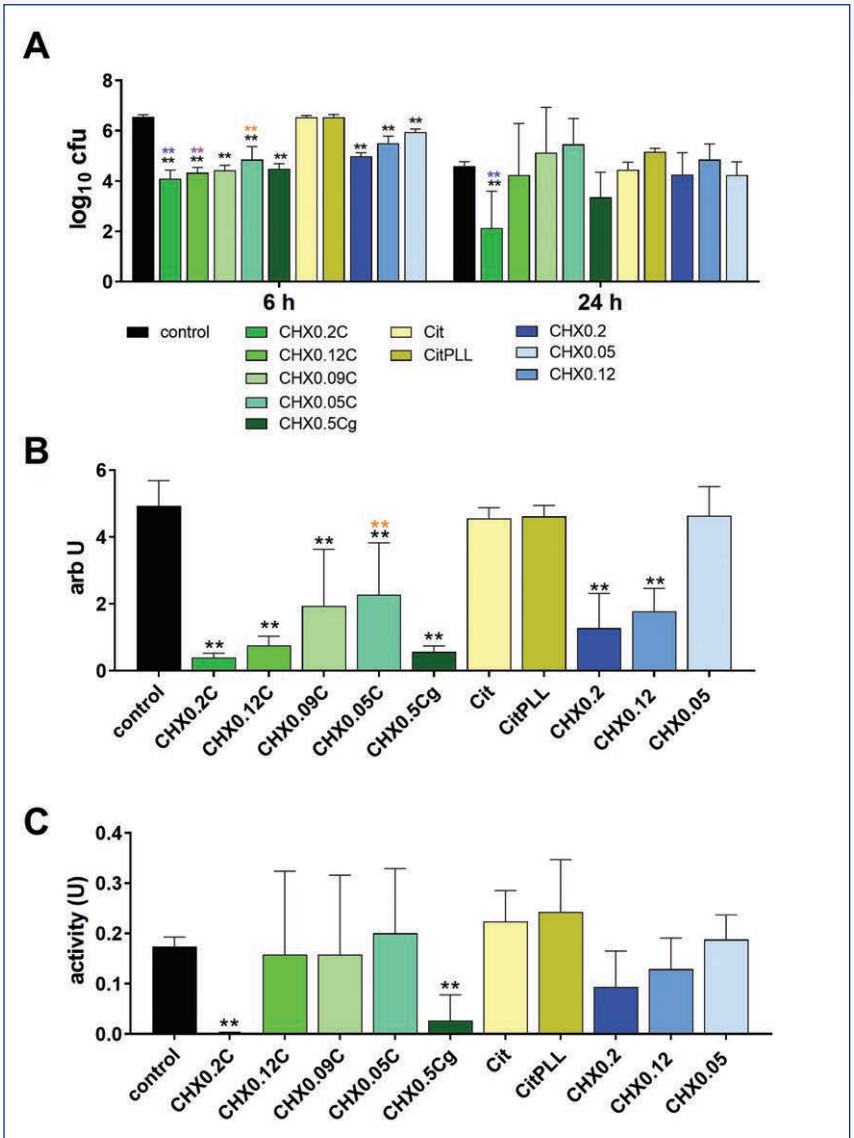

Figure 1: Activity of different formulations/ controls (coating of the surface with 10%, final concentration in the assays 1% of the formulations/ solutions) bacterial counts (A) after 6 h and 24 h of incubation, mass (B) and metabolic activity (C) both at 24 h in the formed "cariogenic" biofilm consisting of five different species. Tested formulations with CHX, Citrox® and poly-L-lysine: mouthrinsing formulations with 0.2% CHX (CHX0.2C), 0.12% CHX (CHX0.12C), 0.09% CHX (CHX0.09C) and 0.05% CHX (CHX0.05C) and a gel formulation with 0.5 CHX (CHX0.5Cg). Controls: 0.9% w/v NaCl as negative control (control), Citrox® preparations without (Cit) and with poly-L-lysine (CitPLL); CHX solutions without additives as positive controls with 0.2% CHX (CHX0.2), 0.12% CHX (CHX0.12) and 0.05 % CHX (CHX0.05).

and CHX0.05C in comparison with their respective control solutions CHX0.12 (p=0.001) and CHX0.05 (p=0.019). At 24 h the counts after applying CHX0.2C and CHX 0.12C were lower than those of the solutions CHX0.2 and CHX0.12 (each p<0.001) and those after CHX0.09C were reduced more than after CHX0.12 (p<0.001). The Citrox® formulations did not affect the CFU counts (Figure 2A).

The biofilm mass of the 'periodontal' biofilm after 24 h was lower after applying any of the CHX formulations or CHX0.2 and CHX0.12 (each p<0.001). CHX0.05C reduced the biofilm mass more than CHX0.05 (p<0.001) (Figure 2B).

The metabolic activity was reduced after applying CHX0.2C, CHX0.12C, CHX0.5Cg and CHX0.2 and CHX0.12 (each p<0.001 vs. control). It was increased after applying CHX0.05C (p<0.001) (Figure 2C).

Activity of CHX formulations on established biofilm

Differences between the two biofilm models were visible.

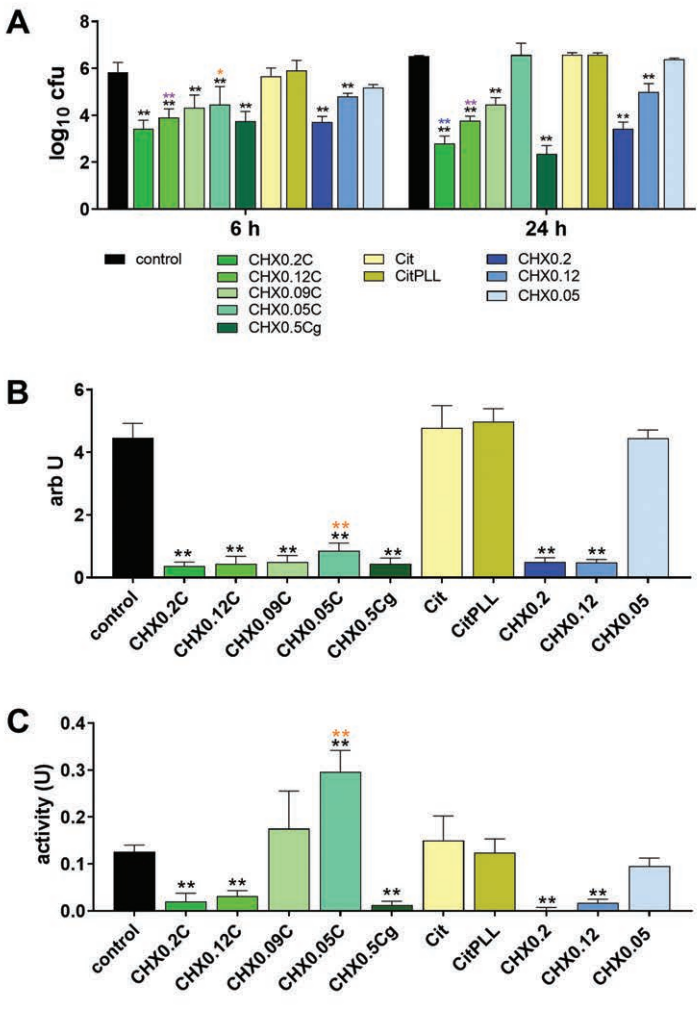

Figure 2: Activity of different formulations / controls (coating of the surface with 10%, final concentration in the assays 1% of the formulations/ solutions) bacterial counts (A) after 6 h and 24 h of incubation, mass (B) and metabolic activity (C) both at 24 h in the formed "periodontal" biofilm consisting of 12 different species
Tested formulations with CHX, Citrox® and poly-L-lysine: mouthrinsing formulations with 0.2% CHX (CHX0.2C), 0.12% CHX (CHX0.12C), 0.09% CHX (CHX0.09C) and 0.05% CHX (CHX0.05C) and a gel formulation with 0.5 CHX (CHX0.5Cg)
Controls: 0.9% w/v NaCl as negative control (control), Citrox® preparations without (Cit) and with poly-L-lysine (CitPLL); CHX solutions without additives as positive controls with 0.2% CHX (CHX0.2), 0.12% CHX (CHX0.12) and 0.05 % CHX (CHX0.05).

The controls of the cariogenic biofilm contained a mean of 5.26 log10 CFU, those of the 'periodontal' biofilm 7.22 log10.

In the 'cariogenic' biofilm CHX mouthrinsing formulations/ solutions with ≥0.09% CHX reduced the CFU counts (CHX0.2C, CHX0.12C p<0.001, CHX0.09C p=0.008, CHX0.2 p=0.001, CHX0.12 p=0.019). CHX0.2C was the most active, as no CFU were counted after application. The difference to CHX0.2 was statistically significant (p=0.001). The Citrox® formulations without CHX did not affect the CFU counts (Figure 3A). An influence on biofilm mass was not found for any of the formulations and controls (Figure 3B). Metabolic activity decreased after the application of CHX0.2C (p=0.009), CHX0.12C (p=0.002) and CHX0.2 (p<0.001) (Figure 3C).

In the 'periodontal' biofilm only the CHX mouth rinsing formulation/solution with 0.2% CHX statistically significant decreased the CFU counts. The difference of CFU counts for CHX0.2C were -1.31 log10 (p=0.009) and 1.26 log10 (p=0.001) for CHX0.2. (Figure 4A). An influence on biofilm mass was not found (Figure 4B) and the metabolic activity decreased only after the application of CHX0.5Cg (p<0.001) (Figure 4C).

Discussion

The present results have shown that the tested new CHX

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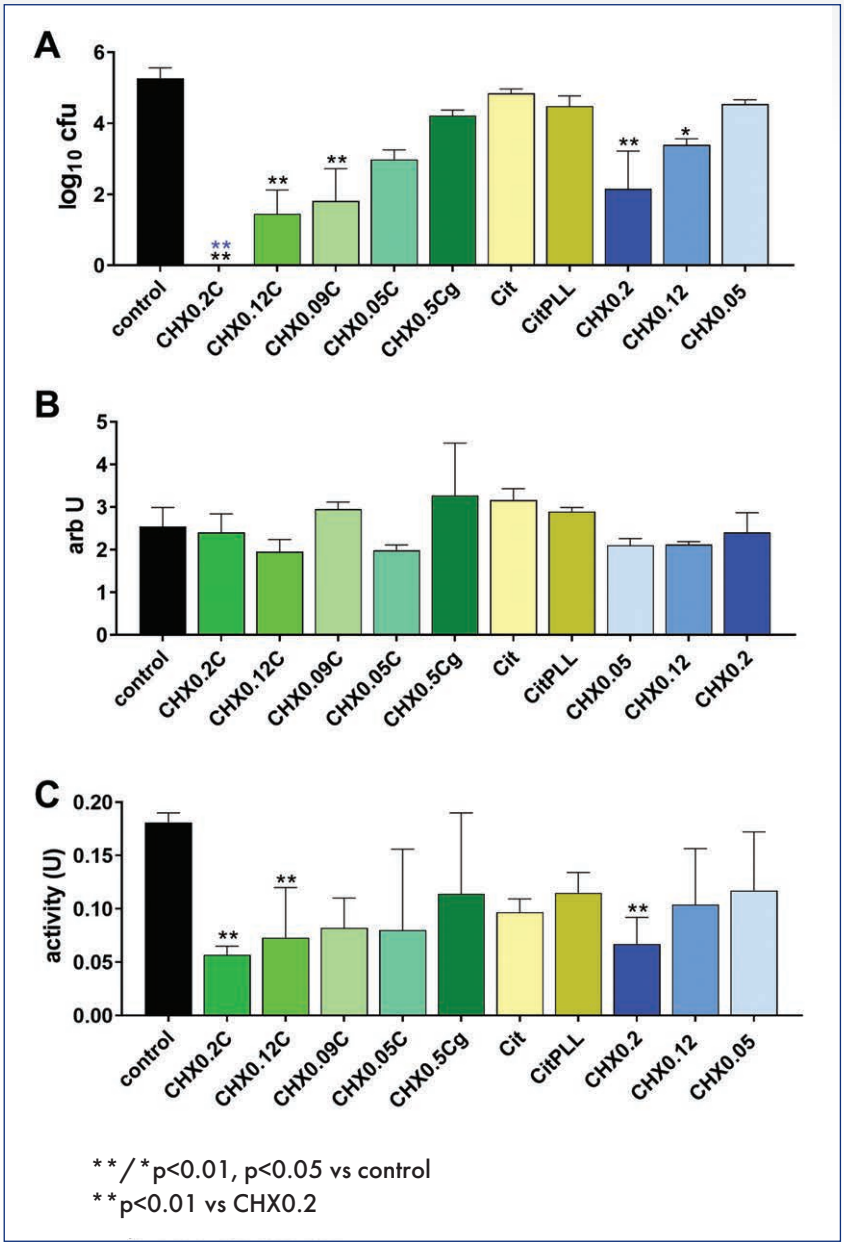

Figure 3: Activity of different formulations / controls on bacterial counts (A), mass (B) and metabolic activity (C) of the established "cariogenic" biofilm formed by five bacterial species for 48 h and after 1 h of exposition (1 min 100% of the formulation/solution, thereafter 10% for 1 h)
Tested formulations with CHX, Citrox® and poly-L-lysine: mouthrinsing formulations with 0.2% CHX (CHX0.2C), 0.12% CHX (CHX0.12C), 0.09% CHX (CHX0.09C) and 0.05% CHX (CHX0.05C) and a gel formulation with 0.5 CHX (CHX0.5Cg) Controls: 0.9% w/v NaCl as negative control (control), Citrox® preparations without (Cit) and with poly-L-lysine (CitPLL); CHX solutions without additives as positive controls with 0.2% CHX (CHX0.2), 0.12% CHX (CHX0.12) and 0.05 % CHX (CHX0.05).

formulations were active against the selected oral bacteria. They retarded biofilm formation to a greater extent than solutions with the same concentration of CHX without additives. The anti-biofilm activities depended on the CHX concentration within the formulations. However, as with the tested solutions, the formulations had only minor activity on an already formed biofilm.

In the present study, two different biofilm models and two different approaches were used. The biofilm models were designed to resemble caries and a periodontal disease. Defined strains were used to allow reproducible experiments with standardized conditions. One limitation of our study is the biofilm model used. The use of multispecies biofilms implies interaction between the various included species, but does not reflect the complexity present in the oral cavity, which consists of substantially more microorganism species. Using modern technologies, about 70 different microorganisms in caries[16] and about 300 in periodontal disease[17] were identified. Further limitations are the application and use of a static model. In the case of biofilm formation, the health-care formulations/solutions were applied only once and there was a constant concentration of 1% of the respective formulation/solution in the assay. In the established model, a 100% concentration of the formulations/solutions were

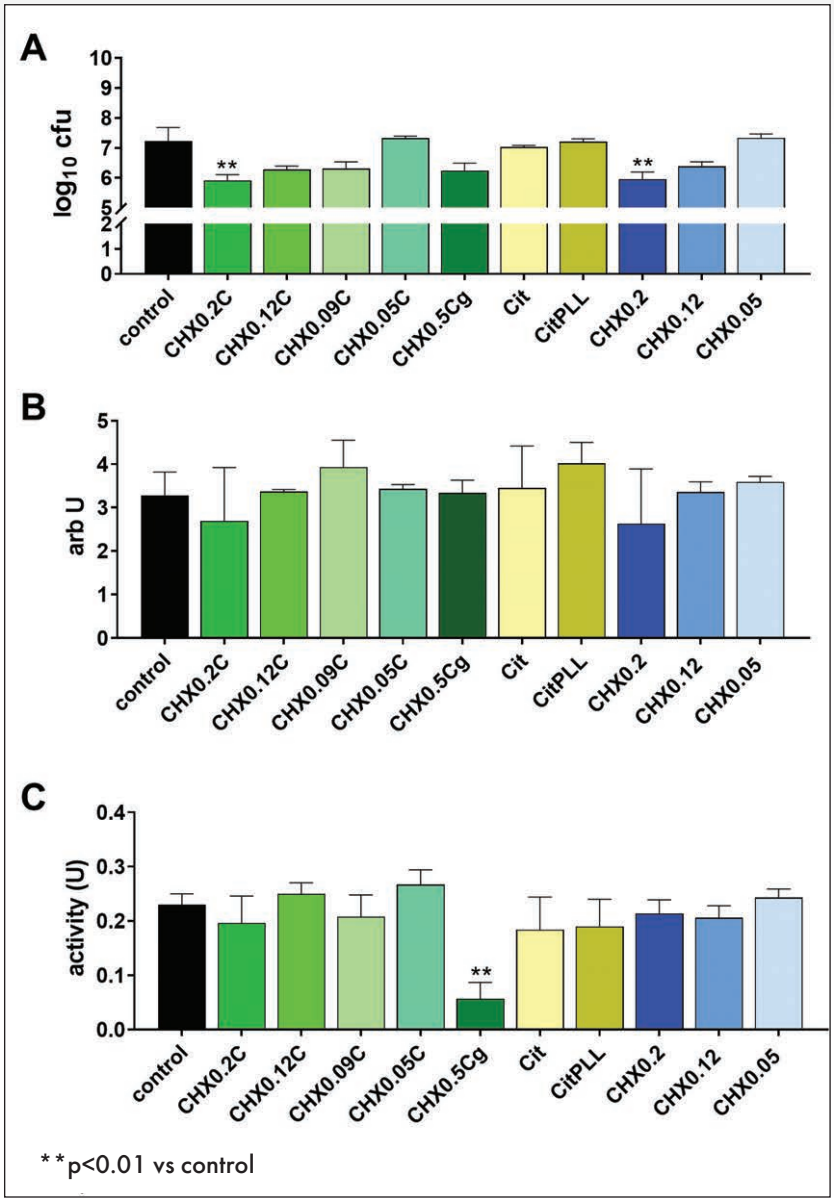

Figure 4: Activity of different formulations / controls on bacterial counts (A), mass (B) and metabolic activity (C) of the established "periodontal" biofilm formed by 12 bacterial species for 3.5 d and after 1 h of exposition (1 min 100% of the formulation/solution, thereafter 10% for 1 h)
Tested formulations with CHX, Citrox® and poly-L-lysine: mouthrinsing formulations with 0.2% CHX (CHX0.2C), 0.12% CHX (CHX0.12C), 0.09% CHX (CHX0.09C) and 0.05% CHX (CHX0.05C) and a gel formulation with 0.5 CHX (CHX0.5Cg)
Controls: 0.9% w/v NaCl as negative control (control), Citrox® preparations without (Cit) and with poly-L-lysine (CitPLL); CHX solutions without additives as positive controls with 0.2% CHX (CHX0.2), 0.12% CHX (CHX0.12) and 0.05 % CHX (CHX0.05).

applied for a short time before diluting to 10%. Limitations of the static biofilm are also visible in the 'cariogenic' biofilm model. When the different biofilms were formed, the log10 CFU counts of the cariogenic biofilm were higher after 6 h than after 24 h, whereas in the case of the periodontal biofilm, there was a continued increase. The 'cariogenic' biofilm consists mainly of streptococci, whereas anaerobically growing bacteria were dominant in the periodontal biofilm. The doubling time of streptococci is much quicker (4 – 6 h) compared with those of gram-negative anaerobes (20-24h),[18] suggesting that bacteria in the 'cariogenic' biofilm model consumed the available nutrients faster. Thus, the results obtained after 6 h of cariogenic biofilm formation might more closely resemble an in-vivo situation.

Citrox® was one of the additives in the tested formulations. It derives from citrus fruits, contains many different bioflavonoids and was first used as an additive in commercial sanitizer.[12] Citrox® is also in use as a food additive, where it is able to decrease the counts of certain pathogens such as *Salmonella* sp.[13] It has also been shown to be active against *Staphylococcus aureus* strains and to reduce the viability of biofilms.[19] Good to moderate activity was also found against oral microorganisms.[20] However, the results of the present study were different. MIC values were higher against oral streptococci, *Actinomyces* ssp., but lower against *P. gingivalis*, which may depend on the

cultivation media used. Furthermore, no activity by Citrox® on biofilm formation or an established biofilm was observed in our experiments. One explanation for this finding might be due to the fact that, in the present study, more-complex multi-species biofilm models were used.

Although no effect by Citrox® was found, the formulations were shown to inhibit biofilm formation. Even the low-concentration CHX formulations slowed 'cariogenic' biofilm formation more than higher-concentration CHX solutions without additives. This effect might be related to constituents other than Citrox®. All the formulations contained xylitol and poly-L-lysine. Xylitol has been described as an anti-adherent agent in biofilm formation.[21] In vitro, it inhibited formation of single-species biofilms of *S. mutans* and *S. sobrinus*[22] and also those of a dual-species biofilm by *S. gordonii* and *P. gingivalis*.[23] Poly-L-lysine has a strong antibacterial and anti-biofilm activity against *S. aureus*.[24] Functionalized titanium surfaces with poly-L-lysine containing silver nano-particles showed enhanced antimicrobial activity.[25] The effect was explained by the binding of poly-L-lysine to the negatively charged nanoparticles.[25] This cannot be assumed for binding to CHX as this is positively charged.[2] However, there might be a synergistic effect of binding to negatively charged surfaces as teeth and probably the plastic surfaces of microtiter plates.

As recently stated in a systematic review, despite the fact that CHX mouth rinses are able to reduce *S. mutans* counts in saliva, a definitive conclusion on its efficacy in preventing new caries lesions could not be drawn.[26] The efficacy of CHX mouth rinses on the reduction of *S. mutans* depends on their concentration[27] which was confirmed by our in-vitro study. Fluoride supplementation to CHX solution combines the fluoride retention in the oral cavity and the effects of CHX on the reduction of plaque, gingival inflammation and *S. mutans* counts.[28] In the present study, CHX0.05C containing sodium fluoride was in part more active than CHX0.05, which may support its use in preventing caries.

CHX0.09C was supplemented with hyaluronic acid. In dentistry, an adjunctive topical application may lead to additional clinical benefits in periodontal therapy.[29] Hyaluronic acid, a glycosaminoglycan is well known for its anti-inflammatory and wound-healing efficacy.[30] Hyaluronic acid inhibits bacterial adhesion and biofilm formation.[31] In the present study, CHX0.09C inhibited biofilm formation more than CHX0.12. Further research might be of interest to verify the role of hyaluronic acid as a component in mouth rinse solutions.

In the present in-vitro experiments, a gel formulation containing 0.5% CHX was also included. However, the results on bacteria counts were not superior to the use of 0.2% CHX solution. This is in agreement with findings of a systemic review that favored mouth rinse formulations to gels for clinical applications.[31]

Activitiy of CHX formulations/solutions was minor on an already formed 'periodontal' biofilm. Only the highest concentrations of 0.2% CHX used exerted some activity. This in vitro-result may once more underline the general guidelines that mechanical removal of a biofilm by scaling and root planing is essential in initial therapy of periodontitis.[33]

Conclusion

Taken together, the present in-vitro data support the anti-biofilm activity of the novel CHX, Citrox®, poly-L-lysine and xylitol oral health-care formulations. However, the biofilm inhibiting effect might not be related to Citrox® which cannot replace CHX-containing products. Further studies are warranted to confirm the present findings in various clinical settings.

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References

1. Slot DE, Berchier CE, Addy M, Van der Velden U, Van der Weijden GA. The efficacy of chlorhexidine dentifrice or gel on plaque, clinical parameters of gingival inflammation and tooth discoloration: a systematic review. Int J Dent Hyg 2014;12:25-35.

2. TM, Szkaradkiewicz AK. Chlorhexidine--pharmaco-biological activity and application. Eur Rev Med Pharmacol Sci 2015;19:1321-1326.

3. Costa L, Amaral C, Barbirato DDS, Leao ATT, Fogacci MF. Chlorhexidine mouthwash as an adjunct to mechanical therapy in chronic periodontitis: A meta-analysis. J Am Dent Assoc 2017;148:308-318.

4. Featherstone JDB, Chaffee BW. The Evidence for Caries Management by Risk Assessment (CAMBRA(R)). Adv Dent Res 2018;29:9-14.

5. Okada EM, Ribeiro LN, Stuani MB, Borsatto MC, Fidalgo TK, Paula-Silva FW, et al. Effects of chlorhexidine varnish on caries during orthodontic treatment: a systematic review and meta-analysis. Braz Oral Res 2016;30:e115.

6. James P, Worthington HV, Parnell C, Harding M, Lamont T, Cheung A, et al. Chlorhexidine mouthrinse as an adjunctive treatment for gingival health. Cochrane Database Syst Rev 2017;3:CD008676.

7. Eick S, Goltz S, Nietzsche S, Jentsch H, Pfister W. Efficacy of chlorhexidine digluconate-containing formulations and other mouthrinses against periodontopathogenic microorganisms. Quintessence Int 2011;42:687-700.

8. Guggenheim B, Meier A. In vitro effect of chlorhexidine mouth rinses on polyspecies biofilms. Schweiz Monatsschr Zahnmed 2011;121:432-441.

9. Graziani F, Gabriele M, D'Aiuto F, Suvan J, Tonelli M, Cei S. Dental plaque, gingival inflammation and tooth -discolouration with different commercial -formulations of 0.2% chlorhexidine rinse: a double-blind randomised controlled clinical trial. Oral Health Prev Dent 2015;13:101-111.

10. Liu JX, Werner J, Kirsch T, Zuckerman JD, Virk MS. Cytotoxicity evaluation of chlorhexidine gluconate on human fibroblasts, myoblasts, and osteoblasts. J Bone Jt Infect 2018;3:165-172.

11. Muller HD, Eick S, Moritz A, Lussi A, Gruber R. Cytotoxicity and Antimicrobial Activity of Oral Rinses In Vitro. Biomed Res Int 2017;2017:4019723.

12. Lopez-Galvez F, Allende A, Selma MV, Gil MI. Prevention of Escherichia coli cross-contamination by different commercial sanitizers during washing of fresh-cut lettuce. Int J Food Microbiol 2009;133:167-171.

13. Tsiraki MI, Savvaidis IN. The effects of citrus extract (Citrox(c)) on the naturally occurring microflora and inoculated pathogens, Bacillus cereus and Salmonella enterica, in a model food system and the traditional Greek yogurt-based salad Tzatziki. Food Microbiol 2016;53:150-155.

14. Kwasny SM, Opperman TJ. Static biofilm cultures of Gram-positive pathogens grown in a microtiter format used for anti-biofilm drug discovery. Curr Protoc Pharmacol 2010;Chapter 13:Unit 13A 18.

15. Pettit RK, Weber CA, Kean MJ, Hoffmann H, Pettit GR, Tan R, et al. Microplate Alamar blue assay for Staphylococcus epidermidis biofilm susceptibility testing. Antimicrob Agents Chemother 2005;49:2612-2617.

16. Carda-Dieguez M, Bravo-Gonzalez LA, Morata IM, Vicente A, Mira A. High-throughput DNA sequencing of microbiota at interproximal sites. J Oral Microbiol 2020;12:1687397.

17. Liu G, Chen F, Cai Y, Chen Z, Luan Q, Yu X. Measuring the subgingival microbiota in periodontitis patients: Comparison of the surface layer and the underlying layers. Microbiol Immunol 2020;64:99-112.

18. McBain AJ, Sissons C, Ledder RG, Sreenivasan PK, De Vizio W, Gilbert P. Development and characterization of a simple perfused oral microcosm. J Appl Microbiol 2005;98:624-634.

19. Hogan S, Zapotoczna M, Stevens NT, Humphreys H, O'Gara JP, O'Neill E. Eradication of Staphylococcus aureus Catheter-Related Biofilm Infections Using ML:8 and Citrox. Antimicrob Agents Chemother 2016;60:5968-5975.

20. Hooper SJ, Lewis MA, Wilson MJ, Williams DW. Antimicrobial activity of Citrox bioflavonoid preparations against oral microorganisms. Br Dent J 2011;210:E22.

21. Ferreira AS, Silva-Paes-Leme AF, Raposo NR, da Silva SS. By passing microbial resistance: xylitol controls microorganisms growth by means of its anti-adherence property. Curr Pharm Biotechnol 2015;16:35-42.

22. Salli KM, Forssten SD, Lahtinen SJ, Ouwehand AC. Influence of sucrose and xylitol on an early Streptococcus mutans biofilm in a dental simulator. Arch Oral Biol 2016;70:39-46.

23. Hashino E, Kuboniwa M, Alghamdi SA, Yamaguchi M, Yamamoto R, Cho H, et al. Erythritol alters microstructure and metabolomic profiles of biofilm composed of Streptococcus gordonii and Porphyromonas gingivalis. Mol Oral Microbiol 2013;28:435-451.

24. Alkekhia D, Shukla A. Influence of poly-l-lysine molecular weight on antibacterial efficacy in polymer multilayer films. J Biomed Mater Res A 2019;107:1324-1339.

25. Ghilini F, Rodriguez Gonzalez MC, Minan AG, Pissinis D, Creus AH, Salvarezza RC, et al. Highly Stabilized Nanoparticles on Poly-l-Lysine-Coated Oxidized Metals: A Versatile Platform with Enhanced Antimicrobial Activity. ACS Appl Mater Interfaces 2018;10:23657-23666.

26. Coelho A, Paula ABP, Carrilho TMP, da Silva M, Botelho M, Carrilho E. Chlorhexidine mouthwash as an anticaries agent: A systematic review. Quintessence Int 2017;48:585-591.

27. Jayaprakash R, Sharma A, Moses J. Comparative evaluation of the efficacy of different concentrations of chlorhexidine mouth rinses in reducing the mutans streptococci in saliva: an in vivo study. J Indian Soc Pedod Prev Dent 2010;28:162-166.

28. Villa O, Ramberg P, Fukui H, Emilson CG, Papanikolaou G, Heijl L, et al. Interaction between chlorhexidine and fluoride in a mouthrinse solution-a 4-day and 6-week randomized clinical pilot study. Clin Oral Investig 2018;22:1439-1448.

29. Eliezer M, Imber JC, Sculean A, Pandis N, Teich S. Hyaluronic acid as adjunctive to non-surgical and surgical periodontal therapy: a systematic review and meta-analysis. Clin Oral Investig 2019;23:3423-3435.

30. Litwiniuk M, Krejner A, Speyrer MS, Gauto AR, Grzela T. Hyaluronic Acid in Inflammation and Tissue Regeneration. Wounds 2016;28:78-88.

31. Romano CL, De Vecchi E, Bortolin M, Morelli I, Drago L. Hyaluronic Acid and Its Composites as a Local Antimicrobial/Antiadhesive Barrier. J Bone Jt Infect 2017;2:63-72.

32. Supranoto SC, Slot DE, Addy M, Van der Weijden GA. The effect of chlorhexidine dentifrice or gel versus chlorhexidine mouthwash on plaque, gingivitis, bleeding and tooth discoloration: a systematic review. Int J Dent Hyg 2015;13:83-92.

33. Smiley CJ, Tracy SL, Abt E, Michalowicz BS, John MT, Gunsolley J, et al. Evidence-based clinical practice guideline on the nonsurgical treatment of chronic periodontitis by means of scaling and root planing with or without adjuncts. J Am Dent Assoc 2015;146:525-535.

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Jeyakumar J, Sculean A, Eick S. Anti-biofilm Activity of Oral Healthcare Products Containing Chlorhexidine Digluconate and Citrox. Oral Health Prev Dent. 2020 Oct 27;18(1):981-990. doi: 10.3290/j.ohpd.a45437. PMID: 33215489

CPD QUESTIONNAIRE 11.2.1

Article: Masterclass in Endodontics: Identification and management of Radix Entomolaris.
Van der Vyver, Vorster, page 8

1. Which of the following are considered main reasons for root canal failure?
a Missed canals
b Failure to remove microorganisms
c Failure to remove pulp remnants
d All of the above

2. Radix Entomolaris refers to a mandibular molars with a supernumerary root located on which side of the tooth?
a Disto-lingual b Mesio-buccal
c Disto-buccal

3. True or False. The coronal third of the disto-lingual root of Radix Entomolaris is always partially fixed to the distal root.
a *True* b *False*

4. According to Clark's rule, as described in the paper, an object that moves in the same direction as the repositioned X-ray cone is located towards which of the following positions?
a Buccal b Lingual
c Distal

5. Cone-Beam Computed Tomography (CBCT) has the following advantage(s) with specific reference to challenging morphologic interpretations during endodontic treatment.
a Elimination of superimpositions
b Identification of specific structures at their precise locations
c All of the above

Article: Class II orthodontic treatment of a growing patient using aligner treatment with mandibular advancement
Iwaniuk, page 10

6. In the case described, diagnosis included:
a Agenesis of UR6, UL6, and LL6
b Agenesis of UR7, UL7, and LL7
c Agenesis of UR8, UL8, and LL8

7. The treatment plan included the addition of a clear retainer for night-time wear to the upper arch after approximately:
a 25 days
b 45 days
c 65 days

8. he treatment time from initial aligner delivery to retention was:
a 23 months
b 18 months
c 30 months

9. Which statement is correct:
a 1/4" 4.5 oz. Class II elastics were worn full time during the pre-MA phase.
b 3/16" 4.5 oz. Class II elastics were worn full time during the pre-MA phase.
c 1/4" 3.5oz. Class II elastics were worn full time during the pre-MA phase.

10. True or False: A posterior open bite during mandibular advancement treatment can be a common phenomenon with twin block therapy
a True
b False

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CPD QUESTIONNAIRE 11.2.2

Article: COVID-19 risk management in dental practice. Part 3: Are dental healthcare workers at greater risk of COVID-19 than other health professionals or general population? Hartshorne, van Zyl, page 24

11. Which of the following statements relating to the health burden of COVID-19 amongst health care workers (HCW's) is TRUE?
a Infections were mainly in men and doctors
b Deaths were mainly in women and nurses
c Overall COVID-19 infection rate among HCWs in South Africa is 5%
d The median age of HCW's with COVID-19 admissions was 68 years
e. The most commonly reported comorbid condition amongst HCWs was Tuberculosis

12. Which of the following statements relating to the psychological and physical burden of COVID-19 is TRUE?
a Only HCWs caring for symptomatic infected patients were at risk of anxiety
b Insufficient knowledge and experience on appropriate use of PPE has resulted in high levels of psychological distress amongst HCWs
c Prolonged PPE use is not associated with any cutaneous manifestations
d Appropriate PPE use has not resulted in any physical strain amongst HCWs
e HCWs are not afraid they might affect their family members and/or relatives

13. Dental professionals felt a moral duty to reduce routine care for fear of spreading COVID-19 among their patients and beyond. (TRUE or FALSE?)
a *TRUE*
b *FALSE*

14. Risk of exposure to SARS-CoV-2 is high in dental practice due to the following:
a Routine non-aerosol generating procedures
b Indirect contact with the oral cavity
c DHCWs have identified which patients are asymptomatic and pre-symptomatic
d Close and prolonged contact between provider and patient

15. Which of the following statements relating to asymptomatic carriers is TRUE?
a SARS-CoV-2 does not spread through asymptomatic carriers
b Asymptomatic dental HCWs are not considered a risk in the dental practice setting
c Approximately 40-45% of SARS-COV-2 infections are likely to be asymptomatic
d Children cannot be asymptomatic
e The viral load in asymptomatic individuals is much lower than symptomatic individuals

Article: COVID-19 risk management in dental practice. Part 3: Are dental healthcare workers at greater risk of COVID-19 than other health professionals or general population? Hartshorne, van Zyl, page 24

16. Which of the following statements relating to occupational risk of HCWs for COVID-19 is TRUE?
a COVID-19 infection rates among HCWs closely follow community dynamics
b When contact times were under 15 minutes there was an increased risk of infection
c Appropriate use of PPE does not mitigate occupational risk to HCWs
d Current data suggest that occupational risk is much greater than population-based risk

17. Which of the following statements relating to COVID-incidence among HCWs is TRUE?
a COVID-incidence among HCWs in Europe is lower than global rate of 10%
b COVID-incidence among HCWs in USA is higher than global rate of 10%
c A meta-analysis show that nearly 10% of all COVID-19 positive cases are HCWs
d HCWs younger than 55 were the highest report risk of death

18. Which of the following statements relating to possible reasons that may impact on HCW exposure risk is FALSE?
a Short exposure time
b Failure to use effective PPE
c Shortage of PPE
d Lack of proper training on how to use PPE

19. Reducing the viral load in saliva and/or oral environment and /or limiting the effects of viral diffusion could lower the risk of transmission and therefore critically import for infection control. (TRUE or FALSE?)
a TRUE
b FALSE

20. Which of the following statements relating to aerosol generating procedures (AGPs) is TRUE?
a Piezo-surgery is a non-aerosol generating procedure
b Aerosols generated from ultrasonic scaling and root planing are not contaminated by saliva
c Biologic risk of inhaling SARS-CoV-2 is extremely low when performing AGPs
d AGPs increases the risk of exposure by dental health care workers to SARS-CoV-2

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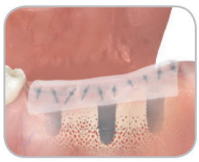
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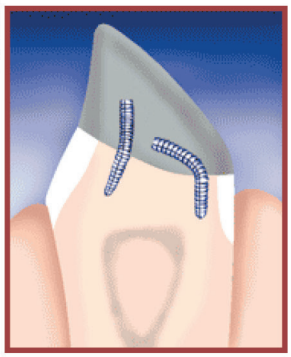

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