What's new for the clinician: excerpts from and summaries of recently published papers

1. The use of immersive virtual reality for pain control in dentistry

SM Alshatrat, R Alotaibi, M Sirois, Z Malkawi. Int J Dent Hygiene. 2019; 17: 71-6.

Pain and anxious expectations about pain are known to be the primary reasons for avoidance of dental treatment and patients who experience pain may be more likely to avoid subsequent dental treatment.

Dental hygiene procedures such as scaling and root planing (SRP) are usually painful, unpleasant and traumatic for patients. Contact with the gingiva during dental hygiene procedures is the main reason for this discomfort and pain.

Pain management is an important element in addressing the patient's fears and/or needs. A number of techniques have been developed to assist in alleviating the procedural pain. These range from pharmacological intervention to behavioural intervention; yet, pain management is still one of the main challenges in establishing regular dental visits.

Used as a distraction technique during SRP, immersive virtual reality (VR) could possibly help dental hygienists make dental hygiene care less painful, thereby improving health outcomes. Virtual reality is defined as a human-computer interface that enables the user to be immersed in and interact with a computer-generated environment.

The most common applications of the VR are training simulators (flight simulators), entertainment (video games) and desensitization therapy (phobia treatment). Furthermore, VR is used in eating and body dysmorphic disorders, neuropsychological assessment and rehabilitation and as a distraction technique for painful procedures. Alshatrat and colleagues (2019)[1] reported on a study that sought to determine whether immersive virtual reality (VR) was an effective pain management technique for patients undergoing SRP.

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ACRONYMS

SRP:	Scaling and Root Planing
VAS:	Visual Analog Scale
VR:	Virtual Reality

MATERIALS AND METHODS

Fifty adults (22 male and 28 female) who provided informed consent and met the following inclusion criteria were selected for this study: participants were 18 years or older, in good general physical and mental health, had generalized periodontitis, needed non-surgical periodontal treatment (scaling and root planing), and had at least five teeth per quadrant. Participants who have any of the following condition(s) were excluded from the study: a history of seizures or convulsive disorder, taking psychotropic drugs, history of serious vestibular abnormalities and musculoskeletal disorders.

A within-subject split-mouth design was used in this study. The participants of this study experienced two conditions: (a) without treatment condition (control/no distraction), or (b) with treatment condition (immersive VR application). All the procedures were performed by an oral hygienist who recorded probing depth, the depth of a sulcus or periodontal pocket, and calculated the clinical attachment loss.

The hygienist performed scaling and root planing procedures for each patient during a 1-hour appointment which involved supra and subgingival ultrasonic scaling and hand scaling on one-half of the mouth (right/left side) without using any type of anaesthesia while the participant used the immersive VR. The same procedures were performed on the second half of the mouth without the use of immersive VR.

Tossing a coin was used to randomly determine the side of the mouth that would initially be treated and the sequence of the treatment conditions: whether the right or the left side would be treated first, and whether or not immersive VR would primarily be used.

Baseline parameters recorded included patient demographics, and the blood pressure (BP) and pulse (PR) were measured after the first half of the treatment and again at the end of the treatment. The level of pain was measured with the Visual Analog Scale (VAS).

Additionally, the participants rated how much time they spent thinking about their pain during the session, how unpleasant the dental care was, how much their teeth and gums bothered them during the procedure, their worst pain and the average pain.

Participants gave ratings using 0 -10 scales with cut points on the scale indicating (0) none, (1-3) mild, (4-6) moderate or (7-10) severe. Immediately after the VR treatment, participants were also asked three questions to assess presence, realism and nausea.

The presence has been defined as "the subjective experience of being in one place or environment even when you are physically located in another". To assess the presence, this question has been asked: While experiencing VR, to what extent did you feel like you went into the virtual world?

Participants gave ratings using a 0-10 scale with cut points on thescale indicating that (0) "I did not feel like I went inside at all"; (1-3) "mild sense of going inside"; (4-6) "moderate sense of going inside"; or (7-10) "strong sense of going inside."

To assess the realism, this question has been asked: How real did the objects in the virtual world seem to you? Participants gave ratings using a 0-10 scale with cut points on the scale indicating that (0) "completely fake"; (1-3) "somewhat real"; (4-6) "moderate real"; or (7-10) "very real".

To assess the nausea, this question has been asked: "To what extent (if at all) did you feel nausea while experiencing VR?" Participants gave ratings using a 0-10 scale with cut points on the scale indicating that (0) "no nausea at all"; (1-3) "mild nausea"; (4-6) "moderate nausea"; or (7-10) "severe nausea". In addition, the participants were asked to identify the preferred treatment conditions: no distraction or VR distraction.

RESULTS

All 50 patients completed the study. The mean age of the subjects was 36 ± 11.843 (ranging from 18 to 54 years). Most (88%) of the sample had mild periodontitis, 10% had moderate periodontitis and only 2% had severe periodontitis. More than half of the patients (56%) had received "above high school" education.

The Wilcoxon signed-rank test indicated that the time spent thinking about pain when using virtual reality (mean rank = 11.29) was rated less than the time spent thinking about pain without virtual reality (mean rank = 12.38).

In addition, the test indicated that the scaling and root planing session without virtual reality (mean rank = 21.50) was rated more unpleasant than the session with virtual reality (mean rank = 12.11). Also, the test showed that the teeth/gums bothered the patient more during the session without the virtual reality (mean rank = 14.50) than the session with virtual reality (mean rank = 15.61).

A Wilcoxon signed-rank test indicated that the worst pain during the session without virtual reality (mean rank = 13.00) was rated more than the session with virtual reality (mean rank = 14.68). The Wilcoxon signed-rank test revealed that the VAS scores for the average pain perception were significantly lower during VR (mean rank = 11.05) compared with without VR (mean rank = 10.00).

On average, participants experienced significantly lower systolic BP after using VR than systolic BP after treatment without VR (P = 0.01). There was no statistically significant difference between vital signs (diastolic BP and PR) when using VR or without using VR (within group comparison).

For the assessment of VR presence, realism and nausea, most of the participants (84%) felt like they went inside the virtual world, 82% of the participants felt that the virtual objects seemed real to them, and 94% did not feel nausea as a result of experiencing the virtual world. Of the participants, 98% preferred using VR during SRP.

CONCLUSIONS

The results of this study provide evidence of the feasibility and acceptability of immersive VR application as a pain management technique for patients undergoing SRP.

Implications for practice:

The use of technology (immersive VR) as an adjunct for pain control can only improve the patient experience especially for dental procedures that cause pain and discomfort for the patients. VR, like other distraction techniques such as music, etc. is just one more alternative available to practitioners to improve patient experiences in the dental setting.

Reference
1. Alshatrat SM, Alotaibi R, Sirois M, Malkawi Z. The use of immersive virtual reality for pain control during periodontal scaling and root planing procedures in dental hygiene clinic. Int J Dent Hygiene. 2019; 17: 71 - 76.

2. Effect of a single-tufted toothbrush on the control of dental biofilm in orthodontic patients: A randomized clinical trial

Orthodontic components can increase biofilm accumulation and present enormous challenges to patients in terms of maintaining a clean and healthy mouth.

This is especially difficult in areas in the "shadow" of the orthodontic arch, such as the mesial and distal surfaces of the brackets and cervical surface of the orthodontic bands.[1]

An important aspect for motivating orthodontic patients is choosing the oral hygiene instruments that best meet individual needs.[1] Thus, different toothbrush models have been developed such as, for example, interdental toothbrushes and single-tufted toothbrushes.[1]

Single-tufted toothbrushes are recommended for free surfaces and areas of the teeth that are not easily reached with other oral hygiene devices, such as areas of bifurcation, distal surfaces of molars, areas with rizectomy (removal of only the root of a tooth), surfaces with irregular gingival margins, dental crowding areas and proximal surfaces of a single tooth.[1]

These toothbrushes are easily directed towards the gingival sulcus, providing greater efficiency in biofilm removal. However, the efficacy of this type of toothbrush for patients using conventional orthodontic appliances has not yet been studied.

Thus, da Cunha and colleagues (2018)[1] reported on a trial that sought to compare the effect of single-tufted toothbrushes, conventional toothbrushes and the combination of both for controlling bacterial biofilm formation in dentogingival areas of healthy subjects using fixed orthodontic appliances.

MATERIALS AND METHODS

Twenty-five patients above 18 years of both genders who were undergoing orthodontic treatment with mandibular and maxillary fixed orthodontic preadjusted edgewise brackets, attached to the buccal surface, were invited to participate in this trial. The inclusion criteria for volunteers were as follows: at least 20 teeth, good general and oral health [no caries, gingivitis (GBI<10%) or periodontitis (PS≤3mm)] and no use of anti-inflammatory and antibiotics three months before or during the study.

The exclusion criteria were as follows: smokers, pregnant women, diabetics, hypertensive patients with restorations or poorly fitted dentures, and those who had used single-tufted or conventional toothbrushes before the research.

This was a randomized, single-blinded, crossover, clinical trial with an analytical and quantitative approach.

ACRONYMS

GBI:	Gingival Bleeding Index
SPI:	Stained Plaque Index
VPI:	Visible Plaque Index

The first stage was pre-experimental, followed by three experimental periods using a single-tufted (Bitufo®) (G1) and a conventional toothbrush (G2), alone or in combination (G3). Randomization was performed by a computer-generated table that randomly distributed patients into the three experimental periods.

Three kits with different products (single-tufted toothbrush, conventional toothbrush and the third kit contained the two toothbrushes) were delivered by the examiner blinded to which experiment each patient received. Each kit also contained a toothpaste. At follow-up of the patient, the used kit was returned, and the patient received a new kit.

After selecting the volunteers, an oral clinical examination was performed to obtain the following initial clinical parameters:
- VPI (Visible plaque index) and GBI (gingival bleeding index), both represent dichotomous scores 0 and 1 for absence or presence of plaque and bleeding.
- The SPI (stained plaque index)- this method records the presence of plaque on an individual tooth surface, and is calculated by the number of surfaces containing plaque and the total number of surfaces available.

Both the indices were analysed for the buccal, lingual, mesial and distal surfaces of anterior and posterior teeth, excluding the maxillary and mandibular first molars due to variation of components (orthodontic bands and bonded tubes) among patients.

A single calibrated examiner collected the indices. The clinical parameters of 10% of the volunteers were evaluated in duplicate to obtain diagnostic confidence using the Kappa agreement test, whose intra-rater agreement was k = 0.86.

Before the study began, patients received a scaling and polishing. Each patient then received the products (randomly selected), as well as specific instruction on how to use them.

Assessments were performed at the beginning of each experimental group, immediately before treatment with the toothbrushes, and right after completion of the 72-hour experimental period. Seven days after the pre-experimental stage, three 72-hour experimental periods were performed. In each experimental period, the volunteers were randomly assigned to one of the oral

hygiene regimens. An interval of 7 days (washout) was recommended between each period to prevent possible residual effects of treatment (carry over).

During the washout period, all volunteers used a conventional toothbrush, different from the one used in the experiment, toothpaste without antimicrobial agents and standard dental floss, provided by the researchers. During treatment, patients were instructed not to use any type of therapeutic mouthwash to aid hygiene.

At the beginning and completion of each experimental period, the same clinical parameters were assessed again. The hygiene instruments used by patients were placed in sequentially numbered sealed opaque packages and coded by another researcher to prevent identification of the product. The codes were not disclosed to the examiner before completion of the experimental stage.

RESULTS

Five volunteers did not complete the study because they needed to remove the orthodontic appliance before the end of the study. All subjects (n=20) with ages between 20 and 42 years (mean of 26.6 years; 6 men and 14 women) completed the three stages of the study. No adverse effects to the treatments were reported by any individual or by the examiner.

Comparing the variables VPI, SPI and GBI in G1, G2 and G3 at T0 and T72 hour no significant differences were found in the intragroup analysis for the parameters assessed in G1 (single tuft toothbrush) and G2 (conventional toothbrush). The variables SPI and VPI showed a statistically significant decrease after 72 hours in G3 (P< 0.05). A statistically difference was found for the VPI in the intergroup analysis at T0 in G3 when compared with G2.

No statistical difference was found for any parameters measured among the groups after 72 hours. For delta analysis (T0-T72 hour), no significant differences were found in the intergroup analysis for the parameters assessed.

Comparing the anterior teeth in G1, G2 and G3 (combination of single tuft and conventional toothbrush) and the variables VPI, SPI and GBI at T0 and T72 hour no significant differences were found in the intragroup analysis for any of the parameters assessed in G2.

The VPI and SPI significantly decreased after 72 hours in G1, while only the SPI decreased in G3 (P<0.05). In the intergroup analysis, a statistical difference was found for VPI only in G1 when compared with G2 and G3 at T0. No statistical differences were found for any parameters measured among the groups after 72 hours.

When comparing the posterior teeth in G1, G2 and G3, and VPI, SPI and GBI at T0 and T72 hour, statistical reductions were found in the intragroup analysis (P< 0.05) after 72 hours in G1 for VPI and SBI, in G2 for VPI and in G3 for GBI. In the intergroup analysis, a statistical difference was found for VPI only in G1 when compared with G2 and G3 at T0. No statistical differences were found for any parameters measured among the groups at T72 hour.

When comparing the free tooth surfaces in G1, G2 and G3, and the VPI, SPI and GBI at T0 and T72 hour, statistical reductions were found in the intragroup analysis (P<0.05) in G3 for GBI after 72 hours. In the intergroup analysis, a statistical difference was found for VPI only in G1 when compared with G2 and at T0 and in G3 when compared with G1 and G2 at T72 hours.

When comparing the proximal tooth surfaces in G1, G2 and G3, and the VPI, SPI and GBI at T0 and T72 hours, no statistical differences were found in the intragroup analysis (P>0.05). At T0, a statistical difference was found for SPI in the intergroup analysis in G1 when compared with G2 and G3.

Moreover, a difference for GBI in G1 was found when compared with G2 and G3; however, no differences were found between G2 and G3. This difference could only be observed in the SPI in G3 when compared with G1 at T72 hours.

CONCLUSIONS

In this study, the combination of conventional and single-tufted toothbrushes (group G3) was more effective for controlling dental biofilm compared with the use of the isolated brushes (G1 or G2).

Implications for practice

Orthodontists should provide patients with special guidance on oral hygiene to prevent periodontal diseases. The use of a combination of conventional and specially designed toothbrushes for use in patients with orthodontic appliances seems more beneficial than using conventional methods only.

Reference
1. da Cunha LD, Peruzzo DC, Costa LA, Pereira ALP, Benatti BB. Effect of a single-tufted toothbrush on the control of dental biofilm in orthodontic patients: A randomized clinical trial. Int J Dent Hyg. 2018; 16: 512-518.