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What's new for the clinician?

Excerpts from and summaries of recently published papers

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1. Preservation of root cementum: a comparative evaluation of power-driven versus hand instruments.

Bozbay E, Dominici F, Gokbuget AY, Cintan S, Guida L, Aydin MS, Mariotti A, Pilloni. Int J Dent Hygiene 2018; 16: 202-209.

Cementum is a specialized calcified substance covering the root of a tooth. The cementum is the part of the periodontium that attaches the teeth to the alveolar bone by anchoring the periodontal ligament. Cementum may be classified in a number of ways, viz., by location (radicular cementum –found on root surface; coronal cementum-forms beneath enamel covering the crown of a tooth); by cellularity (cellular & acellular); by the presence of collagen fibrils in the matrix (fibrillar & afibrillar); and by origin of the matrix fibres (extrinsic fibres [Sharpey's fibres], intrinsic fibres, mixed fibres). These descriptors for the classes of cementum can be used in various combinations to more precisely describe a specific type of cementum.

The major role of cementum is to serve as the site of attachment for principal collagen fibres (Sharpey's fibres). In particular, cementum, by virtue of its structural and dynamic qualities, provides tooth attachment and maintenance of occlusal relationships between the jaws. Periodontal disease may alter cementum, resulting in the loss of connective tissue attachment to cementum.[1] As the relationship between local bacteria and periodontal disease is widely recognized it is generally accepted that removal of pathogenic micro-organisms that form plaque and calculus on cementum is the major goal of periodontal treatment.[1] This therapy currently consists of scaling and root planing, using mechanical instrumentation.[1]

Previously it was accepted that bacterial endotoxins or bacteria penetrate the cementum of periodontally diseased root surfaces. This concept resulted in the removal of the subgingival plaque and calculus deposits, and the removal of all or most of the cementum as a primary endpoint of periodontal healing.[1] In contrast, recent approaches in the treatment of periodontal disease have recommended that a less aggressive removal of cementum was necessary for optimal periodontal health as well as for periodontal regeneration. With this goal in mind, Bozbay and colleagues (2018)[1] reported on a trial that sought to evaluate the effect of four procedures on cementum removal from diseased root surfaces that had never been periodontally treated: the use of piezoelectric ultrasonic scalers (U), with or without subgingival air polishing (AP), or air polishing with glycine powder alone,compared with the use of hand curettes (HC). The aim of the trial was to evaluate how much cementum could be retained as well as the surface characteristics of the retained cementum following *in vivo* root instrumentation.

ACRONYMS

AP: subgingival air polishing
CAL: clinical attachment levels
HC: hand curettes
OHI-S: Oral Hygiene Index-simplified
PPD: periodontal probing depth
RCI: Remaining Calculus Index
RLTSI: Roughness Loss of Tooth Substance Index
SEM: scanning electron microscopy and
U: piezoelectric ultrasonic scalers

MATERIALS AND METHODS

Twenty-seven patients (aged >18) with teeth diagnosed with severe chronic periodontitis and scheduled for extraction were included in this study. The inclusion criteria included participants who were systemically healthy, were non-smokers, had single-rooted teeth or molars with fused roots and had bleeding on probing. The patients participated on the basis of a periodontal probing depth (PPD) ≥5 mm in at least two sites per tooth with radiographical bone loss for more than two-thirds of root length and hence having single-rooted teeth which were hopeless for periodontal treatment. Exclusion criteria for subjects included subjects who were pregnant, breastfeeding, had been treated for periodontal disease (either non-surgical or surgical), had dental caries or restorations on the mesial or distal tooth surfaces or had Class III dental mobility.

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All the subjects of the study received a supragingival tooth cleaning one week prior to the measurements with the use of ultrasonic scaler and glycine-based air polishing. Before treatment, probing depths (PD) and clinical attachment levels (CAL) were measured on all teeth, at six locations per tooth and to nearest 1mm. using a standardized periodontal probe.

Prior to extraction, the teeth (n = 48) were randomly divided into these four treatment groups:
(i) piezoelectric ultrasonic scaler (U);
(ii) U followed by air polishing with the glycine powder (U + AP);
(iii) air polishing with the glycine powder (AP); and
(iv) hand instruments (HC) (Gracey curettes 5/6, 11/12, 13/14).

Treatment options were randomly assigned to the operator immediately prior to treatment. Instrumentations with air polishing and U devices were performed with medium power settings and with the use of water cooling (as instructed by the manufacturer). One approximal root surface (distal or mesial) of each tooth was randomly subjected to debridement, and the other approximal surface was used as control. All the measurements and instrumentations of teeth were performed by a single operator. The criteria for adequate treatment were smooth, hard root surfaces, with no clinical evidence of calculus. The cleanliness and smoothness of the root surface were checked using a fine dental explorer. The procedures were carried out under local anaesthesia. The length of time required for scaling, air polishing and root planing with each instrument was recorded in seconds. The mesial and distal locations of the gingival margin were determined and defined on the root surface with shallow 'V'-shaped notches cut with a diamond flame bur. Following instrumentation, the teeth were immediately extracted atraumatically and wiped with wet gauze to remove debris. The teeth were stored in numbered and labelled jars in a solution of 0.9% w/v of NaCl for a maximum 30 days.

Before sectioning, the root surface characteristics of 20 randomly selected teeth were analysed using a scanning electron microscopy (SEM). Remaining Calculus Index (RCI) and Roughness Loss of Tooth Substance Index (RLTSI) were calculated to determine remaining calculus, root surface roughness and loss of root substance. Additionally, scratches, gouges, cracks, cementum presence and any other changes in the cementum were noted.

The teeth were rinsed in NaOCl for two minutes to remove deposits and periodontal fibres before sectioning. The teeth were sectioned perpendicularly to the root axis with a microtome to produce slices of between 10 and 15 μm thickness which were stained with haematoxylin and eosin. Two horizontal root sections of each tooth were taken from the coronal and apical portion of the instrumented root for a total of 96 histologic specimens. Coronal sections were taken 1mm. apically from the gingival margin, whereas apical sections were taken 1mm. coronally from the notched root surface (i.e. endpoint of periodontal pocket). Both histologic and SEM measurements were carried out by blinded examiners.

RESULTS

Ninety-six sections of 48 teeth were processed for histologic examination. The mean age of patients (14 females and 13 males) was 42.5 years. The mean values of PD and CAL for all teeth were 5.08 ± 1.64mm and 7.77 ± 2.10mm, respectively.

Regardless of the type of subgingival instrumentation, a statistically significant amount of cementum was removed in both coronal and apical surfaces of the root. Despite the consistent removal of cementum, there were differences between the treatment modalities with regard to the amounts of cementum retained following the subgingival instrumentation. The percentages of coronal cementum retained were 84% with the piezoelectric ultrasonic scaler (U), 80% with the piezoelectric ultrasonic scaler + air polisher with glycine powder (U + AP) and 94% with air polishing with the glycine powder only (AP), whereas hand curettes (HC) retained only 65% of the cementum.

In the apical sections, cementum loss was similar with an 84% retention with U, an 83%. with U + AP, 88% with AP and 70% with HC. When comparing the cementum retention for coronal and apical sections, only AP had a statistically significant effect on reducing the amount of remaining cementum in apical sites when compared with coronal sites (P = 0.027).

Overall, power-driven instruments were statistically more efficient at retaining cementum when compared with hand instruments. More specifically, HC and U + AP produced significantly greater cementum removal than AP in coronal sections ($P = 0.002$, $P = 0.004$, respectively); HC caused significantly greater removal of cementum than AP in apical sections ($P = 0.016$). It should be noted that in both the coronal and apical sections, AP produced the least amount of cementum loss and therefore the greatest retention of residual cementum.

With regard to mean time to complete root instrumentation, the shortest was recorded when using AP and the longest was U + AP. In comparison with HC, AP required 31% less time for root preparation, whereas U + AP required 30% more time.

SEM results found the smoothest root surfaces were produced by the HC followed by the AP, while root surfaces instrumented by U or U + AP presented grooves and scratches.

CONCLUSIONS

The study found that air-polishing with glycine powder alone (AP) was significantly more effective in preserving cementum than the other treatment modalities. The use of hand curettes (HC) resulted in more removal of cementum than did (ultrasonic scaling (U) and air polishing with glycine powder (AP).

IMPLICATIONS FOR PRACTICE

Clinicians seeking more conservative treatment options aiming for maximum preservation of the cementum layer should consider the superior performance of air polishing with glycine powder to achieve this outcome.

Reference

1. Bozbay E, Dominici F, Gokbuget AY, Cintan S, Guida L, Aydin MS, Mariotti A, Pilloni A. Preservation of root cementum: a comparative evaluation of power-driven versus hand instruments. Int J Dent Hygiene 2018; 16: 202-209.

2. Assessment of efficacy of two chlorhexidine mouthrinses on oral hygiene and gingival health in adolescents wearing two types of orthodontic brackets

Jurišić S, Verzak Ž, Jurišić G, Jurić H.
Int J Dent Hyg 2018; 16: e52—e57.

Orthodontic appliances increase dental plaque retention and make oral hygiene more difficult for patients due to the increased surface area on which plaque can then accumulate. Essentially there are two types of fixed orthodontic bracketss: - metal and ceramic. The popularity of ceramic brackets has grown during the last few years due to increased demand for superior aesthetics during orthodontic treatment. Plaque in association with fixed appliances can result in clinical problems, such as demineralization of the adjacent enamel and gingival inflammation. To prevent this, meticulous oral hygiene is suggested and often a host of mechanical (toothbrush, inter-dental brush, etc.) and chemical (mouthrinses) adjuncts are recommended to maintain a clean mouth during orthodontic treatment.

Several antimicrobial agents have been incorporated in mouthrinses as adjuncts to daily plaque control and are more beneficial than only mechanical brushing. Chlorhexidine (CHX) mouthrinse, an antimicrobial agent, is considered the gold standard in preventing the dental plaque formation and gingival inflammation due to its antigingivitis effects.[1] It is a cationic composition that can bind to bacterial plaque, enamel hydroxyapatite and mucous membranes. However, CHX has known side effects, like extrinsic tooth and tongue staining when used over longer periods (>4weeks). In recent times in dental clinical practice, there has also been an advanced version of CHX with antidiscolouration system (CHX-ADS). Besides maintaining its antiseptic qualities, CHX-ADS avoids the side effect of staining.[1]

Jurišić and colleagues from Croatia (2018)[1] reported on a trial that sought to investigate the effectiveness of two chlorhexidine mouthrinses on oral hygiene and gingival health status of adolescents wearing two different types of orthodontic brackets. The first null hypothesis was that two mouthrinses show no differences in the effectiveness of reducing gingival signs of inflammation and improving oral hygiene during the period of 18 weeks. The second null hypothesis of the study was that stainless steel and ceramic brackets have no influence on gingival and oral health status.

MATERIALS AND METHODS

Eighty-seven subjects with indications for fixed orthodontic appliance treatment participated in this prospective clinical study. The subjects had to fulfil the following criteria: good general health, no antibiotic intake or use of antibacterial mouthrinses in the previous three months, no periodontal disease (no periodontal probing depth >4 mm; bleeding on probing frequency <20%) and non-smoking. Seven subjects were excluded because they did not meet the inclusion criteria (four used antibiotics at the time and three declined to participate). In total, 80 subjects were included (61 girls, 19 boys; aged 11-18 years, mean age 14.2±1.4 years).

ACRONYMS

CHX: Chlorhexidine
CHX-ADS: antidiscoloration system
GI: gingival index—Löe and Silness

Before the treatment and at every visit, the patients were given oral hygiene instructions. Verbal instruction and physical demonstration were provided on how to carry out effective oral hygiene close to the brackets and ligatures, and how to use dental floss for cleaning spaces around the brackets, between the teeth and under the archwires using a model. All instructions were given by the same experienced investigator. The subjects were instructed to use manual and interdental tooth brushes and to floss twice daily.

A total of 80 subjects considered for standard orthodontic treatment (metallic brackets) were randomly divided into two groups according to bracket types: 40 subjects received metal-stainless steel brackets and 40 subjects received ceramic brackets (3M Unitec) by random choice. All archwires were ligated using stainless steel ligatures. Four weeks after the placement of the fixed orthodontic appliance the subjects from each bracket group were randomly divided into two equal subgroups and were provided with two different mouthrinses for use during the next 14 days. Within each bracket group 20 subjects received a conventional, alcohol-free chlorhexidine solution (0.2% CHX; Parodontax), 20 subjects received a chlorhexidine solution with antidiscoloration system (0.2% CHX-ADS; Curasept ADS 220). Ten millilitres of each mouthrinse was used twice daily. The subjects were instructed to avoid eating and drinking for 30 minutes after mouthrinse usage.

The following parameters were measured: (a) gingival status—using the Gingival Index—Löe and Silness (GI) for each tooth with brackets and (b) oral hygiene status—using the Oral Hygiene Index-simplified (OHI-S) examining standard six tooth surfaces (facial surfaces of the first molars in the right and left maxilla, the lingual surfaces of the first molars in the right and left sides of the mandible; the facial surfaces of the maxillary right central incisor and mandibular left central incisor.

The mean values for OHI-S and GI were calculated. All clinical measurements were performed by the same examiner at three time points: (i) prior to the placement of the fixed orthodontic appliance (t1), (ii) 6 weeks after the placement of the fixed orthodontic appliance (after 14 days of rinsing) (t2), and (iii) 18 weeks after the placement of the fixed orthodontic appliance (t3).

RESULTS

From 87 subjects eligible for the study, 80 met the inclusion criteria (61 girls, 19 boys; aged 11-18 years, mean age 14.2±1.4 years) and participated in the study. Changes in the values of GI and OHI-S were observed, and it was noticed that the changes observed depended on the type of orthodontic brackets and different mouthrinses at definite points of time (0, 6 and 18 weeks) after insertion of the orthodontic appliances.

Significantly lower GI values at second time point for all bracket types and mouthrinses after the usage of the mouthrinse was found (t2; 6 weeks later) ($t=2.313$; $df=78$; $P=.023$). The results of the comparison of the measurements at all three time points in each subgroup showed a decreasing trend for both parameters evaluated in the study at t2 and an increasing trend at t3. In the ceramic brackets group, the mean GI values were significantly lower in the subjects using CHX-ADS mouthrinse ($t=2.849$; $df=38$; $P=.046$).

No significant differences were found between GI and OHI-S values in the ceramic brackets groups using CHX were found. However, between the measurements a decreasing trend at t2 followed by an increasing trend at the t3 were also seen ($P>.05$). At the same time, GI and OHI-S values in the ceramic brackets groups using CHX-ADS at different time points significantly differed ($p < 0.05$ at both time intervals)

Overall there was a statistically significant decrease in GI and OHI-S indices in time point t2 (after 6 weeks) and then an increase, although not significant, by time point t3 (18 weeks) for all groups in this investigation. There was no statistically significant difference between the groups having ceramic and metal brackets when these variables were tested alone, and none between mouthrinses alone. Significantly lower GI values were found in subjects wearing ceramic brackets who also used CHX-ADS both in time points t2 and t3.

CONCLUSIONS

Within the limitations of this study the authors concluded that the ceramic orthodontic brackets together with CHX-ADS resulted in improved gingival status.

IMPLICATIONS FOR PRACTICE

Ceramic brackets together with CHX with anti-staining proved to offer superior benefits for gingival health. However, clinicians should note that the sample size was relatively small. Other important factors such as cost were not considered here.

Reference

1. Jurišić S, Verzak Ž, Jurišić G, Jurić H. Assessment of efficacy of two chlorhexidine mouthrinses on oral hygiene and gingival health in adolescents wearing two types of orthodontic brackets. Int J Dent Hyg 2018; 16: e52—e57.