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# A clinical study on the effects of cordless and conventional retraction techniques on the gingival and periodontal health

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***Abstract***

**Aim:** To investigate the influence of two cordless techniques on the periodontium in comparison with conventional cords.

**Material and Methods:** Dental students ($n = 60$) with healthy gingival conditions were recruited – an expanding poly vinyl siloxane material (Magic Foam Cord®), a paste-like material (Expasyl®), and a conventional retraction cord (Ultrapak®) were applied on the buccal aspects of three premolars of each subject. Probing depth, clinical attachment level, gingival index (GI), plaque index, mobility, bleeding, and sensitivity were assessed at baseline, and at 1 and 7 days after application. Data were analysed using Kruskal–Wallis and Mann–Whittney tests ($\alpha = 0.05$).

**Results:** The periodontal parameters were not statistically significant among the groups at all time intervals except for the GI, which was increased for all groups after 1 day. The highest was in Expasyl ($p = 0.011$). After 7 days, the GI returned to a non-significant level compared with baseline except for Expasyl, which was still significant ($p = 0.044$). Expasyl induced sensitivity in four subjects. Bleeding was only induced by Ultrapak in 28.3% and 26.7% during and after retraction, respectively.

**Conclusions:** All techniques caused a temporary gingival inflammation; the greatest was in Expasyl, which also showed slower recovery. Cordless techniques did not induce bleeding during or after retraction.

Key words: cordless techniques; gingival displacement; gingival health; retraction cord

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## Introduction

Management of the gingival tissues is essential for obtaining accurate impressions for the fabrication of fixed restorations, particularly when the finish line is at, or just within, the gingival sulcus (Goldberg et al. 2001, Rosenstiel et al. 2006, Hansen et al. 1999, Perakis et al. 2004, Donovan & Chee 2004). This is also true when dealing with procedures for the restoration of cervical lesions due to their proximity to the periodontal tissue (Meraner 2006).

Gingival displacement is defined as the deflection of the marginal gingiva away from the tooth (Glossary of prosthodontics; The Academy of Prosthodontics, 2005). This is performed to create sufficient lateral and vertical space between the preparation finish line and the gingival tissue to allow the injection of adequate bulk of impression material into the expanded gingival crevice (Nemetz et al. 1984, Weir & Williams 1984, Benson et al. 1986, Cassidy & Gutteridge 1994). It is especially critical when using hydrophobic impression materials that do not displace the gingival tissues (Wassell et al. 2002). Numerous forces act to return the tissues to their original position, such as the elasticity of the gingival cuff around the tooth and the rebound forces of the compressed adjacent attached gingiva during retraction (Livaditis 1998). The critical sulcular width has been reported to be approximately 0.15–0.2 mm at the level of the finish line. Impressions with less sulcular width have higher incidences of voids, tearing of impression materials, and reduction in marginal accuracy

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(Laufer et al. 1996, 1997, Baharav et al. 2004, Donovan & Chee 2004).

Retraction techniques can be classified as mechanical, chemical or surgical, and are often used in combination. The use of retraction cords as a mechanical or chemo-mechanical technique is well established in practice due to their relative predictability, effectiveness, and safety compared with rotary gingival curettage and electrosurgery (Benson et al. 1986, Hansen et al. 1999). However, the use of retraction cord can be laborious, time-consuming, can cause gingival bleeding, uncomfortable for patients in the absence of anaesthesia, and when inappropriately manipulated, can lead to direct injury and gingival recession (Ruel et al. 1980, de Gennaro et al. 1982, Azzi et al. 1983, Feng et al. 2006). Various haemostatic agents with varying degrees of safety and effectiveness are available such as aluminium potassium sulphate (Alum), aluminium chloride, epinephrine, zinc chloride, ferric sulphate and sympathomimetic amines. Recently, cordless techniques have been introduced with several claimed advantages, such as time-savings and enhanced patient comfort while being minimally invasive. Expasyl® (Kerr Corp., Orange, CA, USA) is a paste-like gingival retraction material that depends on the haemostatic properties of aluminium chloride and the hygroscopic expansion of kaolin upon contact with the crevicular fluid, to provide mild displacement of the gingiva in about 2 min. (Lesage 2002). Aluminium chloride has been reported to be irritant in moderate concentrations and caustic in high concentrations. It is sold in a stable acidic buffer, resulting in an etched dentine (Donovan et al. 1985, Felpel 1997, Polat et al. 2007).

Magic Foam Cord® (Coltène Whaledent AG, Altstatten, Switzerland) is an expanding poly vinyl siloxane material designed for easy and fast retraction of the sulcus without the potentially traumatic and time-consuming packing of retraction cord.

Most studies on cordless techniques are demonstrations of their clinical use; their effects on the gingival and periodontal tissues are not well documented (Poss 2002, Shannon 2002, Smelltzer 2003).

Yang et al. (2005) investigated two cordless techniques: Expasyl and Korlex-GR® (Biotech-one, San-Chung, Taiwan) and compared them with Ultrapak® cords (Ultradent Products Inc., South Jordan, Utah). The authors reported no significant difference in achieving gingival deflection, but reported that the use of Ultrapak appeared to be more painful and produced more gingival recession than the cordless technique(s).

This study was conducted to investigate the influence of Expasyl and Magic Foam Cord on the gingival and periodontal tissues in comparison with conventional retraction cord.

## Material and Methods

Fourth and fifth year dental students at the Jordan University of Science and Technology were recruited for the study on March 2007, according to the following inclusion criteria: currently enrolled student with no relevant medical history; non-smoker or quit smoking for at least 6 months before the study; with at least three premolars in one of the two arches. The selected premolars were screened for periodontal health and teeth included in the study were those with a gingiva not expressing a highly scalloped margin and at least 2 mm of keratinized tissues, non-fibrotic gingival tissues, no recession, probing depths of $\leqslant 3$ mm, no evidence of significant loss of attachment, no bleeding on probing, and scored 0 or 1 according to the gingival and plaque indices (Löe 1967, Palmer & Floyd 1995).

The study protocol was approved by the health and safety committee for research on humans at Jordan University of Science and Technology, and by the college of dentistry-related committees. The selected participants gave their consent after they were informed about the purpose, procedures, and duration of the study.

The study was performed at the periodontal clinics of the dental health teaching centre, Jordan University of Science and Technology. Probing depth (PD), clinical attachment level (CAL), gingival index (GI), plaque index (PI), and mobility were recorded for the buccal aspects of the selected teeth before gingival retraction was initiated. Subjects were also asked to report the presence or absence of sensitivity (subjective reporting). Cold air test for sensitivity was also performed on the selected teeth through a one second application of cold air from a dental unit syringe (at $20 \pm 3^{\circ}$C at 60–65 psi). The same measurements were again recorded on the first and seventh days post-retraction (Löe 1967, Holland et al. 1997). Periodontal probing to the bottom of the sulcus was conducted on the buccal aspect of every selected tooth with Williams probe (Hu-Friedy Manufacturing Inc., Chicago, IL, USA). This probe had a tapered tip with a diameter of 0.5 mm, and markings consisted of milled grooves and were situated at 1, 2, 3, 5, 7, 8, 9, and 10 mm from the tip. The probe was held with a light grasp and pointed towards the apex buccally while being parallel to the long axis of the tooth. Each measurement was rounded to the lowest whole millimetre. Clinical attachment loss measurement was then recorded as the distance from the CEJ to the base of the probable crevice.

The GI was recorded for every selected premolar based on the modification of the method of Löe & Silness (1963). Bleeding also was observed within 15 s after probing, or if there was any tendency to spontaneous bleeding.

For purposes of calibration, a pilot study was conducted during which an experienced periodontist measured the periodontal parameters for selected quadrants on four subjects. The principal investigator randomly repeated the measurements 30 min. later on the same subjects, and subsequently. Duplicate measurements were obtained to measure the reliability of the examination using percent agreement, Kappa test, which revealed more than 95% agreement in parameter assessment.

The following gingival deflection techniques were used on the buccal aspect of the premolars: Ultrapak knitted non-impregnated retraction cord (Ultradent Products Inc., Ref. No. BØ456, LOT UP131), Magic Foam Cord (Coltene Whaledent AG, Art. No. 6735, LOT 0078546), and Expasyl (Kerr Corp., Ref. No. 261030, LOT 3104). Each technique was applied to the buccal gingival sulcus along the distance from the mesial to the distal papilla of the selected premolar.

Three premolars were selected in one arch for each subject to receive the three retraction techniques. Each tooth was assigned a number from 1 to 3 starting from the most distal premolar in the right side of the subject. The middle premolar was assigned number 2 and the last premolar number 3. Each tooth received one retraction technique. Maxillary premolars were chosen in half of the subjects and mandibular premolars were chosen for the other. The sequence of application was chosen taking in consideration the recommended time

*Table 1.* Subject distribution for periodontal parameters at the three visits for each technique (E, Expasyl®; M, Magic Foam®; R, Ultrapak® Cords)

| Parameter | Subjects distribution, $n = 60$ | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | before retraction | | | 1 day post-retraction | | | 7 days post-retraction | | |
| | E | M | R | E | M | R | E | M | R |
| PD (mm) | | | | | | | | | |
| 1 | 10 | 11 | 9 | 8 | 10 | 9 | 12 | 11 | 13 |
| 2 | 37 | 30 | 29 | 33 | 31 | 34 | 30 | 32 | 33 |
| 3 | 13 | 19 | 22 | 19 | 19 | 17 | 18 | 17 | 14 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mean ± SD | 2.05 ± 0.62 | 2.13 ± 0.70 | 2.22 ± 0.69 | 2.2 ± 0.68 | 2.15 ± 0.68 | 2.13 ± 0.65 | 2.1 ± 0.70 | 2.1 ± 0.68 | 2.02 ± 0.67 |
| GI | | | | | | | | | |
| 0 | 36 | 34 | 35 | 18 | 25 | 26 | 29 | 36 | 34 |
| 1 | 24 | 26 | 25 | 18 | 28 | 24 | 20 | 21 | 20 |
| 2 | 0 | 0 | 0 | 24 | 7 | 10 | 11 | 3 | 6 |
| PI | | | | | | | | | |
| 0 | 46 | 45 | 47 | 47 | 48 | 48 | 45 | 43 | 45 |
| 1 | 12 | 15 | 12 | 11 | 10 | 10 | 13 | 16 | 14 |
| 2 | 2 | 0 | 1 | 2 | 2 | 2 | 2 | 1 | 1 |
| Sensitivity | | | | | | | | | |
| − ve | 60 | 60 | 60 | 56 | 60 | 60 | 56 | 60 | 60 |
| +ve | 0 | 0 | 0 | 4 | 0 | 0 | 4 | 0 | 0 |
| Mobility | | | | | | | | | |
| 0 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| CAL (mm) | | | | | | | | | |
| 0 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |

PD, probing depth; GI, gingival index; PI, plaque index; CAL, clinical attachment level.

of placement for each technique. Ultrapak was applied first as it has the longest possible time of application (10 min.) (Löe & Silness 1963), followed by the Magic Foam Cord (5 min.), and then by Expasyl (2 min.). The sequence of retraction techniques allocation was in the order of teeth number 1, 2, 3. In the next subject the order was changed to 2, 3, 1 and then to 3, 1, 2. The order was changed in the next subject back to 1, 2, 3 and so on. The whole procedure was practised before starting the study.

Tissue displacement was preceded with isolation and drying of the area. Appropriate Ultrapak cord size and length was chosen and wetted with water, and was packed gently in the buccal gingival sulcus with a plastic instrument without anaesthesia and kept in the gingival sulcus no more than 10 min.; during that time, the other two materials were applied on the remaining premolars. A suitable Comprecap size was selected and adjusted proximally to allow its placement and Magic Foam was syringed into the buccal sulcus around the premolar and the Comprecap was placed for 5 min. Expasyl was extruded into the buccal sulcus using the gun at even pressure, the tip was perpendicular to the axis of the tooth, and then it was pressed against the tooth and angled until it contacted the sulcus lining of the gingival margin (Lesage 2002). Expasyl was left in place for 2 min. All materials were removed at the same time; the cord was removed manually, while cordless materials were copiously irrigated with water until no traces of materials were left. The same procedure was repeated in every eligible subject.

The presence or absence of bleeding during and after the procedure was recorded for each technique.

The whole study was carried out by two researchers: one was responsible only for the application of the retraction materials, and the other carried out the rest of the study. The researcher who recorded the periodontal parameters was unaware of the technique applied on the tooth. The data were analysed using Statistical Package for Social Sciences software (version 15.0; SPSS Inc., Chicago, IL, USA). Kruscal–Wallis and Mann–Whittney tests were used to analyse the differences of the periodontal parameters among the three materials and the differences among the three visits within each material applied ($p \leqslant 0.05$). With regard to sensitivity and evaluation of bleeding within and after the procedure, simple descriptive statistics were computed using the frequency and descriptive procedures of SPSS.

## Results

One hundred and eighty premolars in 60 subjects free of clinical signs of gingivitis participated in this study. The sample size was determined in consultation with a statistician. The participants were between 20 and 29 years of age with a mean of (22.32 ± 1.900). Most subjects (93.3%) were between 21 and 26 years, with 56.7% females and 43.3% males. Premolars were equally distributed between the two arches.

Mobility and CAL measurements were not different among the three groups. Sensitivity was only induced by Expasyl in four subjects at the 1 and 7 days period (Table 1). Means of PD for all techniques are presented in Table 1. Mean ranks of PD, GI, and PI are presented in Tables 2–4 for the Expasyl, Magic Foam Cord, and Ultrapak, respectively. Kruskal–Wallis test was used to compare the mean ranks between the three groups at the three times intervals ($p = 0.05$). Mann–Whittney test was used for two-way comparisons and the significant difference is presented in the tables by superscripts. The GI, PD, and PI values at the baseline measurements were homogenous among the three groups. The PD and PI values were not significantly different among the groups at all time intervals.

*Table 2*. Mean ranks of probing depth (PD), gingival index (GI), and plaque index (PI) for the Expasyl® group (*p*-value using Kruskal–Wallis test)

| Parameter | Time | *n* | Mean rank | *p* |
|---|---|---|---|---|
| PD | Before retraction | 60 | 85.81 | 0.918 |
| | 1 day after retraction | 60 | 95.84 | |
| | 7 days after retraction | 60 | 89.85 | |
| GI | Before retraction | 60 | 71.00[a] | 0.001 |
| | 1 day after retraction | 60 | 112.15[b] | |
| | 7 days after retraction | 60 | 88.35[c] | |
| PI | Before retraction | 60 | 90.50 | 0.496 |
| | 1 day after retraction | 60 | 89.05 | |
| | 7 days after retraction | 60 | 91.95 | |

Mean ranks with different superscripts are significantly different ($p \leqslant 0.05$ using Mann–Whitney test).

*Table 3*. Mean ranks of probing depth (PD), gingival index (GI), and plaque index (PI) for the Magic Foam Cord® group (*p*-value using Kruskal–Wallis test)

| Parameter | Time | *n* | Mean rank | *p*-value |
|---|---|---|---|---|
| PD | Before retraction | 60 | 90.98 | 0.917 |
| | 1 day after retraction | 60 | 92.02 | |
| | 7 days after retraction | 60 | 88.51 | |
| GI | Before retraction | 60 | 84.83[a] | 0.046 |
| | 1 day after retraction | 60 | 102.54[b] | |
| | 7 days after retraction | 60 | 84.13[a] | |
| PI | Before retraction | 60 | 90.63 | 0.614 |
| | 1 day after retraction | 60 | 86.93 | |
| | 7 days after retraction | 60 | 93.94 | |

Mean ranks with different superscripts are significantly different ($p \leqslant 0.05$ using Mann–Whitney test).

*Table 4*. Mean rank of probing depth (PD), gingival index (GI), and plaque index (PI) for the Ultrapak® group (*p*-value using Kruskal–Wallis test)

| Parameter | Time | *n* | Mean rank | *p*-value |
|---|---|---|---|---|
| PD | Before retraction | 60 | 97.29 | 0.256 |
| | 1 day after retraction | 60 | 91.08 | |
| | 7 days after retraction | 60 | 83.13 | |
| GI | Before retraction | 60 | 82.67[a] | 0.076 |
| | 1 day after retraction | 60 | 101.27[b] | |
| | 7 days after retraction | 60 | 87.57[ab] | |
| PI | Before retraction | 60 | 89.90 | 0.83 |
| | 1 day after retraction | 60 | 88.77 | |
| | 7 days after retraction | 60 | 92.83 | |

Mean ranks with different superscripts are significantly different, while mean ranks with ''ab'' superscript are at no significant difference with those with ''a'' or ''b'' superscripts ($p \leqslant 0.05$ using Mann–Whitney test).

The use of Ultrapak resulted in a slight decrease in the mean of the PD values after 1 day (2.13 mm) and a further decrease after 7 days (2.02 mm) compared with the baseline (2.22 mm). The mean of the PD for the Magic Foam group almost had the same values (2.13, 2.15 mm, 2.10 at baseline, 1, and 7 days, respectively). The values of the PD for the Expasyl group showed a slight increase from 2.05 mm at baseline to 2.2 and 2.1 mm at 1 and 7 days after retraction.

All techniques resulted in a significant increase in the GI values (Table 1). Mann–Whittney tests demonstrated that the increase in GI means after 1 day by all techniques was significant compared with their baseline measurements (Tables 2–4). The highest increase was induced by Expasyl and was also significantly different from the other groups. After 7 days, the GI for the three retraction techniques decreased to a non-significant level compared with their baseline measurements except the Expasyl group (Table 4).

Bleeding during and after each retraction material was encountered only with the use of Ultrapak. Bleeding during placement happened in 28.3% and after removal in 26.7% of the subjects.

## Discussion

A narrow young age range group was studied and teeth were equally distributed between maxilla and mandible, which eliminated age/gender influence and ensured little variation in gingival thicknesses. This allowed using the same size of Ultrapak cord in all subjects (size one) to minimize differences among the groups. Only buccal aspects of premolars with comparable features in terms of periodontal clinical features were selected, also because premolars offered good visibility and accessibility.

The sequence of applications was selected taking in consideration the recommended time of placement for each technique. Ultrapak has the longest possible time of application (10 min.). Retraction cords have been reported to cause necrosis of the crevicular epithelium when placed longer than 10 min. (Löe & Silness 1963). This allowed the application of Magic Foam Cord for 5 min., and then Expasyl for 2 min. as recommended by the respective manufacturers.

This study investigated the effects of different retraction techniques on gingival and periodontal health and did not test the effectiveness of gingival displacement. The use of unprepared teeth was beneficial, because the adverse effects of preparation and provisionlization steps on the gingival tissue were avoided. This provided the study with a homogenous group, as shown by the periodontal baseline measurement (Table 1). On the other hand, because the retraction materials were applied to structurally healthy teeth, in which no crown preparation was performed, one could argue that the results may not be extrapolated to the clinical reality. In order to minimize the possible effects of this on the results, every attempt was made by the expert prosthodontist to apply these materials in the same way as they would be used with prepared teeth. The technique and time of application was strictly followed according to the manufac-

turer's instructions and the relevant literature on conventional retraction cords. The Comprecaps were adjusted proximally to allow a proper placement over the unprepared teeth.

Clinical diagnostic indicators including PD, CAL, GI, PI, mobility, and sensitivity were used to evaluate periodontal health in this study. These indices have been developed to identify the degree of severity of gingival and periodontal disease by analysing the degree of gingival inflammation in gingivitis and the degree of connective tissue destruction in periodontitis. They are easy to perform, cost-effective, and relatively non-invasive. Clinical probing is the most commonly used parameter both to document loss of attachment and to establish a diagnosis of periodontitis. There are, however, some sources of error inherent to this method which contribute to the variability of the measurements. These include the tip of the probe, probing force, placement and angulations of probing, and the crudeness of the measurement scale (Lang & Corbet 1995). In this study, a 0.5 mm probing tip was used in a light force and the placement and angulation was standardized to minimize the variability in measurements. Probing depth is generally assessed to the nearest millimetre (Glavind & Löe 1967). It is evident that even a measurable loss of attachment of 0.5 mm accepts a high incidence of false negative values, which, in turn, means that ''true'' disease progression may actually occur, but only to a small extent which is not revelled by the crudeness of the measurement scale (Lang & Corbet 1995). Ultrapak use caused PD reduction (about 0.1 mm in 1 day and about 0.2 mm after 7 days). Such reduction is possibly of some clinical importance because it might imply gingival recession. It may have occurred as result of low-grade trauma due to impaction of foreign bodies (retraction cord) on the gingival tissue. Direct injury to the gingiva through mechanical procedures often shows obvious and immediate changes (de Gennaro et al. 1982, Feng et al. 2006). Previous studies reported that gingival retraction with cord caused destruction of the junctional epithelium that took 8 days to heal and caused gingival recession of about 0.2–0.1 mm (Ruel et al. 1980, Wassell et al. 2002). This study did not demonstrate that at a significant level, due probably to the crudeness inherent in the PD measurement. The fact that no anaesthesia was used could have resulted in reduction of the force of impaction. Dentists tend to increase the force of cord placement in the absence of pain. None of the other materials caused any significant changes on PD mean after 1 or 7 days. As mentioned previously, the use of structurally healthy teeth may imply that the retraction techniques could have been used in a different way, causing a different packaging force in the sulcus. Nevertheless, similar results were reported by Yang et al. (2005), who found that the greatest amount of gingival recession was demonstrated by the use of epinephrine-impregnated cord while the recession observed in the cordless techniques was too small and clinically insignificant.

The GI is a valuable tool in assessing gingival condition (Löe & Silness 1963). This index is probably the most widely used index in clinical trials, and provide a more objective assessment of gingivitis than do indices which rely solely on visual criteria (Lang & Corbet 1995).

All techniques caused gingival injury after the first day as shown by the significant increase of GI. This may be explained by the reaction of the inflammatory cells to the mechanical or chemical trauma (de Gennaro et al. 1982). However, when the three groups were compared after the first day, the greatest increase was significantly evident in the Expasyl group, while Ultrapak and Magic Foam groups showed similar increase. Expasyl contains 15% aluminium chloride, which has been reported to result in local tissue damage and transient ischemia in concentrations higher than 10% (Donovan et al. 1985, Felpel 1997, Polat et al. 2007). All groups showed tissue recovery after 7 days. Magic Foam showed the best healing followed by Ultrapak. Expasyl group showed slower healing, and was still significantly different from the baseline measurements. The results for the Ultrapak group in this study were similar to those reported by Feng et al. (2006) who reported that GI was the highest in the first and second day after placement of retraction cord, but it appeared clinically to reverse itself in 2 weeks.

Dentine sensitivity is dependent on exposure and patency of the dentinal tubules (Addy 2002, Banfield & Addy 2004). Expasyl induced sensitivity in four subjects. This might be attributed to its acidity, which may have affected the patency of the dentinal tubules (Baharav et al. 1997). In addition, it was noticed that Expasyl caused a degree of dryness, which although was a desirable characteristics for making successful impressions, it may have resulted in sensitivity.

Bleeding during and after application was only observed with the use of the non- impregnated Ultrapak cord. Retraction cord is usually used in combination with local anaesthesia and a haemostatic agent to provide better control over bleeding. Homeostasis was controlled by the aluminium chloride in the Expasyl group, while the Magic Foam was only applied with little pressure on the gingiva. This was similar to the findings reported by Yang et al. (2005) who found that less bleeding and pain was observed with the cordless techniques compared with the use of traditional retraction cord.

This study did not investigate the efficiency in achieving gingival deflection among the three techniques. This area requires further research to provide the clinicians with valuable clinical information on the efficiency of the cordless techniques.

Each type of retraction appears to possess desirable characteristics. It is imperative to match positive characteristics to a particular challenge presented by each unique patient, clinical condition, and specific abutment.

## Conclusions

This study showed that all retraction techniques caused an acute injury after 1 day of retraction, which took 1 week to heal in the Ultrapak and the Magic Foam groups. The Expasyl group had the highest GI compared with others, and showed slower healing. Its use might cause sensitivity in a small number of cases. The use of cordless techniques did not require haemostatic agent to control bleeding during retraction.

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### Clinical Relevance

*Scientific rationale for the study:* The present study is the first to investigate the effects of using cordless techniques on the gingival and periodontal health in comparison with conventional retraction cords.

*Principal findings:* The data indicated that all retraction techniques caused a temporary inflammation, measured through the gingival index. The recovery at 7 days was slower for Expasyl.

Bleeding during or after retraction was only encountered with the use of conventional retraction cords.

*Practical implications:* This study showed that none of the techniques tested seems to harm the tissues in the long term; however, clinicians should be aware that Expasyl use is less friendly to the gingival tissues.

Cordless techniques do not require haemostatic agents to control bleeding.