

What's new for the clinician – excerpts from and summaries of recently published papers (September 2018)

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Compiled and edited by Prof V Yengopal, Dept. of Community Dentistry, School of Oral Health Sciences, Faculty of Health Sciences, University of the Witwatersrand

1. Diamond burs versus curettes in root planing: a randomized clinical trial.

Türktekin, F., Buduneli, N., Lappin, D.F., Türk, T., Buduneli, E. Australian Dental Journal 2018; 63: 242–252.

Gracey curettes are the most widely used instruments for root planing and are regarded as the gold standard, but their usage is technique sensitive and time consuming for the clinician and efficacy is reduced in deep pockets, root irregularities, and furcations.¹ Alternative sonic, ultrasonic and rotary instruments have been investigated for potential benefits in improving mechanical access. Sonic and ultrasonic instruments are used for scaling, but these cannot provide smooth root surfaces.

Intensiv Perio Set is a rotating diamond bur system developed for odontoplasty, scaling and root planing. It is used only in right angle hand piece, at rotation speeds of 6000 rpm, with reduced pressure application. These burs have two different head types for morphologically different areas; flame or tapered, three different grains; 75, 40, or 15 µm, with either a short or long neck for each unit. Burs with 75 µm grain are used only in odontoplasty, whereas, 40 and 15 µm burs are used for scaling and root planing.

There is no clinical study in humans evaluating microbiological, biochemical and scanning electron microscopic (SEM) findings of non-surgical periodontal therapy with diamond burs. Different techniques and instrumentation used for SRP may lead to differences in surface properties that may affect treatment outcome by creating retention loci for bacteria.

Tactile perception by the clinician may not be precise enough to determine the smoothness of a root surface. Therefore, *in vitro* evaluation techniques are frequently used in studies comparing root surface topography following SRP with various instruments. It is hypothesized that RP with diamond burs provide comparable findings with curettes in pockets with probing depth (PD) of 5 mm more in a shorter time.

Veerasamy Yengopal, BChD, BScHons, MChD, PHD, Community Dentistry Department, School of Oral Health Sciences, University of Witwatersrand, Medical School, no 7 York Road, Parktown 2193. Email address: veerasamy.yengopal@wits.ac.za

ACRONYMS

CAL:	Clinical Attachment Level
GCF:	Gingival Crevicular Fluid
IL:	Interleukin
LTSI:	Loss Of Tooth Substance Index
OPG:	Osteoprotegerin
PBI:	Papilla Bleeding Index
PCR:	Polymerase Chain Reaction
PD:	Probing Depth
PI:	Plaque Index
RCI:	Remaining Calculus Index
RP:	Root Planing
SEM:	Scanning Electron Microscopy
sRANKL:	Soluble Receptor Activator of Nuclear Factor-κB Ligand
SRI:	SEM Roughness Index
SRP:	Scaling And Root Planing
TNF:	Tumour Necrosis Factor
VAS:	Visual Analogue Scale

Türktekin and colleagues (2018)¹ reported on a randomized clinical trial that sought to compare diamond burs and curettes in non-surgical periodontal treatment of chronic periodontitis patients.

METHODS

Fifteen patients were recruited for this single-centred, randomized, prospective, split-mouth, controlled clinical trial. Inclusion criteria were: clinical diagnosis of generalized chronic periodontitis; presence of at least three teeth with PD of 5 mm or more and clinical attachment level (CAL) of 4 mm or more in each quadrant. Exclusion criteria were: presence of any known systemic disease or using medications that affect periodontal tissues; antibiotic treatment and/or periodontal treatment within the past six months; tobacco use during the last 12 months; and being pregnant or in the lactation period. Third molars, maxillary first premolars (due to their frequently having two roots and root concavities), crown/bridge abutment teeth and teeth

with enamel projections or pearls, or excessive destruction of crown were excluded. Plaque index (PI), papilla bleeding index (PBI), PD and CAL were measured by a single calibrated researcher at six sites/tooth, at baseline and 1, 3 and 6 months after completion of SRP.

Gingival crevicular fluid (GCF) and subgingival plaque sampling were obtained from the deepest site in each quadrant at baseline and then one month after completion of SRP. Sampling sites were air-dried gently, isolated with cotton rolls and supragingival plaque was gently removed with sterile curettes. GCF samples were collected by inserting filter paper strips (Periopaper; Oraflow, Plainview, NY, USA) one mm into the pocket and leaving for 30 s.

The absorbed GCF volume was estimated by a calibrated instrument (Periotron 8000). Subgingival plaque samples were obtained from the same sites by sterile paper points from the base of the pockets. Samples were placed separately in polypropylene tubes, frozen immediately and kept at -40°C until the laboratory analyses. Patients were motivated and instructed to brush with modified Bass technique and use interdental toothbrushes and dental floss. A strict protocol was followed and the RP was completed during a single session. In brief, RP was performed under local anaesthesia. Diamond burs (Intensiv Perio Set) were used in the test quadrants and curettes were used in the control quadrants. Randomization was performed with a computer-generated list.

In the test quadrants, 15- and 40- μm burs with long necks were used at 6000 rpm with low pressure. Tapered burs were used particularly at the anterior teeth to reach narrow subgingival sites, whereas flame burs were used at premolars and molars to reach the furcation sites and root concavities. A new bur set and a standard curette set newly sharpened with Arkansas stone were used for each patient. A single researcher performed SRP in all patients. The procedures were continued until a hard, smooth root surface was sensed with an explorer tip. The time spent for RP was recorded for both treatment types.

The samples collected at baseline and one month following SRP were subjected to polymerase chain reaction (PCR) assay standards and selected bacterial type strains were grown on agar plates prepared with the appropriate culture media and atmospheric conditions. Enzyme-linked immunosorbent assay and specific kits were used for measurement of interleukin (IL)-1 β , tumour necrosis factor- α (TNF- α), osteoprotegerin (OPG), human soluble receptor activator of nuclear factor- κB ligand (sRANKL) (Peprotech, London, UK) levels according to the manufacturers' recommendations in 96-well plates in duplicate. Colour development was measured at 450 nm with wavelength correction set at 650 nm using a microplate reader (FLUOstar Omega). The minimum detection limits were as follows: TNF- α , 1.6 pg/mL; IL-1 β , 1.6 pg/mL; OPG, 8.4 pg/mL; and sRANKL, 3.9 pg/mL.

Twenty-one hopeless teeth (three single-rooted, 18 multi-rooted) destined for extraction were randomly divided into three groups with seven teeth in each group: RP with diamond burs; RP with curettes; no treatment. A notch was made at the level of gingival margin before extraction for localization of the surface that would be examined.

Extracted teeth were rinsed with saline for 2 min. The roots were separated from the crowns and rinsed with saline, stored in 2.5% glutaraldehyde for 30–60 min, transferred to ethanol for dehydration in an ascending ethanol series (25%, 50%, 75% and 90%) and held in 100% ethanol overnight. Dehydrated samples were bonded to the bell metal, stored in a desiccator for 6 days, coated with 200 Å gold (Polar on C502).

Microphotographs were taken at the SEM Laboratory. In total, 180 photos were taken at $\times 350$ magnification. A number was assigned to each photograph before blinding the treatment to the examiner. All photographs were divided into nine equal regions by a standard grid and evaluated separately at full-screen resolution. The microphotographs were graded on a VAS scale ranging 1–10 to harmonize measurement criteria. '0' was the surface without calculus, no loss of tooth substance and devoid of instrumental marks, while '10' denoted the maximum observed contrary score.

RESULTS

This six-month follow-up study was completed with 12 patients (seven men, five women, aged 37–60 years; mean age, 46.41 ± 6.22) of the original 15 patients recruited; three patients had to be excluded due to non-compliance. The average duration of an RP session was 41.6 min for the burs and 36.5 min for the curettes ($P > 0.05$). In total, 371 sites from single-rooted (burs, 185; curettes, 186) and 239 sites from multi-rooted (burs, 122; curettes, 117) teeth were evaluated. The distribution of various teeth was similar for the two treatment modalities ($P > 0.05$).

There was no significant difference in full-mouth clinical periodontal findings at any time point of the study between teeth treated with burs and those treated with curettes ($P > 0.05$). The improvements in clinical periodontal findings were also similar with both treatment modalities. PD and CAL reductions from the baseline values were significant at single- or multi-rooted teeth with curettes and burs ($P < 0.0001$). The reductions in PD were seen to be significantly greater at single-rooted teeth than at multi-rooted teeth at 1, 3 and 6 months when burs were used for RP ($P < 0.05$) and at 3 and 6 months when the curettes were used for RP ($P < 0.05$). Clinical improvements in PD, CAL, PI and PBI were evident at 1 month at the selected GCF and microbial sample sites ($P < 0.05$) and these improvements were similar for burs and curettes ($P > 0.05$).

Bacteria numbers revealed similar findings at the two treatment sites at baseline and 1-month evaluation ($P > 0.05$). The percentages of *F. nucleatum* and *T. denticola* were reduced at curette-treated sites, while percentages of *P. gingivalis* and *Peptostreptococcus micros* were reduced at bur-treated sites of single-rooted teeth significantly at 1-month follow up when compared with the baseline values ($P < 0.05$). Gingival crevicular fluid sample volumes were similar in the two RP modalities both at baseline and 1 month after treatment. Total amount of IL-1 β and TNF- α changed similarly following treatment. The cytokine levels were similar for the two RP modalities at baseline ($P > 0.05$). At 1 month, significant differences were found in the total amounts of IL-1 β and TNF- α between the GCF samples

collected at diamond bur- and curette-treated single-rooted teeth ($P < 0.05$). Lower remaining calculus index (RCI) values were found on all surfaces of RP treatment than the untreated controls ($P < 0.0001$). Bur-treated teeth exhibited lower RCI values on all root surfaces except the furcation sites but the difference between the two RP modalities was significant only on mandibular molar furcations ($P < 0.0001$).

RP with burs revealed better results in the mandibular and maxillary furcations, whereas RP with curettes indicated better findings in the mandibular molar approximal root surfaces ($P < 0.0001$). Curettes appeared to be more successful in SRI than the burs in single-rooted teeth and mandibular furcations without significant differences ($P > 0.05$). The burs were significantly better at maxillary furcational root sites ($P < 0.0001$) and curettes were better at molar approximal root surfaces ($P < 0.0001$).

RCI and LTSI up to dentin and instrumental marks revealed no significant differences between the two treatment modalities ($P > 0.05$). Both treatment types showed improvements when compared with untreated sites on

all surfaces except for the furcations but the differences were significant only for the furcational root surfaces of bur-treated mandibular molars ($P < 0.0001$).

CONCLUSION

Within the limits of the present study, it can be concluded that RP with diamond burs provided similar clinical, microbiological and biochemical data when compared with curettes.

Implications for practice

The use of diamond burs appears to be a suitable alternative to curettes for RP in patients with chronic periodontitis.

Reference

1. Türktekin, F., Buduneli, N., Lappin, D.F., Türk, T., Buduneli, E. (2018) Diamond burs versus curettes in root planing: a randomized clinical trial. *Australian Dental Journal* 2018; 63: 242–252.

2. Effect of intracanal cryotherapy on pain after single-visit root canal treatment.

Keskin C, Özdemir Ö, Uzun I. Güler B. *Aust Endod J.* 2017; 43: 83-88.

Prevention and management of postendodontic pain is an integral part of endodontic treatment. Informing patients about expected postendodontic pain and prescribing medications to manage it can increase patient confidence in their dentist, increase patients' pain threshold, and improve their attitude toward future dental treatment.

It is generally accepted that there are various factors affecting postoperative pain including the condition of pulp and periradicular tissues, preoperative pain, and the presence of periapical radiolucency. The causes of postoperative pain can be classified as mechanical, chemical and/or microbiological injuries to the periradicular tissues. These periapical injuries often lead to periapical inflammation known as flare-ups.¹

Several strategies have been developed for postoperative pain management including prescribing prophylactic analgesics and corticosteroids, administering long-lasting anaesthesia, root canal preparation using the crown-down technique and occlusal reduction.¹

Cryotherapy is a long-standing technique that has been frequently applied in sports injuries and surgical procedures for pain management and postoperative care.¹

Cryotherapy has been reported to be effective at decreasing oedema, pain, inflammation and recovery time with short-term applications in orthopaedic, abdominal, gynaecological and hernia operations. Consequently, the local physiological effects and mechanisms of action of cryotherapy were investigated. The application of cold basically subtracts heat from tissues and results in a decreased temperature. When the temperature decreases,

vasoconstriction occurs and restricts oedema formation. Vasoconstriction also decreases cell metabolism, thereby reducing the oxygen demand of cells and limiting the production of free radicals in tissues. Inflammatory enzymes have also been reported to increase with rising temperature.¹

A local cold application onto the skin has been shown to alter pain threshold and reduce pain. Cryotherapy also affects the conduction capacity of nerves. Nociceptors are specialised nerve endings that are activated when tissue injury occurs. There are also pain receptors called thermoreceptors, which are temperature-sensitive nerve endings that are activated by changes in tissue temperature.¹ Activation of these thermoreceptors by cryotherapy can block nociception within the spinal cord.¹

In dentistry, cold application has been frequently utilised following intraoral surgical procedures for postoperative pain control. It has also been speculated that cryotherapy has the potential to result in a local anti-inflammatory effect in periradicular tissues.

However, no literature exists as to whether cryotherapy reduces postoperative pain or not. Keskin and colleagues (2017)¹ reported on a trial that sought to evaluate the effect of cold saline irrigation as a final irrigant following biomechanical preparation of root canals on postoperative pain in patients with irreversible pulpitis.

METHODS

A total of 170 patients aged between 19 and 63 years were included in this randomised clinical trial. Patients with one maxillary or mandibular tooth diagnosed

with asymptomatic irreversible pulpitis or symptomatic irreversible pulpitis with either normal apical tissues or symptomatic apical periodontitis were included in the study. Patients with immature apices or root resorption were excluded from the study. Medically compromised patients, individuals who were pregnant, patients using medications such as analgesic or anti-inflammatory drugs, patients who refused to participate in the study, patients who were allergic to articaine were also excluded from the study.

Pulp sensibility tests were based on electric pulp and cold tests. Random division of participants into a cryotherapy group ($n = 85$) and a control group ($n = 85$) occurred after informed consent but prior to the initiation of treatment. Each patient was assigned a number and asked to choose a sealed envelope, which contained a piece of paper with a group name written on it. According to the text written on the piece of paper, the patients were randomly assigned to either the cryotherapy or the control group. Both groups received pre-established procedures.

Prior to treatment the patients were instructed how to complete a visual analogue scale (VAS) to determine their pain scores. The VAS included a 10 cm straight horizontal line numbered at each centimetre with following criteria; 0, no pain; 1–3, mild pain; 4–6, moderate pain; 7–9, severe pain and 10, the worst pain experienced. After recording preoperative pain levels, local anaesthesia with 4% articaine containing 1:100 000 epinephrine was administered, a rubber dam was applied and the endodontic access cavities were prepared with sterile burs.

None of the patients required further anaesthetic use. Following removal of the pulp tissue with broach, a glide path was established with a #10 K file. The working lengths (WL) were determined using a Root ZX mini apex locator and confirmed radiographically. The root canals were instrumented with a ProTaper Next (Dentsply) system under copious irrigation with 5.25% sodium hypochlorite (NaOCl) at a rate of 3 mL min⁻¹. The files were driven by an endodontic motor and used with a continuous brushing motion according to the manufacturer's instructions.

Patency was confirmed with a #10 K file between each instrument change. The root canals were flushed with 5 mL of 17% EDTA solution agitated with EndoActivator (Dentsply) for 1 min and 5.25% NaOCl. In cryotherapy group, following completion of biomechanical preparation, the root canals were irrigated with at a temperature of 2.5°C; the solution was stored in refrigerator until use. In the control group, final irrigation was performed using 5 mL of 0.9% physiological saline solution at the room temperature.

Due to the use of cold or warm syringes during root canal treatment, blinding of the endodontists was not possible. The final irrigation was performed for 5 min in the root canals of each tooth using a 31 G NaviTip needle inserted 2 mm short of the WL (Ultradent Products).

In both groups, the root canals were dried with paper points and obturated with cold lateral compaction technique using gutta-percha cones and AH Plus (Dentsply Maillefer). Coronal access cavities were restored with direct composite restorations using dentinal adhesives (Single

Bond Universal) and universal composite resin (Charisma). Patients were instructed to complete VAS to determine their postoperative pain scores at 24 and 48 h. Patients were told to use analgesic if they experienced severe pain that required analgesics and to contact their dentists for any type of emergency related to treated teeth. Patients were contacted by telephone by one of the endodontists and asked whether they experienced any pain or use analgesics and, if so, their VAS scores were recorded.

RESULTS

The mean age (mean \pm standard deviation) of patients in the cryotherapy group was 40.01 \pm 14.92 years, and the mean age of patients in the control group was 39.21 \pm 13.9 years ($P > 0.05$). The mean baseline preoperative pain scores in the cryotherapy and the control groups were 2.3 \pm 0.8 and 2.0 \pm 0.6, respectively, showing no significant difference ($P > 0.05$). Distribution of tooth type also showed no significant differences between groups ($P > 0.05$). All of the 170 patients included in the study returned 24 and 48 h after their treatment to complete the VAS forms, and none of the patients reported taking any analgesics.

Patients in the cryotherapy group reported significantly lower VAS scores compared with patients in the control group ($P < 0.05$) at 24 h follow-ups. In the cryotherapy group, 85.88% of patients had no postoperative pain, 12.94% of patients reported mild pain, and 1.18% of patients reported moderate pain; in the control group, 68.23% of patients had no postoperative pain, 24.71% of patients reported mild pain, and 7.06% of patients reported moderate pain at 24 h.

At the 48 h follow-up pain scores revealed a significant reduction; only one patient from the cryotherapy group (1.17%) and two patients from the control group (2.35%) reported mild pain. None of the patients reported severe pain or flare-ups during the period of the study. There was no significant difference between gender and the postoperative pain in either group ($P > 0.05$). There was also no significant difference between the tooth type and the postoperative pain in either group ($P > 0.05$).

CONCLUSION

Cryotherapy reduced postoperative pain following single-visit root canal treatment in teeth with vital pulps. Over a 24 hour period, patients in the cryotherapy group reported significantly lower postoperative pain than patients in the control group.

Implications for practice: This trial provides evidence for the use of cryotherapy as a simple, cost-effective, and non-toxic option for postoperative pain control in single visit root canal treatment. Significant postoperative pain relief is obtained within 24 hours as compared to the use of 0.9% physiological saline solution at the room temperature.

Reference

1. Keskin C, Özdemir Ö, Uzun I, Güler B. Effect of intracanal cryotherapy on pain after single-visit root canal treatment. *Aust Endod J.* 2017; 43: 83-88.