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

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## 1. Root surface alterations following manual and mechanical scaling: A comparative study

M Maritato, L Orazi, D Laurito, et.al. Int J Dent Hygiene. 2018; 16: 553-8.

Periodontitis and gingivitis are common inflammatory conditions affecting the oral cavity. These conditions can be managed in nearly all cases when proper plaque control is practiced, requiring professional cleanings in the form of scaling and polishing and daily brushing and flossing. Scaling and root planing involve both the cleaning and smoothing of the root surface. In the past, the removal of dental plaque, calculus and altered cement was performed using hand-held instruments only, for example sickle, curettes, chisel, files and hoes.[1]

Sonic and ultrasonic scalers are referred to as power-driven scalers and are currently used for scaling and root planing in conjunction with, or as an alternative to, hand-held instruments. There is still some controversy about the effectiveness of available treatment options. According to some authors, ultrasonic scalers leave more contaminated cementum on the root surface compared with curettes, and hence consider the power driven scalers as adjuncts to hand instruments for tooth surface debridement.[1]

Further concern has been raised concerning the effects of periodontal instrumentation on root surfaces as several studies on plaque accumulation have found a positive correlation between root roughness and plaque growth, with a greater amount of plaque on rougher than on smooth surfaces.[1] Maritato and colleagues (2018)[1] reported on an *in vitro* study that sought to analyse the morphological changes and the roughness on the root surfaces of extracted teeth treated with hand curette and with two different mechanical ultrasonic devices.

### MATERIALS AND METHODS

Twenty-four extracted monoradicular human teeth were selected for the study. Inclusion criteria were the following: teeth extracted as a result of severe periodontal disease (probing depth >6 mm), tooth mobility (grade II or grade III), no root decay and no history of periodontal treatment over the past six months. All specimens were washed and cleaned to remove any residual soft tissue attached to the root surface. Calculi were not removed during the sample preparation. After embedding in plaster casts, the samples were randomly divided into four groups (n=six teeth per group) and the middle third of the mesial and distal root surfaces of each tooth were instrumented with the following devices:

- **Group A:** Piezoelectric ultrasonic device *Piezon Master 400* with scaler tip "A"
- **Group P:** Piezoelectric ultrasonic device *PiezoSmart®* alone with a scaler tip "P1"
- **Group C:** Gracey curette 7/8 alone
- **Group AC:** Piezoelectric ultrasonic device *Piezon Master 400* with scaler tip "A" followed by Gracey curette 7/8

Each sample was instrumented until a smooth, calculus-free surface was obtained. One single operator performed the tests to ensure the same working conditions and consistency in applied pressure during scaling. Subsequently, 5 × 5 mm sections of each surface were cut (thus obtaining n=12 sections per group) and sent for surface analysis.

After instrumentation, nine specimens per group were randomly selected for topographic analysis using a white light interferometer. The data was enhanced digitally and different amplitude parameters were evaluated: $S_a$, average surface height deviation amplitude (arithmetic mean of the distances between the points of the surface and a medium reference plane); $S_t$, distance between the highest peak and the deepest valley within the measured area; $S_q$, root-mean-square roughness (mean square of the distances between the points of the surface and a medium reference plane).

For each parameter, the arithmetic mean, the standard deviation and maximum and minimum values were recorded. Finally, three specimens for each group were analysed using a scanning electron microscope (SEM).

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## RESULTS

Interferometric analysis with a three-dimensional mapping revealed the residual roughness of the samples. The most pronounced roughness alterations were observed in Group C ($S_a = 24.98\,\mu m$). Group AC also showed significant surface alterations ($S_a = 14.48\,\mu m$), while the piezoelectric ultrasonic scalers used in groups A and P produced moderate peaks and less surface modifications than the first two groups ($S_a = 8.99$ and $S_a = 4.45\,\mu m$, respectively). Statistically significant differences were found for $S_a$ and $S_q$ between groups C and P (P = .036 and .023, respectively). For the SEM analysis, samples treated by hand curette (Group C) revealed a non-homogeneous surface with some deeper and smooth portions. In the group treated with the combined technique (Group AC), some areas were characterized by major substance loss and no well-defined borders, presumably due to hand instrumentation. The root surfaces presented, however, a more homogeneous morphology compared with Group C. Finally, samples treated by piezoelectric ultrasonic devices (groups A and P) presented only superficial grooves distributed unevenly, within an almost uniform cementum layer.

## CONCLUSION

The results of this study indicate that both mechanical and hand professional instrumentation can have an impact on the tooth surface. Hand curettes produced the most remarkable surface alterations, modifying the root morphology and roughness, while piezoelectric devices showed a limited but still present impact on root surfaces. Both interventions thus showed evidence of a negative impact on the integrity of the root surfaces.

### Implications for practice

The clinical implications of this and other *in vitro* studies can be questioned and the study is far from giving a definitive answer to the question about the most effective periodontal instrumentation. However, clinicians should be aware that, based on the current knowledge, both manual and mechanical devices could eventually damage the root surface as a result of improper use.

In this study, piezoelectric instrumentation has been demonstrated to preserve root morphology to a greater extent than the use of manual curettes although all the tested instruments produced surface alterations.

**Reference**

1. Maritato M, Orazi L, Laurito D, et.al. Root surface alterations following manual and mechanical scaling: A comparative study. Int J Dent Hygiene 2018; 16: 553-558.

# 2. A comparative evaluation of three obturation techniques in primary incisors

JEJ Akhil, B Prashant, KK Shashibushan. Clin Oral Invest. 2019; 23: 689-96.

Dental caries continues to be one of the most common oral conditions that affects young children in both developed and developing countries. Primary teeth are needed as they act as a natural space maintainer, thereby preventing detrimental psychological effects, aiding in proper mastication, phonation, swallowing, aesthetics, and preventing the development of aberrant oral habits due to loss of teeth.[1]

Pulp treatment to preserve the primary tooth is becoming more common as more parents become aware of the need to keep the primary teeth in the oral cavity for as long as is possible/needed. A three-dimensional (3-D) fluid tight seal is essential in an aseptically prepared root canal to prevent recurrence of infection.[1] This is difficult to achieve due to varied morphologies of primary teeth such as thin ribbon-shaped and lateral branching canals, apical ramifications, and connecting fibrils.[1] Different obturation materials and techniques are used to obtain a proper apical seal with fewer voids.[1] Zinc oxide eugenol paste (ZOE), calcium hydroxide $Ca(OH)^2$ paste, iodoform, and/or a combination of these are the most commonly used obturating materials in primary teeth. However, none meet all the criteria for an ideal filling material.[1] The success of pulpectomy depends on appropriate case selection and usage of ideal obturating materials with proper technique of obturation.[1]

Various obturating techniques like endodontic pressure syringe, lentulospiral, mechanical syringe, incremental filling technique using endodontic finger or hand plugger, jiffy tube, tuberculin syringe, reamer technique, insulin syringe technique, pastinject, cotton pellet, paper point, small amalgam plugger or condenser, disposable injection technique and navitip technique have been used to obturate primary teeth root canals.[1]

Obturation quality of *in vivo* or *in vitro* techniques can be evaluated using radiographs, fluid filtration, bacterial leakage, dye penetration, radio isotopes, microscopic analysis, clearing technique and digital radiography methods like radiovisiography (RVG) or cone beam computed tomography (CBCT). However, there is no literature available regarding the evaluation of obturation quality using three different obturation techniques such as lentulospiral, insulin syringe, and endodontic plugger with a two-dimensional (2-D) digital intra-oral receptor (DIOR) (Vatech, Ez Sensor) and CBCT (Planmeca, Promax® 3D Classic). Akhil and colleagues (2019)[1] reported on an *in-vitro* study using DIOR and CBCT that sought to evaluate and compare the obturation quality, based on the assessment of underfilling, optimal filling, over-filling, and the location of voids in primary incisors among the three obturation techniques.

## MATERIALS AND METHODS

Thirty-three extracted single-rooted primary incisor teeth having full root length were collected. Any teeth with signs of root canal obstruction, gross decay or fracture were excluded. Collected teeth were cleaned and stored in saline until use. Access was gained with carbide bur and pulpectomy was performed by a single trained operator. The canals were dried using sterile absorbent paper points.

After the canal preparation, the apical foramen was covered by a ball of red wax measuring approximately 4–5 mm in diameter, to create a halo anatomical apical space around each root apex. This served as a collection area for any extruded canal filling material, simulating identical environment as *in vivo* conditions. The apical parts of the roots were then mounted in the centre of cold-cured acrylic resin blocks. Later, 33 teeth were randomly selected with 11 teeth in each obturating group. The prepared root canals were filled with slow-setting ZOE. A creamy consistency was achieved by mixing one volume unit of powder and two volume unit of liquid on a dry glass slab at room temperature for 45 seconds. Obturation was done 1 mm short of radiographic apex.

### Group 1: lentulo spiral method

A lentulospiral file (21 mm, Dentsply, Maillefer) was mounted on a rotary slow-speed handpiece (1000 rpm), which was adjusted in clockwise rotation initially to pick up the freshly mixed ZOE. After insertion into the canals, it was operated in a counter clockwise direction. This procedure was repeated 3–5 times until the canal orifices were visibly filled.

### Group 2: insulin syringe method

An insulin syringe (size 30 gauge) loaded with ZOE was inserted into the canal. ZOE was compacted into the canal by pressing the plunger. The needle was then gradually withdrawn from the canal while the material was still being dispensed.

### Group 3: endodontic plugger method

An endodontic finger plugger (35 size, 21 mm) corresponding to the last instrument size was used to incrementally plug the mix into the canal until it was visibly filled near the orifice.

To control paste delivery in all groups, a rubber stopper was placed around each instrument at a distance determined by preoperative measurements. In all groups, when the canals were visibly filled, a wet cotton pellet was used to lightly tamp the material into the canal. Later, the access cavity was filled with a thick mixture of ZOE. All the samples were stored in 37 °C in 100% relative humidity for a day and thereafter scanning was performed.

The quality of the obturation, measured as optimal filling, underfilling, overfilling, and voids (presence and location), was evaluated with DIOR. Radiographic evaluation was done in both bucco-lingual and mesio-distal directions using a paralleling cone technique. Obturated canals were assessed on the basis of presence and number of voids in each third of the root canal (coronal, middle, apical). All the results were reviewed by the second evaluator.

The obturation quality of the filled root canals was recorded, according to the distance of the ZOE filling from the apex using Coll and Sadrian criteria as follows:

- **Score-1 (under filling):** canal filled more than 2 mm short of the apex.
- **Score-2 (optimal filling):** canal having zinc oxide eugenol ending at the radiographic apex or up to 2 mm short of apex.
- **Score-3 (over filling):** any canal showing zinc oxide eugenol outside the root apex.

## RESULTS

The quality of obturation was significant ($P = 0.02$) between the three tested groups with Fisher's exact test in both DIOR and CBCT. The highest optimal filling was found with lentulospiral (90.9%) followed by endodontic plugger (81.8%) and the least was in insulin syringe (63.6%) on both DIOR and CBCT evaluations.

Among the three obturation techniques, statistically significant differences in the number of voids were seen in DIOR (in the apical one third of root, $P = 0.02$) and in CBCT (apical one third of the root, $P = 0.04$ and in the total length of the root, $P = 0.03$)

The highest number of voids was seen in lentulospiral technique followed by endodontic plugger and the least seen in insulin syringe in both DIOR and CBCT. On comparing the number of voids in obturated root canals between the data provided by DIOR and by CBCT, using a paired t test for different obturation techniques, DIOR showed statistically more number of voids at coronal one third of root in lentulospiral group ($P < 0.001$), middle one third of root in insulin syringe ($P = 0.001$) group, and total length of the root in lentulospiral ($P = 0.04$) and insulin syringe ($P = 0.02$) groups.

## CONCLUSION

The study concluded that lentulospiral was effective in terms of optimal length of root canal filling in primary incisors when compared with insulin syringe and endodontic plugger group. The insulin syringe technique resulted in the least number of voids compared with endodontic plugger and lentulospiral groups. Both DIOR and CBCT were effective in determining the length of obturation. However, for void detection, DIOR performed better than CBCT.

### Implications for practice

In day to day practice, DIOR provides a more easily accessible, less expensive, low radiation operational method compared with CBCT. This helps in gaining more confidence for the clinician in a 2-D imaging technique.

### Reference

1. Akhil JEJ, Prashant B, Shashibushan KK. Comparative evaluation of three obturation techniques in primary incisors using digital intra-oral receptor and CBCT—an *in vitro* study. Clin Oral Invest 2019; 23: 689-96.