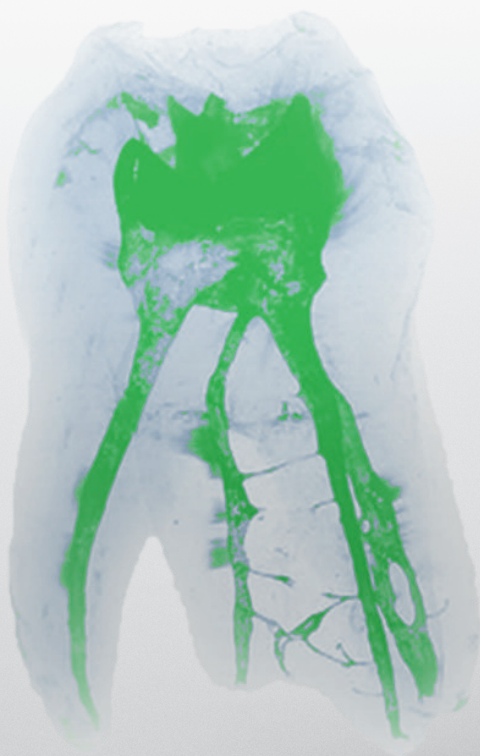




FKG

swiss endo



08/2017

Monograph

"Granted that our medical devices are unique and at the cutting edge of technology, there still remains room to improve the understanding of patient and dentist benefits that can be expected from our products. Provided in this monograph are clinical references that will support and guide you in selecting the suitable FKG instruments."

Thierry Rouiller, CEO of FKG Dentaire SA, 11.07.2017

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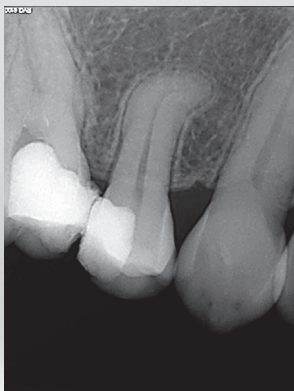
01

Glide Path

"The importance of adequate, straight-line access to the root canals cannot be overstated. Access into the root canal system needs to provide a direct pathway into the orifices without weakening the remaining tooth structure."

AAE (American Association of Endodontists) – ROTARY INSTRUMENTATION: AN ENDODONTIC PERSPECTIVE

Illustration of a case with a severe apical curvature instrumented with ScoutRace



Pre-operation
Diagnosis: pulpitis



Post-operation
Preparation: 35/.04

► ScoutRace

Scouting Ability of 4 Pathfinding Instruments in Moderately Curved Molar Canals

Gustavo De-Deus, Felipe Goncalves Belladonna, Erick Miranda Souza, Vanessa de Oliveira Alves, Emmanuel João Nogueira Leal Silva, Evaldo Rodrigues, Marco Aurelio Versiani, and Carlos Eduardo da Silveira Bueno
JOE 2016; Vol. 42(10); p1540–1544

Abstract

Introduction:

Glide path preparation has been recommended as a mandatory clinical step to ensure the safe usage of nickel-titanium (NiTi) rotary instruments. This study aimed to evaluate the effectiveness and fracture rate of 4 pathfinding NiTi rotary instruments in mechanically negotiating moderately curved molar canals.

Methods:

Moderately curved maxillary ($n = 120$) and mandibular ($n = 120$) molars were randomly distributed into 4 experimental groups ($n = 60$, 30 maxillary and 30 mandibular molars) according to the instrument used for glide path preparation: ScoutRace 10/.02 (FKG Dentaire, La Chaux-de-Fonds, Switzerland) (800 rpm and 1-Ncm torque), ProDesign 25/.01 (Easy Equipamentos Odontologicos, Belo Horizonte, MG, Brazil) (350 rpm and 1-Ncm torque), Mtwo 10/.04 (VDW, Munich, Germany) (280 rpm and 1.2 Ncm torque), or ProGlider 16/.02 (Dentsply Maillefer, Ballaigues, Switzerland) (300 rpm and 5-Ncm torque). The instrument fracture rate and the absolute and percentage frequencies of molars in which the pathfinding instruments reached the full working length in all root canals according to tooth and canal types were recorded and statistically compared using the Pearson's chi-square test ($\alpha = 5\%$).

Results:

The highest and lowest frequency of reached the full working length canals were observed in the ScoutRace (68.3%) and Pro-Design (38.3%) groups ($P < .05$), respectively, whereas the Mtwo (58.3%) and ProGlider (51.6%) groups showed intermediate results ($P > .05$). The ProGlider group showed the highest percentage frequency of instrument separation (11.6%) followed by the Mtwo (8.3%), ScoutRace (3.3%), and ProDesign (3.3%) groups ($P < .05$).

Conclusions:

ScoutRace performed more efficiently and with less instrument breakage than the other systems. ProDesign was the least efficient, and ProGlider exhibited the highest rate of instrument breakage among the systems tested.

Extract

"ScoutRace appeared as the most effective pathfinding instrument, producing the highest frequency of canals classified as RFWL (68.3%). This outcome may be the result of its file's design, which has a small tip size (ISO #10) and a continuous low taper (.02) compared with the other tested systems. This design has been found to minimize the contact area between the shaft and the dentinal walls, reducing torque (13); this, in turn, can render the advance of the instrument toward the apex easier."

More clinical articles:

Glide Path Preparation in S-shaped Canals with Rotary Pathfinding Nickel-Titanium Instruments

Natasha C.C. Ajuz, Luciana Armada, Lucio S. Gonçalves, Gilberto Debelian, José F. Siqueira
JOE 2013; Vol. 39(4); p534–537

Scouting the root canal with dedicated Niti files.

Gilberto Debelian, Martin Trope
Roots 2012; Vol. 2; p24–27

Mechanical Behavior of Pathfinding Endodontic Instruments.

Hélio P. Lopes, Carlos N. Elias, José F. Siqueira, Renata G. Soares, Letícia C. Souza, Julio C.M. Oliveira, Weber S.P. Lopes, Marcelo Mangelli
JOE 2012; Vol. 38(10); p1417–1421

Focus

"Glide path creation has been extensively recommended as a mandatory clinical step to improve the safety and efficiency of rotary nickel titanium (NiTi) instruments by preventing the taper lock phenomenon, thus increasing the instrument's life span by diminishing fracture rates and preventing shaping errors.

Glide path preparation usually has been performed with conventional stainless steel hand files; however, in the last years, dedicated mechanical NiTi instruments were designed exclusively for glide path preparation purposes. Compared with manual preparation, mechanical glide path technique has been shown to significantly reduce procedural chair time while decreasing postoperative pain and flare-ups (2, 6), preserving the original root canal morphology."

*Scouting Ability of 4 Pathfinding Instruments in Moderately Curved Molar Canals
Gustavo De-Deus et al.
JOE 2016; Vol. 42(10); p1540–1544*

02

Canal shaping

"The goal of root canal shaping is to allow an effective irrigation that will facilitate the cleaning and to eliminate the pulp, the bacteria. The desired shape should altogether prepare a cavity specific to the root canal anatomy and allow a three-dimensional obturation."

S. COHEN, R. BURNS – PATHWAYS OF THE PULP

Irreversible pulpitis of the mandibular left first molar.

After preparing a glide path with K-file 10/.02 and 15/.02, the XP-endo® Shaper was used at speed of 800 continuous rotations per minute. Due to its shape memory, this one-file shaping instrument had the ability to expand inside the root canal, reaching a final canal shape of 30/.04.



Preoperative radiograph of a mandibular left first molar



Postoperative radiograph showing a tight root canal filling performed with a vertically warm gutta percha technique

► BT-Race

In vitro evaluation of root canal transportation after use of BT-Race files

Ranya Faraj Elemama, Jose Antonio Capelas, Mário Vaz, Nuno Viriato, Maria de Lurdes Ferreira Lobo Pereira, Álvaro Azevedo

Rev Port Estomatol Med Dent Cir Maxilofac. 2016.

<http://dx.doi.org/10.1016/j.rpemd.2016.02.003>

Abstract

Introduction:

To evaluate the effect of repeated use on the shaping ability of the BT-Race instrument.

Methods:

Thirty-six canals in resin blocks were allocated into six groups. Glide paths were flooded with alcohol while canals were prepared using a crown-down technique to a final apical size of 35/04. Pre- and post-instrumentation images were taken using macroscopic magnifier, layered by PaintShop Pro9 software, and canal transportation was measured using Solidwork CAD 2014 in apical, middle and coronal levels. Data were analyzed using a General Linear Model with a 0.05 significance level.

Results:

When the number of uses only was considered, there were no statistically significant differences in transportation ($F = 0.453$; $p = 0.808$). No statistically significant differences were found in transportation in the interdependence influence of the locations and the number of uses of the files ($F = 0.746$; $p = 0.691$). There were statistically significant differences in this measure between the locations when all groups about number of uses ($F = 22.358$; $p < 0.0005$) were considered. The largest measures were seen at five and seven millimeters from the apex and the shortest ones in the apical area. The direction of transportation was toward the outer side of the curvature in the apical level and toward the inner side in the middle and coronal parts.

Conclusion:

BT-Race file respects the canal morphology well and was safe to use repeatedly with few incidences of transportation.

Extract

"In this study's results, the amount of canal transportations was generally small; the reason for the small amount of transportation induced by BT-Race can be explained by the file flexibility. Previous studies found that a lesser amount of transportation takes place with more flexible files.²³ It was also specified that the centered canal preparation depends on the file design, its flexibility, or the instrumentation technique.²⁴ The file sequences and BT tip of the BT-Race instrument allow adequate apical preparation sizes, ensure that the original canal shape is maintained, and keep the files centered in the canal.^{12,25} These reasons could be another cause of the small amount of observed transportation."

More clinical articles:

Shaping ability of Protaper NEXT and BT-Race nickel-titanium instruments in severely curved root canals.

*S Bürklein, D Mathey, E Schäfer
IEJ 2015; Vol. 48; p774-781*

BT-Race: biological and conservative root canal instrumentation with the final restoration in mind.

*Gilberto Debelian, Martin Trope
Roots 2014; Vol. 2; p20-23*

► iRace

Shaping ability of ProTaper NEXT, ProTaper Universal and iRace files in simulated S-shaped canals.

Sirawut Hiran-us, Somsinee Pimkhaokham, Jirapat Sawasdichai, Arata Ebihara, and Hideaki Suda
AEJ 2015

Abstract

Introduction:

The aim of this study was to determine the shaping ability of three nickel-titanium endodontic file systems by comparing three parameters: canal deviation, apical foramen position and instrumentation time.

Methods:

A glide path was established in 30 simulated S-shaped canal blocks that were randomly assigned into three groups (n = 10): ProTaper Universal, ProTaper NEXT and iRace. Each group was instrumented per its manufacturer's directions. Pre- and postoperative images were superimposed to determine any canal deviation or change in apical foramen position. The instrumentation times were recorded.

Results:

The iRace system resulted in the least mean canal deviation. The apical foramen position was least shifted by the iRace system. The iRace system also required the least instrumentation time.

Conclusion:

The iRace system demonstrated the most favourable shaping ability in all three parameters.

Extract

"Rotary NiTi systems have several advantages when used in shaping an S-shaped canal. The small taper and high flexibility of NiTi files help maintain the original shape of the root canal (4), especially when glide path preparation was performed before using NiTi rotary shaping instruments (5). It was also suggested that NiTi files with a taper greater than 0.04 and above 30 in size should not be used in the apical preparation of S-shaped canals (6). [...]"

Our findings suggest that, after a smooth glide path has been established, the iRace system is more suitable for shaping an S-shaped canal from both a mechanical and economic standpoint."

More clinical articles:

Comparative evaluation of the shaping ability of ProTaperNext, iRace and Hyflex CM rotary Niti files in severely curved root canals.

*SED M Saber, MM Nagy, E Schäfer
IEJ 2015; Vol. 48; p131-136*

Comparison of Remaining Root Dentine Thickness after 3 Rotary Instrumentation Techniques By Cone Beam Computerised Tomography- An Invitro study.

*K Sashidhar Reddy, S.Datta Prasad, C.Sunil Kumar, V.Rajashekhar Reddy, M.Hemadri Basa, Srinivas Karteek
Journal of Research and Advancement in Dentistry 2014; 3:3S; p32-39*

► BioRace

Clinical antibacterial effectiveness of root canal preparation with reciprocating single-instrument or continuously rotating multi-instrument systems.

*Mônica A S Neves, José C Provenzano, Isabela N Rôças, José F Siqueira Jr
JOE 2016; Vol. 42(1); p25-29*

Abstract

Introduction:

This *in vivo* study compared the antibacterial effectiveness of a reciprocating single instrument system (Reciproc; VDW, Munich, Germany) and a rotary multi-instrument system (BioRaCe; FKG Dentaire, La Chaux-de-Fonds, Switzerland) during the preparation of infected root canals of teeth with primary apical periodontitis.

Methods:

Root canals from single rooted teeth with necrotic pulps and apical periodontitis were instrumented using either Reciproc ($n = 29$) or BioRaCe ($n = 30$) instruments under irrigation with 2.5% sodium hypochlorite. DNA was extracted from samples taken before and after preparation and subjected to quantitative analysis of total bacteria and streptococci by using the quantitative real-time polymerase chain reaction.

Results:

All initial samples were positive for the presence of bacteria, with median numbers of 7.1×10^5 and 1.31×10^5 bacterial cells for the Reciproc and BioRaCe groups, respectively. After preparation with Reciproc and BioRaCe, 16 (55%) and 15 (50%) root canals still had detectable bacteria with median counts of 7.05×10^2 and 6.03×10^1 , respectively. Both systems were highly effective in reducing the total bacterial counts ($P < .001$), and there were no significant differences between them ($P > .05$). Streptococci were highly frequent, and both systems succeeded in significantly reducing their levels ($P < .001$).

Conclusions:

Both reciprocating single-instrument and rotary multi-instrument systems were highly effective in reducing the counts of total bacteria and streptococci in root canals of teeth with apical periodontitis. Regardless of the system used, approximately one half of the teeth still had detectable bacteria.

Extract

"Two studies using culture showed that Reciproc was not different from multi-instrument systems in eliminating bacteria from the root canal (17, 18). [...]"

The present study evaluated the in vivo antibacterial effectiveness of the Reciproc system in comparison with a widely used brand of rotary multi-instrument system, the BioRaCe (FKG Dentaire, La Chaux-de-Fonds, Switzerland), during the preparation of infected root canals of teeth with primary apical periodontitis. [...] Reciproc instrumentation caused a mean total bacterial reduction of 95.9%, and BioRaCe instrumentation reduced bacterial counts in 96.9%."

More clinical articles:

Micro-computed tomographic evaluation of 2 nickel-titanium instrument systems in shaping root canals.

Ana Grasiela da Silva Limoeiro, Antônio Henrique Braitt dos Santos, Alexandre Sigrist De Martin, Augusto Shoji Kato, Carlos Eduardo Fontana, Giulio Gavini, Laila Gonzales Freire, and Carlos Eduardo da Silveira Bueno
JOE 2016; Vol. 42(3); p496-499

Comparison of two contemporary rotary systems in a pre-clinical student course setting.

M Marending, P Biel, T Attin & M Zehnder
IEJ 2015; published online

A micro-computed tomography evaluation of long oval canal preparation using reciprocating or rotary systems.

S Busquim, R S Cunha, L Freire, G Gavini, M E Machado & M Santos
IEJ 2015; Vol. 48; p1001-1006

Comparison of canal preparation using K3XF, Mtwo and BioRaCe rotary instruments in simulated curved canals.

Renata Costa Val Rodrigues, Renata G Soares, Lucio S Gonçalves, Luciana Armada, José F Siqueira Jr.
Endo(Lond Engl) 2015; Vol.9 (2); p129-135

Effects of Electropolishing Surface Treatment on the Cyclic Fatigue Resistance of BioRace Nickel-Titanium Rotary Instruments.

Hélio P. Lopes, Carlos N. Elias, Victor T.L. Vieira, Edson J.L. Moreira, Raquel V.L. Marques, Julio C. Machado de Oliveira, Gilberto Debelian, José F. Siqueira
JOE 2010; Vol. 36(10); p1653-1657

Shaping ability of four nickel-titanium rotary instruments in simulated S-shaped canals.

Antonio Bonaccorso, Giuseppe Cantatore, Guglielmo Guido Condorelli, Edgar Schäfer, Teresa Roberta Tripi
JOE 2009; Vol. 35(6); p883-886

BioRace - efficient, safe, biological based sequence files.

Gilberto Debelian, Martin Trope
Roots 2008; Vol. 4(1); p20-26

► XP-endo® Shaper

XP Shaper, A Novel Adaptive Core Rotary Instrument: Micro-computed Tomographic Analysis of Its Shaping Abilities

*Adham A. Azim, Lucila Plasecki, Ulisses Xavier da Silva Neto, Alessandra Timponi Goes Cruz, Katharina A. Azim
JOE 2017; Article in press*

Abstract

Introduction:

The aim of this study was to investigate the shaping abilities of the XP Shaper (FKG, La Chaux-de-Fonds, Switzerland) and compare the file findings with Vortex Blue (Dentsply Tulsa Dental Specialties, Tulsa, OK) using micro-computed tomographic imaging.

Methods:

Twenty matched, extracted, mandibular, central incisors with a single, oval canal were scanned preoperatively at 25- μ m resolution and postoperatively after instrumentation with either Vortex Blue in a crown-down manner up to size 30.04 or XP Shaper.

The percent of untouched walls, changes in canal volume and surface area, the amount of dentin removed, debris remaining in the canal, and the preparation taper were determined. The total time required for instrumentation using each technique was calculated in seconds.

Statistical analysis was used to compare between both groups using repeated measures multivariate analysis of variance with Bonferroni correction for post hoc comparison and independent sample *t* tests.

Results:

The XP Shaper significantly increased the canal volume ($F = 77.948, P < .001$), surface area ($F = 5.543, P = .030$), and amount of dentin removed ($F = 10.044, P = .001$) and had significantly less untouched walls ($38.6\% \pm 8.1\%$) compared with VB ($58.8\% \pm 8.5\%$). There was less debris at all levels of the canal in the XP Shaper group. Results were almost significant ($P = .059$). The XP Shaper was also significantly faster in completing the mechanical preparation of the root canal space by almost 1 minute ($t = 6.216, P < .001$).

Conclusions:

The XP Shaper can expand beyond its core size to adapt to the anatomy of the root canal space. The XP Shaper can prepare and touch more canal walls in oval-shaped canals compared with Vortex Blue. However, the final preparation taper will vary according to the anatomy of the treated tooth.

Extract

"This study highlights the efficiency, shaping abilities, and expansion properties of a newly designed instrument, the XP Shaper. It is clear that this file represents a new generation of rotary files that can expand beyond its nominal size. Standard rotary files, despite their flexibility or surface treatment, can be all classified as "nonadaptive core" instruments. [...]

On the other hand, the XP Shaper can be classified as an "adaptive core" instrument. Its small mass and expanding properties appear to better address the 3-dimensional structure of the canal while allowing enough spaces for debris to escape. This was evident by the significant increase in canal volume, surface area, percentage of untouched walls, and the amount of dentin removed while having less debris accumulation at the different levels of the canal."

More clinical articles:

Effect of ProTaper Gold, Self-Adjusting File, and XP-endo Shaper Instruments on Dentinal Microcrack Formation: A Micro-computed Tomographic Study.

*H. Melike Bayram, Emre Bayram, Mert Ocak, Ahmet Demirhan Uygün, Hakan Hamdi Celik
JOE 2017; Vol. 43(7); p1166-1169*

Focus

"The new XP system is manufactured for shaping the 3-dimensional instrumentation irregularities of root canals (10). According to the manufacturer, the file is prefabricated with the NiTi MaxWire (Martensite-Austenite electropolish-fleX) (FKG Dentaire). The metallurgical alloy gives the instrument high flexibility (10). However, Bier et al (12) reported that a greater taper NiTi file increases stress on the canal walls, causing dentinal defects. To the best of our knowledge, there is no information about dentinal crack formation after using XP files. In the present study, postinstrumentation with XP caused no new microcracks in the dentin; the present finding might relate to the XP instrument's snake-shaped design, which gives the file an extraflexible structure even at a high rotational speed (ie, 800 rpm)."

Effect of ProTaper Gold, Self-Adjusting File, and XP-endo Shaper Instruments on Dentinal Microcrack Formation: A Micro-computed Tomographic Study.

*H. Melike Bayram, Emre Bayram, Mert Ocak, Ahmet Demirhan Uygun, Hakan Hamdi Celik
JOE 2017; Vol. 43(7); p1166-1169*

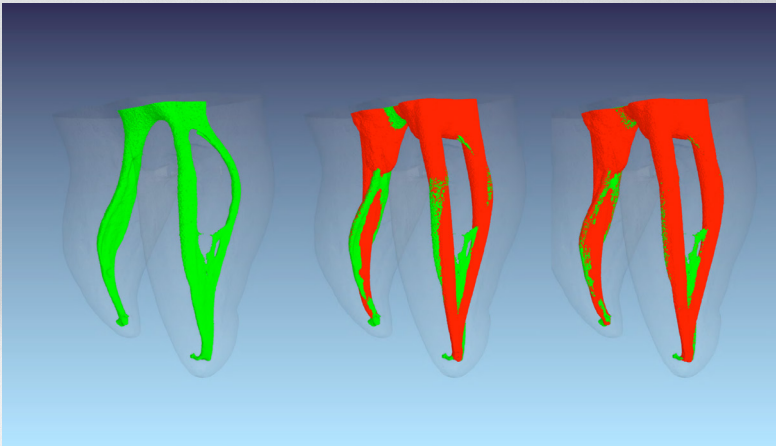
03

Canal cleaning

"Disinfection is arguably the most important step of a root canal treatment, as it has a major impact on the likeliness of a reinflammation."

B. VERHAAGEN – ROOT CANAL CLEANING THROUGH CAVITATION AND MICROSTREAMING

3D Micro CT : Canal morphology before instrumentation (green);
canal walls touched using a standard NiTi file + XP-endo® Finisher (red).



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Dr. Frank Paqué (Switzerland), All Rights Reserved

► XP-endo® Finisher

Efficacy of 4 Irrigation Protocols in Killing Bacteria Colonized in Dentinal Tubules Examined by a Novel Confocal Laser Scanning Microscope Analysis

Adham A. Azim, Hacer Aksel, Tingting Zhuang, Terry Mashtare, Jegdish P. Babu, George T.-J. Huang
JOE 2016; Vol 42(6); p928-934

Abstract

Introduction:

The aim of this study was to determine the efficiency of 4 irrigation systems in eliminating bacteria in root canals, particularly in dentinal tubules.

Methods:

Roots of human teeth were prepared to 25/04, autoclaved, and inoculated with *Enterococcus faecalis* for 3 weeks. Canals were then disinfected by (1) standard needle irrigation, (2) sonically agitating with EndoActivator, (3) XP Endo finisher, or (4) erbium:yttrium aluminum garnet laser (PIPS) (15 roots/group). The bacterial reduction in the canal was determined by MTT assays. For measuring live versus dead bacteria in the dentinal tubules (4 teeth/group), teeth were split open and stained with LIVE/DEAD BackLight. Coronal, middle, and apical thirds of the canal dentin were scanned by using a confocal laser scanning microscope (CLSM) to determine the ratio of dead/total bacteria in the dentinal tubules at various depths.

Results:

All 4 irrigation protocols significantly eliminated bacteria in the canal, ranging from 89.6% to 98.2% reduction ($P < .001$). XP Endo had the greatest bacterial reduction compared with other 3 techniques ($P < .05$). CLSM analysis showed that XP Endo had the highest level of dead bacteria in the coronal, middle, and apical segments at 50- μ m depth. On the other hand, PIPS had the greatest bacterial killing efficiency at the 150- μ m depth in all 3 root segments.

Conclusions:

XP Endo appears to be more efficient than other 3 techniques in disinfecting the main canal space and up to 50 μ m deep into the dentinal tubules. PIPS appears to be most effective in killing the bacteria deep in the dentinal tubules.

Extract

"For bacterial reduction efficiency in the main canal space, XP Endo showed a significantly higher bacterial reduction (98.2%) compared with PIPS (89.6%) and EA (93.3%). In terms of the efficiency of killing the bacteria in dentinal tubules, XP Endo treated teeth also showed the highest percentage of dead bacteria at a 50- μ m depth in the coronal, middle, and apical thirds of the canal, ranging between 78% and 82%. It may have been that mechanical effects of the file during operation together with its irrigation agitation facilitated the removal of bacteria on the canal wall and killing of the bacteria at a depth of 50 μ m. "

More clinical articles:

Ex vivo evaluation of four final irrigation protocols on the removal of hard-tissue debris from the mesial root canal system of mandibular first molars.

G B Leoni, M A Versiani, Y T Silva-Sousa, J F B Bruniera, J D Pecora, M D Sousa-Neto
IEJ 2017; April; Volume 50; p398-406

Efficacy of XP-endo Finisher file in removing calcium hydroxide from simulated internal resorption cavity.

Cangul Keskin, Evren Sariyilmaz, Oznur Sariyilmaz.
JOE 2017; January; Volume 43 (1); p126-130

Cleaning efficiency of XP-endo Finisher file in comparison with sonic and ultrasonic irrigation systems (an in vitro study).

M Ghazi Azzawi, J Aziz Mehdi
IOSR-JDMS 2017; April; Volume 16 (4); p80-86

Adjunctive steps for disinfection of the mandibular molar root canal system : a correlative bacteriologic, micro-computed tomography, and cryopulverization approach.

Flávio R F Alves, Carlos V Andrade-Junior, Marília F Marceliano-Alves, Alejandro R Pérez, Isabela N Rôças, Marco A Versiani, Manoel D Sousa-Neto, José C Provenzano, José F Siqueira Jr.
JOE 2016; Vol 42(11); p1667-1672

XP-endo Finisher: a new solution for smear layer removal.

Slavoljub Zivkovic, Jelena Neskovic, Milica Jovanovic-Medojevic, Marijana Popovic-Bajic, Marija Zivkovic-Sandic
Serbian Dental journal 2015; Vol. 62(3); online

Focus

"Recent studies showed that the irrigation of root canals using the XP-Endo Finisher appeared to be more effective on debris and smear layer removal than needle irrigation (8), which was in accordance with our findings. In previous studies, the XP-Endo Finisher showed similar results to PUI (8) and the EndoActivator (9). However, in this study, the XP-Endo Finisher showed better cleaning efficacy than PUI. Therefore, the null hypothesis that there is no difference between the various techniques was rejected because the XP-Endo Finisher removed significantly more TAP than PUI and needle irrigation. This can be attributed to its metallurgy (7). Within the limitations of this study, the XP-Endo Finisher removed significantly more TAP than the needle irrigation and PUI groups. The XP-Endo Finisher can be used as an alternative irrigation method for the removal of TAP from straight immature root canals when used in combination with NaOCl and EDTA."

Efficacy of XP-Endo Finisher in the Removal of Triple Antibiotic Paste from Immature Root Canals.

Dilek Turkyaydin, Erban Demir, Fatima Betul Basturk, Hesna Sazak Övecoglu

JOE 2017; Article in press

04

Retreatment

"..., the results of endodontic treatment are influenced by a number of biological and technical factors like diagnosis, root canal morphology, root canal instrumentation and obturation, and complications during the treatment. [...] The goal of endodontic retreatment is the same as for primary treatment, namely to obtain a bacteria-free tooth with a bacteria-tight root filling and an adequate coronal restoration so that healing may occur and reinfection is prevented."

L. TRONSTAD – CLINICAL ENDODONTICS

Representative micro-CT 3D reconstructions of a maxillary canine with oval-shaped canal after obturation showing the presence of remnants of root canal filling materials (in pink) after retreatment procedures using standard rotary instruments



After obturation procedure



After retreatment procedure

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► D-Race

Comparative evaluation of the efficiency of manual and rotary Gutta Percha removal techniques.

Ashwini S Colaco & Vivekananda AR Pai
JOE 2015; Vol. 41 (11); p1871-1874

Abstract

Introduction:

This study aimed to evaluate the efficiency of 2 manual and 2 rotary gutta-percha (GP) removal techniques in terms of both the total operating time and GP remnants left in the canal.

Methods:

GP was removed with manual techniques using H-files and xylene (H + X) and H-files and System B (H + SB) (SybronEndo, Orange, CA) and with rotary techniques using the ProTaper Universal Retreatment (PTUR) (Dentsply Maillefer, Ballaigues, Switzerland) and D-RaCe Retreatment (D-RR) (FKG Dentaire, La Chaux-de-Fonds, Switzerland) systems. The total operating time was evaluated as the time taken to reach the working length and completely remove GP until no radiopaque remnants were observed in the final radiograph. Any GP remnants left in the canal were evaluated in terms of percentage in the whole canal.

Results:

Rotary techniques were significantly faster and left lesser GP remnants than manual techniques ($P < .05$). In rotary techniques, the D-RR system was significantly faster than the PTUR system ($P < .05$), but there was no significant difference between them regarding GP remnants ($P > .05$). In manual techniques, H + X was significantly faster and left lesser GP remnants than H + SB ($P < .05$).

Conclusions:

Rotary techniques were more efficient than manual techniques in GP removal. Overall, the D-RaCe Retreatment system was most efficient, whereas manual use of H-files with System B was least efficient. However, because all the techniques showed GP remnants in the canal and radiographs failed to show these remnants, additional measures would be required to ensure complete GP removal and check for cleaner canals during endodontic retreatment.

Extract

"In our study, rotary techniques had significantly less GP remnants than manual techniques, and this could be attributed to the design of the D-RR and PTUR files. D-RR files display alternating cutting edges with a triangular cross section and a smooth surface because of a special electrochemical surface treatment. This file design provides superior sharpness and cleaning ability for the efficient removal and coronal extrusion of GP from the canal (4, 6)."

More clinical articles:

Comparative evaluation of cyclic fatigue resistance of D-RaCe and ProTaper retreatment instruments in curved artificial canals.

H.S. Topçuoğlu, G. Topçuoğlu, A. Akti.

IEJ 2016; Vol 49; p604-609.

Effectiveness of Protaper, D-Race and Mtwo retreatment files with and without supplementary instruments in the removal of root canal filling material.

Marques da Silva & coll.

IEJ 2012; Vol. 45; p927-932

Efficacy of D-Race and ProTaper Universal Retreatment NiTi instruments and hand files in removing gutta-percha from curved root canals – a micro-computed tomography study.

T. Rödig, T. Hausdörfer, F. Konietschke, C. Dullin, W. Hahn & M. Hülsmann

IEJ 2012; Vol. 45; p580-589

► XP-endo® Finisher & XP-endo® Finisher R

Removal of root canal fillings in curved canals using either reciprocating single- or rotary multi-instrument systems and a supplementary step with the XP-Endo Finisher.

Flavio R.F. Alves, Marília F. Marceliano-Alves, Julio Cezar N. Sousa, Stephanie B. Silveira, Jose C. Provenzano, and Jose F. Siqueira, Jr
JOE 2016; Vol 42(7); p1114-1119

Abstract

Introduction:

This study compared the efficacy of a reciprocating single-instrument system and a rotary multi-instrument system followed by a supplementary approach with a finishing instrument in removing the filling material from curved canals during retreatment.

Methods:

Forty mesial canals from extracted mandibular molars were instrumented and filled. Then, each mesial canal was retreated by using either Reciproc (VDW, Munich, Germany) or Mtwo (VDW) instruments, alternating the technique used per canal from root to root. The working time was recorded, and the percentage of removed filling volume was assessed by means of micro-computed tomography imaging before and after retreatment. Canals still showing filling material remnants were subjected to an adjunctive approach with the XP-Endo Finisher (FKG Dentaire, La Chaux-de-Fonds, Switzerland), and another microCT scan was taken. Data were statistically analyzed with a significance level of 5%.

Results:

The percentage of filling material removed with Mtwo instruments (96%) was significantly higher than Reciproc (89%) ($P < .05$), both used up to a final instrument size of 40. Mtwo required less time to remove the filling material than Reciproc ($P < .05$). Intragroup analysis in the Reciproc group showed that the R40 instrument removed significantly more filling material than R25 ($P < .05$). The supplementary approach with the XP-Endo Finisher was effective in significantly enhancing the removal of filling material ($P < .05$).

Conclusions:

The rotary multiple-instrument system was more effective and faster than the reciprocating single-instrument approach in removing previous root canal fillings. As for the Reciproc group, it was observed that the larger instrument promoted significantly better results. The adjunctive finishing instrument XP-Endo Finisher significantly improved filling material removal.

Extract

"A new supplementary strategy using a finishing instrument was evaluated for its ability to improve filling material removal. The results using the XP-Endo Finisher instrument were encouraging because the remaining filling volume was significantly reduced after its use. The instrument expansion at the body temperature added to its helical movement inside the canal may have allowed it to touch and displace the residual filling material."

More clinical articles:

Efficacy of XP-Endo Finisher files in the removal of calcium hydroxide paste from artificial standardized grooves in the apical third of oval root canals.

R Wigler, R Dvir, A Weisman, S Matalon, A Kfir.

IEJ 2016; June; Accepted article

Focus

"The main goal of nonsurgical canal retreatment is to re-establish healthy periapical tissues by the removal of the root canal filling materials, further cleaning and shaping, and refilling (2). Therefore, the removal of as much filling material as possible from an inadequately prepared and/or filled root canal system is necessary to uncover remaining necrotic tissues or bacteria that might be responsible for periapical inflammation and, thus, post-treatment disease (3, 4). Traditionally, root canal retreatment has been accomplished using solvent and hand files (5). An attempt to use rotary nickel-titanium (NiTi) instruments specifically designed for retreatment, such as the R-Endo system (Micro-Mega, Besançon, France), has led to the development of a more efficient way to remove the bulk of the filling materials in comparison with conventional techniques (6, 7). Unfortunately, several reports showed substantial amounts of filling remnants in the canal after retreatment using rotary instruments (4, 6–10). Despite the fact that it has not been proved that the complete removal of filling materials can improve the outcome of the retreatment procedure (3, 11), filling remnants can theoretically impair disinfection by avoiding irrigants to contact the persisting microorganisms. During this process, the anatomy of the root canal system must always be taken into account because the cross-sectional root canal shape has been reported to significantly influence the retreatment procedure (4). Although in straight canals with a round cross-section the operator may simply use rotary files of greater dimensions in order to remove filling residues (12), the retreatment of oval-shaped canals requires additional procedures (4, 7, 9, 13–15) because further enlargement may create complications such as root perforation or canal transportation (16)."

Removal of Filling Materials from Oval-shaped Canals Using Laser Irradiation: A Micro-computed Tomographic Study

Ali Keleş, Hakan Arslan, Aliye Kamalak, Merve Akçay, Manoel D. Sousa-Neto, Marco Aurélio Versiani

JOE 2015; Vol. 41(2); p219-224

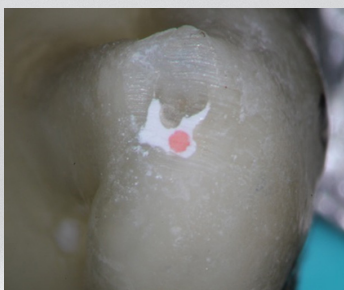
05

Obturation

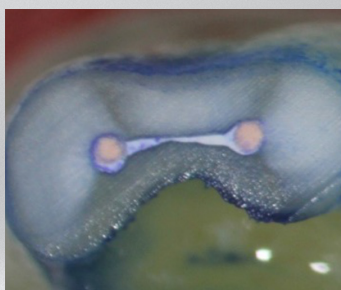
"The purpose of the obturation phase of a root filling is two-fold; to prevent microorganisms from re-entering the root canal system, and to isolate any microorganisms that may remain within the tooth from nutrients in tissue fluids."

P. CAROTTE – BRITISH DENTAL JOURNAL

3D filling using TotalFill® BC Sealer™ and TotalFill® BC Points™



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► TotalFill® BC Sealer™

Evaluation of radiopacity, pH, release of calcium ions and flow of a bioceramic root canal sealer.

*George Taccio de Miranda Candeiro, Fabricia Capelo Correia, Marco Antonio Hungaro Duarte, Danieli Colaço Ribeiro-Siqueira, Giulio Gavini.
JOE 2012; Vol. 38(6); p842-845.*

Abstract

Introduction:

The aim of the present study was to evaluate the physicochemical properties of a bioceramic root canal sealer, Endosequence BC Sealer. Radiopacity, pH, release of calcium ions (Ca(2+)), and flow were analyzed, and the results were compared with AH Plus cement.

Methods:

Radiopacity and flow were evaluated according to ISO 6876/2001 standards. For the radiopacity analysis, metallic rings with 10-mm diameter and 1-mm thickness were filled with cements. The radiopacity value was determined according to radiographic density (mm Al). The flow test was performed with 0.05 mL of cement placed on a glass plate. A 120-g weight was carefully placed over the cement. The largest and smallest diameters of the disks formed were measured by using a digital caliper. The release of Ca(2+) and pH were measured at periods of 3, 24, 72, 168, and 240 hours with spectrophotometer and pH meter, respectively. Data were analyzed by analysis of variance and Tukey test ($P < .05$).

Results:

The bioceramic endodontic cement showed radiopacity (3.84 mm Al) significantly lower than that of AH Plus (6.90 mm Al). The pH analysis showed that Endosequence BC Sealer showed pH and release of Ca(2+) greater than those of AH Plus ($P < .05$) during the experimental periods. The flow test revealed that BC Sealer and AH Plus presented flow of 26.96 mm and 21.17 mm, respectively ($P < .05$).

Conclusions:

Endosequence BC Sealer showed radiopacity and flow according to ISO 6876/2001 recommendations. The other physicochemical properties analyzed demonstrated favorable values for a root canal sealer.

Extract

"An alkaline pH promotes the elimination of bacteria such as Enterococcus faecalis that might survive after chemomechanical preparation and induce or maintain periapical inflammation but do not survive in pH near 11 (12, 13). It has still been suggested that the mechanism of repair stimulation by deposition of mineralized tissue depends on pH and on the ability to release Ca(2+) (14, 15). [...]"

Another interesting fact is that the release of calcium and hydroxyl ions from the calcium silicate-containing material might result in the formation of an apatite layer when it comes in contact with phosphate-containing fluids for 2 months. Thereby, formation of this interfacial layer develops a chemical bond between calcium silicate-based materials and dentinal walls (18)."

More clinical articles:

Evaluation of the filling ability of artificial lateral canals using calcium silicate-based and epoxy resin-based endodontic sealers and two gutta-percha filling techniques

*R. Fernández, J. S. Restrepo, D. C. Aristizábal and L. G. Álvarez
IEJ 2016; Volume 49(4); p365-373,*

The effect of obturation technique on the push-out bond strength of calcium silicate sealers

*Christopher DeLong, Jianing He, Karl F. Woodmansey
JOE 2015; Vol. 41(3); p385-388*

In Vitro Cytotoxicity of Calcium Silicate-containing Endodontic Sealers.

*Hui-min Zhou, Tian-feng Du, Ya Shen, Zhe-jun Wang, Yu-feng Zheng, and Markus Haapasalo
JOE 2015; Vol. 41(1); p56-61*

Root filling materials and techniques: bioceramics a new hope?

*Martin Trope, Alf Bunes & Gilberto Debelian.
Endodontic Topics 2015; Vol.32; p 86-96*

Bioceramic materials in endodontics.

*Zhejun Wang
Endodontic Topics 2015; Vol.32; p3-30*

Clinical use of bioceramic materials.

*Markus Haapasalo, Mark Parhar, Xiang Huang, Xi Wei, James Lin & Ya Shen.
Endodontic Topics 2015; Vol.32; p97-117*

Clinical applications of bioceramic materials in endodontics / Biokeramische Materialien in der Endodontie

*Marga Ree and Richard Schwartz
Endodontic Practice 2014 (ou 2015); Vol. 7(4) / Endodontie 2014; Vol. 23(4); p1-13*

Dentin Extends the Antibacterial Effect of Endodontic Sealers against Enterococcus faecalis Biofilms

*Zhejun Wang, Ya Shen, and Markus Haapasalo
JOE 2014; Vol. 40(4); p505-508*

Bioceramic technology: closing the endo-restorative circle - Parts I and II.

*Kenneth Koch, Dennis Brave, Ali A Nasseh.
dentistrytoday.com 2010; February and March*

► TotalFill® BC RRM™

Sealing ability of two root-end filling materials in a bacterial nutrient leakage model.

HS Antunes, LF Gominho, CV Andrade-Junior, N Dessaune-Neto, FRF Alves, IN Roças, JF Siqueira Jr.
IEJ 2016; Volume 49(10); p960-965.

Abstract

Introduction:

To compare in vitro the sealing ability of rootend fillings with mineral trioxide aggregate (MTA) and BioCeramic Root Repair Material-Fast Set (BC-RRM) Putty using a novel bacterial nutrient leakage model, which provides information on whether or not intracanal bacteria are receiving nutrients from serum via leakage channels.

Methods:

Sixty single-rooted decoronated mandibular incisors with instrumented root canals were subjected to root-end resection and ultrasonic preparation. The root specimens were mounted in the experimental apparatus, and the root-end cavities filled with the test materials. The positive control group used warm Gutta-percha and no sealer. In the negative controls, the entire resected surface was covered with varnish. After sterilization in ethylene oxide, the root canal was inoculated with 1.5×10^5 washed cells of *Enterococcus faecalis*. The apparatus was filled with foetal bovine serum, leaving only the apical root immersed. After 30-day incubation, samples were taken from the canal, cultured and the colony-forming units (CFUs) counted. Statistical analysis was performed using the Mann-Whitney test for quantitative and the Fisher exact test for qualitative data.

Results:

In the MTA group, 10 of 20 (50%) specimens still had detectable viable bacteria in the canals (mean, 8.97×10^3 CFUs). In the BC-RRM Putty group, 5 of 18 (28%) specimens were positive for bacterial growth (mean, 2.88×10^4 CFUs). There was no significant difference when comparing the quantitative or presence/absence data from the MTA and BC-RRM Putty groups. Positive and negative controls yielded the expected results.

Conclusions:

MTA and BC-RRM Putty had similar sealing ability. The experimental model was effective in determining whether or not residual intracanal bacteria could survive by receiving nutrients from outside.

Extract

"The present study using a novel model to evaluate the sealing ability of MTA and BC-RRM Putty showed that both materials had similar behaviour in preventing nutrient leakage to residual bacteria."

More clinical articles:

Non-surgical repair of a cervical resorptive defect utilizing a fast set curing bioceramic root repair material.

Ilya Mer and Martin Trope

Dental Tribune ME 2016; February

The effects of EndoSequence root repair material on differentiation of dental pulp cells.

Jesus Machado, James D Johnson, Avina Paranjpe

JOE 2016; Vol. 42(1); p101-105

A combined surgical and non-surgical approach to repair an external root resorption utilizing a nano-particulate bioceramic root repair material.

Allen Ali Nasseh

Dental Tribune ME & Africa Edition – Sept-Oct 2015.

Focus

"Despite the lack of well-designed long-term clinical trials, the target premixed calcium silicate-based sealers show good physicochemical and biological properties in vitro. In general, the results were similar or better than conventional endodontic sealers as observed in in vitro and in vivo animal studies."

Are premixed calcium silicate-based endodontic sealers comparable to conventional materials? A systematic review of in vitro studies.

*Luiza H Silva Almeida, Rafael R Moraes, Renata D Morgental, Fernanda G Pappen
JOE 2017; April; Volume 43(4); p527-535*

Notes:

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FKG Dentaire SA

Founded in Switzerland in 1931, FKG Dentaire SA gained a new momentum in 1994, the year Jean-Claude Rouiller took over the reins of the company.

He propelled FKG to the forefront in the development, manufacturing and distribution of dental products destined for general practitioners, endodontists and laboratories.

The FKG strategy is centered on innovative high-precision products and the creation of machines designed specifically for the dental field. Its aim is to offer solutions that meet the most demanding needs of end users.

In 2011 the son of Jean-Claude Rouiller, Thierry, succeeded to the head of the company. Through his incentive, the network of distributors has expanded significantly and allowed FKG to make its products available in over 100 countries worldwide.

In 2012, the Swiss Venture Club rewarded FKG for its dynamism, high product quality, and its continuing innovation.

Equipped with a clean room since 2013, FKG is now developing a range of sterile products.

In 2013 and 2014 the company unveiled state-of-the-art training centers in La Chaux-de-Fonds, Dubai, and Oslo.

FKG Dentaire is certified according to international norms and regulations.



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