International Journal of Advanced Engineering Research and Science (IJAERS)
Peer-Reviewed Journal
ISSN: 2349-6495(P) | 2456-1908(O)
Vol-8, Issue-11; Nov, 2021
Journal Home Page Available: https://ijaers.com/
Article DOI: https://dx.doi.org/10.22161/ijaers.811.42

Evaluation of the Infiltration of different Endodontic Cement in Simulated Channels

Lígia Catarine Avelino Negre, Lucireni Morais Costa, Nathalia Moreira De Araujo, Eduardo Fernandes Marques

Instituto Tocantinense Presidente Antônio Carlos ITPAC/Porto Nacional – Tocantins

Received: 21 Sept 2021,

Received in revised form: 09 Nov 2021,

Accepted: 20 Nov 2021,

Available online: 30 Nov 2021

***Keywords*— Simulated Channels, Endodontic cements, Infiltration.**

***Abstract*—** *The main role of the apical sealing provided by endodontic cements is to prevent marginal infiltration of the root canals, contributing to the success of the endodontic treatment. The current work aims to evaluate the infiltration of different endodontic cements in simulated canals. Data collection was exploratory, quali-quantitative, carried out in 40 simulated channels, where they were instrumented with a Logic 2 rotary system, irrigated with 2.5% sodium hypochlorite and filled with different cements, paying attention to the spatulation time, execution of the obturation technique and root canal irrigation volume. Where they were divided into G1 (n= 10) – Endofill, G2 – Sealer 26, G3 – Pulp Canal Sealer and G4 – Mta Fillapex. The results achieved in the research show that groups G1 and G3 presented greater infiltration of the filling cement, compared to groups 2 and 4. Based on this, it is concluded that Endofill and Pulp Canal Sealer cements present greater infiltration in the root canal system compared to cements Pulp Canal Sealer and MTA Fillapex.*

I. INTRODUCTION

Endodontic treatment has several objectives and, among the main ones, is the resolution of inflammation. This type of intervention deals with highly complex processes and, at the same time, requires a very professional handling, as it requires a three-dimensional knowledge of dental anatomy. Teeth have the pulp cavity, where the dental pulp, a richly vascularized fibrous connective tissue that extends through the interior of the tooth, is found. This area can be affected by infectious diseases caused by microorganisms, which infect the entire root canal system (GAVINI, 2018).

In order to be successful in endodontic treatment, in addition to mechanical instrumentation, it is necessary to use suitable materials, such as gutta-percha and filling cements, which provide a good seal, thus avoiding recontamination of root canal systems (MARQUES et al., 2011).

Mechanical instrumentation is done with endodontic files that aim at cleaning and shaping the root canals (PRADO; ROCHA, 2017).

Currently, rotary instruments are preferred in endodontics, with the objective of facilitating the treatment, reducing the time of endodontic sessions, bringing greater comfort to the patient, avoiding physical stress and with the same effectiveness as manual instruments.

Endodontic cements are responsible for the hermetic filling of the root canals, as they fill the ramifications present in this system, formerly occupied by pulp tissue. Furthermore, in the lateral condensation technique, cement is used to reduce the interface between the cones (PRADO; ROCHA, 2017).

There are several types of endodontic cements on the market, with different chemical properties, but with the same objective to prevent infiltration through apical sealing. They are divided into cements based on zinc oxide-eugenol,

resin cements, those containing calcium hydroxide, glass ionomer based and silicone based (MARQUES et al., 2011).

Furthermore, efficiency is linked to the material's ability to offer good flow, adhesion and antimicrobial capacity. The literature also points out other important characteristics, which are observed as possible advantages and/or criteria for choices, such as settings time, ease of handling and final market price (TEIXEIRA, 2014).

The endodontic cement is used together with gutta-percha, which is a material present in the cones for root canal fillings. The most important characteristics of an endodontic cement are related to its ability to promote a seal as perfect as possible and to be tolerated by the apical tissues (ESTRELA, 2013).

According to previous discussions, Estrela (2013) states that one of the most widely used materials for filling the root canal would be gutta-percha, due to its ease of handling during the treatment. Among the countless benefits of its use, gutta percha provides many benefits for the root canal, such as the possibility of condensation and adaptation due to its irregularity, thus being a necessary tool for the endodontic procedure.

A good infiltration is the result of an adequate management of the endodontic treatment, associated with the choice of the ideal cement, to obtain a good sealing and apical flow. Therefore, it is necessary to study existing cements and practice endodontic techniques. To better serve the dental field, simulated canals were created that mimic the anatomy of the canal systems, allowing for realistic procedures to be carried out in them, facilitating learning, technique and better visibility of the filling materials inside the canal.

With this idea in hand, the objective of this work is to evaluate the infiltration of different endodontic cements in simulated canals.

II. METHODOLOGY

Forty simulated channels were used (IMdoBrasil, São Paulo, Brazil). Subsequently, the length of the roots was standardized at 15 mm with the aid of an endodontic calibrating ruler (Dentsply/Sirona, Tusla - USA). A 10 k file (Dentsply/Sirona, Tusla - USA) was previously introduced to check for possible interference, with catheter movement.

It was carried out with the Prodesign Logic 25/06 motor and rotary system (Easy, Belo Horizonte – Brazil), followed by preparation of the cervical third with a Prodesign Logic 06/25 file (Easy, Belo Horizonte – Brazil) towards the crown – apex respecting the canal anatomy, always maintaining a minimum distance of 5 mm from the apical limit on radiography and in curved canals until the beginning of curvature.

Then, odontometry was performed with a K 10 file (Dentsply/Sirona, Tusla - USA) where it was introduced into each canal until it was visualized in the apical foramen. The working length was determined 1 mm short of the apical foramen. Subsequently, a Prodesign Logic 25/06 file (Easy, Belo Horizonte – Brazil) instrumented 1mm short of the real length of the tooth.

During the entire instrumentation, irrigation was carried out with 2.5% sodium hypochlorite (Manipulation Pharmacy – Fórmula and Action – São Paulo – SP), 10 mL Lüer Slip plastic syringe (Advantive, Nanchanc Jangxi - China) and disposable needle 25 x 0.55 (BD, Curitiba - PR). 30 mL of solution were used per experimental unit. The needle was introduced during the entire instrumentation process until reaching 2 mm short of the working length.Os canais, ao término do preparo, foram secos com pontas *capillary tips* (Ultradent Products, Inc, South Jordan, Utah, USA) acopladas a sugador de alta potência e com cones de papel absorvente (Tanari, Manacapuru - AM).

Final irrigation was performed with 3 mL of 17% EDTA (Manipulation Pharmacy – Fórmula and Action – São Paulo – SP). First, 1 mL of 17% EDTA was introduced, followed by ultrasonic vibration with 25 IRRI S insert (VDW; Endo Ultrasonic Files, Endodontic Synergy, Munich, Germany) at a frequency of 30 kHz. The ultrasound insert was connected to a piezoelectric ultrasound operating at 30 kHz (CVDent 1000; CVD Vale, São José dos Campos, SP, Brazil), set at power level 3, for a period of 20s. This process was repeated 2 more times. After this process, irrigation was performed with 5 mL of sodium hypochlorite (Farmácia Formula & Ação, São Paulo - SP. The canals were dried with capillary tips (Ultradent Products, Inc, South Jordan, Utah, USA) coupled to a sucker high power and with absorbent paper cones (Tanari, Manacapuru - AM).

At the time of sealing cement selection, the standardized simulated channels were divided into 4 groups:

G1 (n= 10) - Use of Endofill cement

G2 - Use of Sealer cement 26

G3 – Use of Pulp Canal Sealer cement

G4 – Use of Mta Fillapex cement

The filling cements were mixed according to the manufacturer's recommendations.

After manipulation of the endodontic cement, the canals were filled using the McSpadden thermomechanical technique, the technique is summarized in the adaptation of

the main gutta-pecha cone to the actual working length (C.R.T.). The compactor must have the same diameter as the largest file used. The main cone is placed inside the channel and the compactor is adjusted with the help of the digital spacer on the channel walls until it encounters light resistance, and then the contra-angle drive starts in a clockwise direction, keeping it in position for 4 to 5 seconds to make the gutta-percha plasticized.

Disposal of the materials used in this study were placed in a hospital waste bag (Azeplast Indústria e Comércio Ltda., Santa Cataria – Brazil), made in accordance with ANVISA standards, after completing the laboratory procedures for this research. The hospital waste bag, with biological material, was presented to Fapac/Itapc Porto Nacional's biologically hazardous material disposal sector for disposal, in accordance with ANVISA regulations.

III. RESULTS

The methodology used in this research allowed us to obtain data from the four groups of endodontic cements studied, regarding their flow, sealing and infiltration. Below are digitized images of the samples with results obtained, equating the four cements. Figure 1 - Endofill, figure 2 - Sealer 26, figure 3 - Pulp Canal Sealer and figure 4 - Mta Fillapex. The cements with greater and better flow, sealing and infiltration were Endofil and Pulp Canal Sealer. However, the cements Sealer 26 and MTA Fillapex did not reach the desired flow, sealing and infiltration.

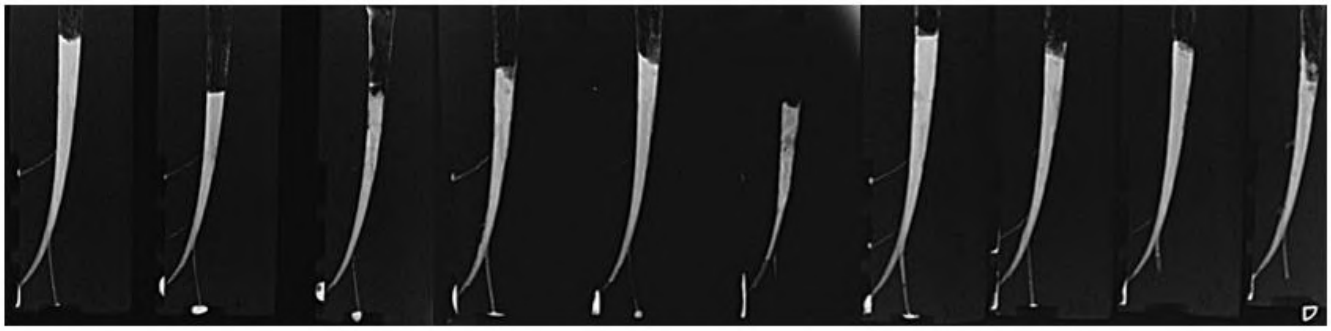

Fig.1: Endofil
Source: Own Authorship

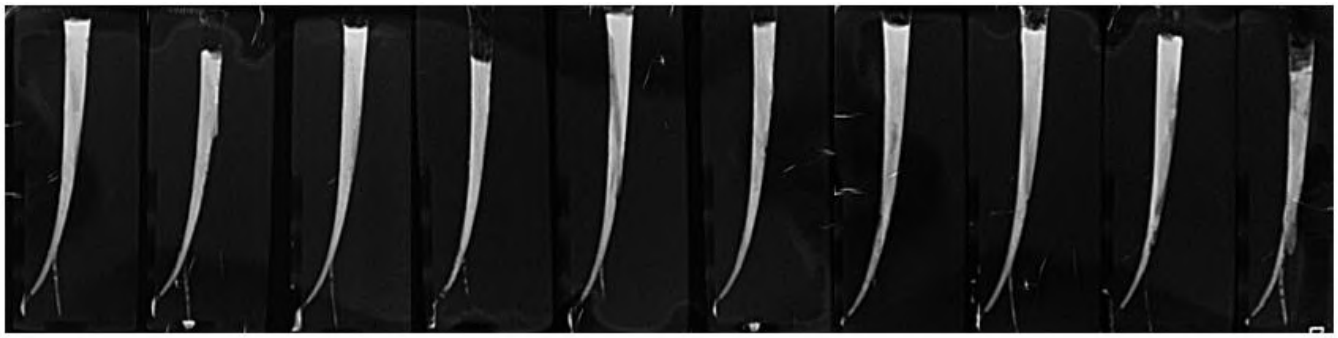

Fig.2: Sealer 26
Source: Own Authorship

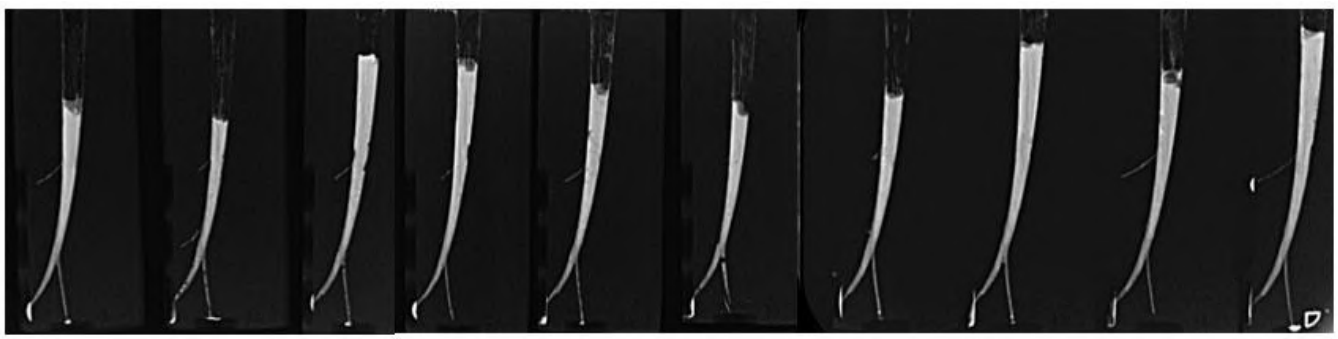

Fig.3: Pulp Canal Sealer
Source: Own Authorship

Fig.4: MTA Fillapex
Source: Own Authorship

IV. DISCUSSION

Endodontic therapy allows us to understand the importance of each stage of treatment, especially when it comes to the obturation process. It is the materials we use in the obturation, together with good technique, that we are able to achieve success in root canal treatment.

Endodontic cements help to fill the root canals, filling spaces, isthmuses and accessory canals. Depending on the composition of each filling cement, its flow may be different, thus interfering with the sealing process of the root canal system.

The constant appearance of new materials and the search for an ideal filling cement lead researchers to analyze the physical and biological properties of these cements, which are often objects of study regarding infiltration (OLIVEIRA et al., 2011).

As a result, our research sought to evaluate, through simulated canals, the infiltration of four endodontic cements used in endodontics with the justification of providing better guidance to the dental surgeon in choosing a more suitable endodontic cement for the filling process. root canals, thus enabling a seal as tight as possible. The cements chosen for this study were Endofill, Sealer 26, Pulp Canal Sealer and Mta Fillapex, due to their characteristics and properties such as biocompatibility, radiopacity and impermeability. During the entire instrumentation of the simulated canals, care was taken with irrigation with 2.5% sodium hypochlorite, drying of the canals and handling of the filling material, in order to be prepared to receive cementation and obtain good results.

Previous studies are recognized that root canal filling techniques that use heat to plasticize the filling material succeed in better adapting this material to the dentin walls. Furthermore, it provides better sealing of the entire root canal system, filling even lateral canals efficiently. Root canal filling techniques without the addition of heat do not approximate this filling result (Maniglia-Ferreira et al., 2010).

The research allowed us to understand that infiltration is of great value for endodontic treatment, as it is the infiltration of cements that fills the spaces where gutta percha cannot reach, that is, the greater the infiltration, the better the filling cement will be.

Comparing the radiographic exams of the simulated canals filled with the chosen cements, we can observe that the Endofill and Pulp Canal Sealer cements demonstrated success in their infiltration. As shown in figure 1, of the Endoffil cement, the material managed to flow through the lateral channels and fill empty spaces, as shown in figure 3, of the Pulp Canal Sealer cement. The cements Sealer 26 and Mta Fillapex were not able to carry out the flow and infiltration of the material in the lateral channels and free spaces of gutta percha. Therefore, we can say that the filling material of first choice for dental surgeons can be either Endofill or Pulp Canal Sealer, as they present excellent infiltration.

V. CONCLUSION

Based on this, it is concluded that Endofill and Pulp Canal Sealer cements present greater infiltration in the root canal system compared to cements Pulp Canal Sealer and MTA.

REFERENCES

[1] ESTRELA, CARLOS. **Endodontia Laboratorial e Clínica**. 1ª edição. São Paulo-SP: Editora Arte Médicas Ltda. 2013.

[2] MARQUES, Karlel; RUON, Vanessa; VOLPATO, Lusiane; MARENGO, Gláucia; HARAGUSHIKU, Gisele; FILHO, Flares; LEONARDI, Denise. Selamento apical proporcionado por diferentes cimentos endodônticos. **STOMATOS- Revista de Odontologia da ULBRA,** Universidade Luterana do Brasil, Rio Grande do Sul, volume 17, número 32, páginas 24-32, janeiro/ junho, 2011.

[3] OLIVEIRA, Elias; QUEIRÓZ, Mário; MELO, Tiago; ROSA, Gabriela; RODRIGUES, Nathalia. Análise comparativa da infiltração coronária em canais obturados com dois diferentes cimentos endodônticos. **Revista da Faculdade de Odontologia- RFO**, Passo Fundo-RS, volume 16, número 3, páginas 282-286, setembro/dezembro, 2011.

[4] PRADO, Maíra; ROCHA, Nedi. **Endodontia Princípios Para Prática Clínica**. 1ª edição. Rio de Janeiro: MEDBOOK- Editora Cientifica Ltda. 2017.

[5] SENA, Ana Luiza Moraes. **Avaliação do escoamento de cimentos obturadores endodônticos**. 2018. 28 páginas. Monografia (Graduação em Odontologia) Universidade Federal do Rio Grande do Norte, Centro de Ciências da Saúde, Departamento de Odontologia, Natal-Rn.

[6] REISS-ARAÚJO, Cristina; Saúde de ARAÚJO, Sinara; BARATTO FILHO, Flares; Carvalho REIS, Luciana; Rivera FIDEL, Sandra. Comparação da infiltração apical entre os cimentos obturadores AH Plus, Sealapex, Sealer 26 e Endofill por meio da diafanização. **RSBO- Revista Sul- Brasileira de Odontologia**, volume. 6, número. 1, 2009, páginas. 21-28 Universidade da Região de Joinville, Joinville, Brasil 2009.

[7] ROCHA, Bianca; ESCOLA, Gustavo; TOMAZINHO, Luis Fernando; BRUNINI, Henrique. Análise da capacidade de preenchimento dos canais radiculares de cimentos endodônticos. **Revista Brasileira de Cirurgia e Pesquisa Clínica – BJSCR,** Umuarama-Paraná, volume 31, número 1, páginas 39-43, junho/agosto, 2020.

[8] SYDNEY, Gilson; FERREIRA, Mônica; DEONIZIO, Marili; LEONARDI, Denise; BATISTA, Antonio. Análise do perfil de escoamento de seis cimentos endodônticos. **Revista Gaúcha de Odontologia- RGO**, Porto Alegre, volume 57, número 1, páginas 7-11, janeiro/março, 2009.

[9] VALERA, M. C.; ANBINDER, A. L.; LEONARDO, M. R.; PARIZOTO, N. A.; KLEINKE, M. U. Cimentos endodônticos: análise morfológica imediata e após seis meses utilizando microscopia de força atômica**. Pesquisa Odontológica Brasileira,** volume 14, número 3, páginas 199-204, julho/setembro, 2000.