Research Article
Open Access
CrossMark

Influence of different techniques of insertion of the self-adhesive agent in the formation of bubbles in the endoposte cementation process

Abstract

Purpose: To identify the influence of different techniques of insertion of the self-adhesive agent in the formation of bubbles in the process of cementation of the endoprosthesis.

Materials and methods: n = 30 unirradicular premolars extracted for orthodontic purposes were subjected to endodontics. Sample randomly divided into three groups according to the cement insertion method in the lentulo group, the lima group, the intraradicular tip group. Cementation procedure of fiber bolts using a self-conditioning and self-adhesive dual-type resinous cement. Cuttings are made at the level of the apical third, receiving a special preparation prior to the observation in TESCAN MIRA scanning electron microscope, voltage of 5 Kv, capturing several microphotographs of its topography.

Results: Averages obtained 3.03% for lentulo, 1.54% for lime and 2.73% for tip. It was determined that the lima group had a lower formation of air bubbles in the resinous cement followed by the tip group and ending with the lentulo group, differences that are not statistically significant.

Conclusion: In the three techniques applied in this study it was possible to demonstrate the presence of trapped air, which indicates that none of them are infallible. In the technique of application of cement with intraradicular tip that according to the hypothesis should be shown as the most efficient, it showed in some cases larger air bubbles with respect to the other two techniques.

Keywords: cementation, premolars, dental cements, scanning electron microscope, hypothesis, biomaterials is dizzying

Volume 3 Issue 2 - 2019

Step Valladares,[1] Virginia Viscarra,[1] Alexandra Mena,[2] Byron Velasquez[3]

[1]Dentist, Resident 4 Oral Rehabilitation Post Grade, UDLA, Colón Camps, Quito Ecuador
[2]PhD Dentistry and Adhesion, UDLA, Colón Campus, Quito Ecuador
[3]PhD Dental Clinic Investigation, Prosthetic and TMD Department, UDLA, Colón Campus, Quito Ecuador

Correspondence: Byron Velasquez Ron, PhD College Dentistry of the Americans University, Investigation Department of Prosthesis, Quito-Ecuador, Tel +593984938162, Email byron.velasquez@udla.edu.ec

Received: February 19, 2019 | **Published:** March 06, 2019

Clinical significance

The continuous errors in the cementation techniques, generate in some occasions decementation of posts including their coronary prosthesis. It is proposed to analyze the best technique to avoid these failures.

Introduction

In restorative dentistry the evolution of biomaterials is dizzying, with immediate clinical applications, within these cementation of fiber bolts have provided significant developments in recent years with success in the final restoration of endodontics.[1] These reconstructions with fiber bolts as all dental process, are exposed to complications, emergencies and failures beneficially with a small percentage.[2] The failures in the fiber endodontic poles is the de-cementing product of an adhesive alteration in the union of the dentine with the cementing agent.[3] This trapped air eventually reduces the tolerance to forces applied in the root canal, consequently increasing the percentage of failure in the restorative procedure.[4] Other studies report the formation of small bubbles in the resin-based cementing agent using scanning electron microscopy at the tooth-cement interface, considering these sites susceptible to fracture.[5] According to Ferrari et al.,[8] the removal or adhesive fracture of reinforced fiber bolts to the endodontic dentine is the statistically most frequent cause in the corresponding reconstructions of endodontics teeth with fiberglass bolts.[6] According to Jara Vidal et al., 2010 these failures alter adhesion in the dentin-cementing agent interface.[7] State that the use of intraradicular tips can minimize the presence of bubbles in the cementation. The presence of trapped air[8] can decrease the tolerance to forces generated within the conduit and therefore increases the possibility of faults in the final restorative treatment. It is intended to determine which technique in the most reliable in order to avoid failures.[9] The proposed study will contribute to suggest the most reliable technique of resinous cement insertion for the cementing of fiber bolts helping the professional Rehabiliter to minimize failures.[10]

Materials and methods

In vitro, experimental study, sample of n = 30 premolars, that meet the inclusion and exclusion criteria:

Inclusion criteria:

I. Completely healthy premolars,
II. Straight roots,
III. Uniradicular roots

Exclusion criteria:

I. presence of two ducts or two roots,
II. first upper premolars.

The premolars are subjected to endodontic treatment.[11] Using type K files, the root canal was accessed and cleaned. A preparation of the same was done with a manual technique of apono-apical using as irrigant during the process 2.5% sodium hypochlorite. The endodontic filling was performed with horizontal condenzation technique with digital capacitors using gutta-percha cones and an endodontic cement based on calcium hydroxide such as sealapex. They were subjected to partial desobturation of the canal, leaving in the apical segment 3 to 4 mm of filling of the endodontics. The desobturation was done with strawberries type gates glidden at the beginning I, II, III and strawberries weight III.[12]

The cementing process of the posts:

I. Flushing of the conduit with sodium hypochlorite in 2.5% concentration
II. Drying the duct with air and absorbent cones.
III. Application of silane on posts prior to cementation.
IV. The cementation of the endoposts was done with self-etching resinous cement from the Coltene house with the trade name "SoloCem"
V. The bolts used in this study are from the house Angelus.

The sample n=30 premolars are divided into three groups randomly:

Group 1: Technique with endodontic lime Cement insertion technique with endodontic file. The polymerization was carried out with LED light and finally the pieces were restored with composite resin.

Group 2: Technique with Lentulus Spiral Technique of cement insertion with spiral of lentulo. The polymerization was carried out with LED light and finally the pieces are restored with composite resin.

Group 3: Technique with intraradicular tip Cement insertion technique with intraradicular tip. The polymerization was carried out with LED light and finally the pieces were restored with composite resin.

The cuts are made using diamond discs at the level of the apical third of the endoprosthesis in order to perform the respective observations under a microscope and determine the presence, size of air bubbles in the cementing agent in the three groups. Obtained the cuts of the pieces of the three groups was performed the process of preparation prior to the observations in scanning electron microscope (SEM) in high vacuum TESCAN MIRA3 FEG with resolution of 1.2nm. The cleaning process of the samples was carried out under a stereomicroscope with 99% anhydrous ethanol. To avoid impurities the samples were dried with compressed air. The samples were coated by a conductive material to allow observation under a microscope. In these samples, a Quorum Q105R sputter coating gold evaporator was used under the following conditions: 15 mZ and 80 mTorr for 1 minute to produce a thickness of approximately 20 nm. The samples were introduced directly into the carousel of the scanning electron microscope TESCAN MIRA 3 (.The samples were observed with a voltage of 5 Kv and several microphotographs of its topography were obtained Figure 1 & Figure 2. Once the previous preparations were made, the observation was carried out in a scanning electron microscope Figure 3, dividing the sample into three groups, obtaining the following microphotographs in which measurements were made subsequently expressed in tables.

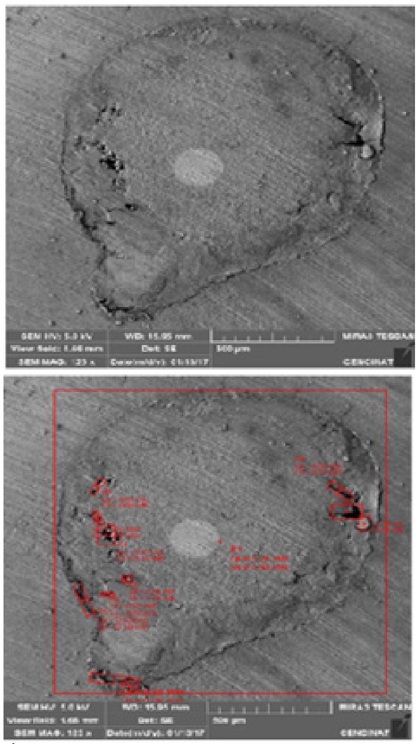

Figure 1 Lentulo.

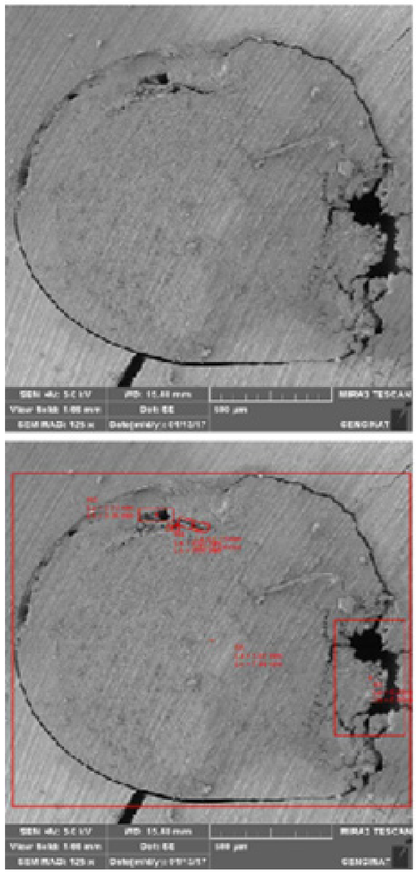

Figure 2 Lime.

Citation: Valladares S, Viscarra V, Mena A, et al. Influence of different techniques of insertion of the self-adhesive agent in the formation of bubbles in the endoposte cementation process. *Int J Fam Commun Med.* 2019;3(2):49–53. DOI: 10.15406/ijfcm.2019.03.00129

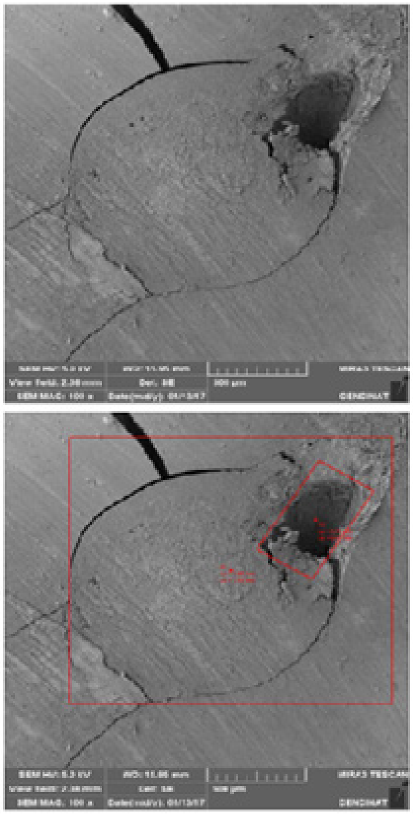

Figure 3 TIP.

Statistical analysis

The data obtained in the observations and measurements in scanning electron microscope are expressed in square millimeters (mm^2). The total measurements of the observed areas are expressed in the following Table 1. The comparison of the measurements of the observed area was made, contrasting with the measurements of the area where the presence of trapped air could be evidenced, obtaining the following measurements in each group. The lentulo group (Table 2), the lima group (Table 3) and the tip group (Table 4).

Table 1 The total measurements of the observed areas are expressed in the following table

Lentulo	Lime	Tip	mm^2
2	2,3	2,6	mm^2
2,3	0,9	1,7	mm^2
1,7	0,6	2,6	mm^2
1,9	3	5,7	mm^2
4,6	2,9	3,9	mm^2
1,9	2,2	2,3	mm^2
4,6	2,2	1,9	mm^2
1,9	2,6	3,2	mm^2
2	2,1	2	mm^2
1,4	2,6	3,2	mm^2
1,6	2,9	2	mm^2
4	2	3,8	mm^2

Table 2 Group lentulo

1	2	3	4	5	6	7	8	9	10
A[mm^2]	A[mm^2]	A[mm^2]	A[mm^2]	A[mm^2]	A[mm^2]	A[mm^2]	A[mm^2]	A[mm^2]	A[mm^2]
2,080	2,320	1,730	1,840	4,530	1,890	2,040	1,400	1,610	4,040
0,010	0,010	0,030	0,005	0,090	0,010	0,020	0,002	0,020	0,003
0,010	0,003		0,040	0,010			0,050	0,020	0,020
0,010			0,020	0,005			0,010	0,020	0,010
0,010			0,030	0,010			0,040	0,010	0,010
0,001			0,020	0,040					0,010
0,001			0,010	0,004					
0,001									
0,002									
0,005									

Table 3 Group lime

1	2	3	4	5	6	7	8	9	10
A[mm^2]	A[mm^2]	A[mm^2]	A[mm^2]	A[mm^2]	A[mm^2]	A[mm^2]	A[mm^2]	A[mm^2]	A[mm^2]
2,340	0,920	0,640	3,050	2,930	2,210	2,160	2,630	2,930	2,070
0,010	0,010	0,003	0,010		0,002			0,003	
0,005	0,040	0,003	0,005		0,020			0,010	
0,001		0,003							
0,140									

Table 4 Group tip

1	2	3	4	5	6	7	8	9	10
A[mm²]	A[mm²]	A[mm²]	A[mm²]	A[mm²]	A[mm²]	A[mm²]	A[mm²]	A[mm²]	A[mm²]
2,580	1,680	2,580	5,720	3,890	2,300	2	3,210	2,090	3,760
0,100	0,030	0,200	0,080		0,010		0,160		
0,120			0,110		0,005				
					0,005				
					0,003				

Group lentulo:

LENTULO: Lentulo 1 presented 2.4% trapped air. Lentulo 2 presented 1.4% trapped air. Lentulo 3 presented 1.7% trapped air. Lentulo 4 presented a 6.7% trapped air. Lentulo 5 presented 3.5% trapped air. Lentulo 6 presented 0.5% trapped air. Lentulo 7 presented 0.9% trapped air. Lentulo 8 presented 7.2% trapped air. Lentulo 9 presented 4.3% trapped air. Lentulo 10 presented 1.3% trapped air. Presenting an average of 3.03%.

LIME: Lime 1 presented 6.6% trapped air. Lime 2 presented 5.4% trapped air. Lime 3 presented 1.4% trapped air. Lime 4 presented 0.4% trapped air. Lime 5 presented 0% trapped air. Lime 6 presented 0.9% trapped air. Lime 7 presented 2.1% trapped air. Lime 8 presented 2.4% trapped air. Lime 9 presented 0.01% trapped air. Lime 10 presented 0% trapped air. Presenting an average of 1.54%

TIP: Tip 1 presented an 8.5% trapped air. Tip 2 presented 1.7% trapped air. Tip 3 presented 7.7% trapped air. Tip 4 presented 3.3% trapped air. Tip 5 presented 0% trapped air. Tip 6 presented 0.02% trapped air. Tip 7 presented 0% trapped air. Tip 8 presented 4.9% trapped air. Tip 9 presented 0% trapped air. Tip 10 presented 0% trapped air. Presenting an average of 2.73%.

The averages obtained are 3.03% for lentulo, 1.54 (for lime and 2.73% for tip .This determines that the lime group had a lower formation of air bubbles in the resinous cement followed by the tip group and ending with the lentulo group. However, these differences are not statistically significant, therefore, the null hypothesis is accepted. "The insertion techniques do not influence the presence of bubbles in the cementation process of the endoplants.

Test	Lentulo %	Lime %	Tip %
1	2,403	6,666	8,527
2	1,422	5,434	1,785
3	1,734	1,406	7,751
4	6,793	0,491	3,321
5	3,509	0	0
6	0,529	0,995	1
7	0,98	0	0
8	7,28	0	4,984
9	4,347	0,443	0
10	1,311	0	0
Average	3,03	15,435	27,368

Discussion

Fiber bolt reconstructions, like all dental processes, are subject to complications, emergencies and failures even when these are reduced.[12] The retention of the fiber bolts depends on several factors such as the cement's adhesion resistance, after the resin and cement to the dentin of the canal. Styluanou, et al.,[13] Have indicated that there are no cavities in the post-cement interface and the cement-dentin bond strength is less than that of the post-cement interface. In other words, the cement-dentin interfaces is the weak point of the fiber posts due to the diverse dentinal morphology in different areas of the root canal; the binding quality is different in coronal, middle and apical regions.[14] These data coincide with the present study, which confirms a greater formation of air bubbles in the cement-dentin interface and a lower or minimum formation of bubbles in the post-cement interface.[15] In the literature very little is said about the method to bring the cementing agent to the root canal and if there is a specific technique that minimizes the possibility of air bubbles in the cement.[16] The application technique of resin cements can be an inherent limitation in the cementing of fiber posts, since bubbles can form inside the cement and in the adhesive interface. These imperfections can reduce the ability of the cement to retain the fiberglass post in the root canal and therefore influence the longevity of the restoration.[17] In this aspect the present study ratifies categorically that the formation of bubbles in the cementing agent is a reality, whatever the method of introduction of the same.[18] The use of intraradicular tips can minimize the presence of cement bubbles. The presence of trapped air can decrease tolerance to forces generated within the conduit and therefore increases the possibility of faults in the final restorative treatment.[19] The results obtained allow to establish that the presence of air bubbles during a process of cementing fiber bolts can present in whatever the technique of introduction of the cementing agent and not necessarily the use of an intraradicular device can assure us a better distribution of the cementing agent.[20] In fact, the larger bubbles that were observed in the present study were presented in pieces whose cementation was performed with an intraradicular tip. It is also necessary to mention that in all three techniques there were some observed samples with optimal results.

Conclusion

There is no perfect technique the presence of air trapped in the sample was general, indicating that none of them is infallible. It is important to mention that in all three techniques optimal results were obtained in some cases. The cement application technique with intraradicular tip that according to the hypothesis should be shown as the most efficient, showed in some cases larger air bubbles with respect to the other two techniques. We can intuit, due to the size of the bubbles presented, that the same tip when introduced and when the resinous cement is applied, leaves a bed, which in some occasions is not filled with cement. According to the percentages determined, it is concluded that the technique of introducing the cementing agent with endodontic lime showed a lower percentage of bubble formation, however, the differences are not so great if we compare with the other two study groups.

Acknowledgments

None.

Conflicts of interest

The author declares there is no conflict of interest.

References

1. Angerame D, De Biasi M, Cattaruzza M, et al. Resistance of endodontically treated roots restored with different fiber post systems with or without post space preparation: In vitro analysis and SEM investigation. *Giornale Italiano di Endodonzia*. 2016;30(2):111–119.
2. Ceccbin D, Cazarotto L, Farina A, et al. Bond Strength between Fiber Posts and Root Dentin Treated with Natural Cross-linkers. *J Endod*. 2015;41(10):1667–1671.
3. Cuadro-Sánchez J, Szesz A, Hass V, et al. Effects of Sonic Application of Adhesive Systems on Bonding Fiber Posts to Root Canals. *J Endods*. 2016;18(6):493–499.
4. Daleprane B, Pereira C, Bueno A, et al. Bond strength of fiber posts to the root canal: Effects of anatomic root levels and resin cements. *J Prosthet Dent*. 2016;116(3):416–423.
5. de Oliveira A, de Cássia F, Costa L. Influence of Insertion Techniques for Resin Cement. *Journal of Adhesive Dentistry*. 2016;17(2):1–3.
6. Figueiredo FE, Martins-Filho PR, Faria-E-Silva AL. Do Metal Post–retained Restorations Result in More Root Fractures than Fiber Post–retained Restorations? A Systematic Review and Meta-analysis. *J Endod*. 2015;41(3):309–316.
7. Ebrahimi Farzin S, Shadman N, Baradaran E, et al. Effect of polymerization mode of two adhesive systems on push-out bond strength of fiber post to different regions of root canal dentin. *Dent Res J (Isfahan)*. 2016;11(1):32–38.
8. Ferrari M, Vichi A, Manocci F, et al. Retrospective study of the clinical performance of fiber posts. *Am J Dent*. 2006;13(Spec No):9B–13B.
9. Ambica K, Mahendran K, Talwar S, et al. Comparative Evaluation of Fracture Resistance under Static and Fatigue Loading of Endodontically Treated Teeth Restored with Carbon Fiber Posts, Glass Fiber Posts, and an Experimental Dentin Post System: An In Vitro Study. *J Endod*. 2013;39(1):96–100.
10. Li XJ, Zhao SJ, Niu LN, et al. Effect of luting cement and thermomechanical loading on retention of glass fiber posts in root canal. *Journal of Dentistry*. 2015;42(1):75–83.
11. Malferrari S, Monaco C, Scotti R. Clinical evaluation of treated teeth restored with quartz fiber reinforced epoxy resin posts. *Int J Prosthodont*. 2002;16(1):39–44.
12. Saraiva LO, Aguiar TR, Costa L, et al. Effect of different adhesion strategies on fiber post cementation: Push-out test and scanning electron microscopy analysis. *Contemp Clin Dent*. 2013;4(4):443–447.
13. Altmann AS, Leitune VC, Collares FM. Influence of Eugenol-based Sealers on Push-out Bond Strength of Fiber Post Luted with Resin Cement: Systematic Review and Meta-analysis. *J Endod*. 2015;41(9):1418–1423.
14. Stylianou A, Burgess JO, Liu PR, et al. Light-transmitting fiber optic posts: An in vitro evaluation. *J Prosthet Denty*. 2016;117(1):116–123.
15. Sarkis-Onofre R, de Castilho R, Boscato N, et al. Cast metal vs. glass fiber posts: A randomized controlled trial with up to 3 years of follow up. *J Dent*. 2014;42(5):582–587.
16. Souza AC, Gonçalves Fde C, Anami LC, et al Influence of insertion techniques for resin cement and mechanical cycling on the bond strength between fiber posts and root dentin. *J Adhes Dent*. 2016;17(2):175–180.
17. Tian Y, Mui Y, Setzer F, et al. Failure of Fiber Posts after Cementation with Different Adhesives with or without Silanization Investigated by Pullout Tests and Scanning Electron Microscopy. *J Endod*. 2016;38(9):1279–1282.
18. Tiznado Orozco G, Robles Romero D, Sánchez Huerta H, et al. Pruebas de Adhesión en postes de fibra de vidrio utilizando dos diferentes cementos a base de resina. *Revista Tamé*. 2012;21(1):2–8.
19. Valandro LF, Filho OD, Valera MC, et al. The effect of adhesive systems on the pullout strength of a fiberglass-reinforced composite post system in bovine teeth. *J Adhes Dent*. 2005;7(4):331–336.
20. Zamorano X, Díaz F. Microestructura de la zona de adhesión en conductos tratados endodónticamente. *Revista dental de Chile*. 2004.