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Comparison of conventional fiberglass and splendor sap post systems

Comparação de sistemas de retenção intrarradicular de fibra de vidro convencional e Splendor SAP

Comparación de sistemas de retención intra-raiz convencionales de fibra de vidrio y Splendor SAP

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Abstract
The aim of this study was to compare the effect of posts systems and the luting agent on bond strength. Thirty single-rooted bovine teeth were used. The specimens were randomly grouped into: Rely X Ultimate- shaped pin (ULT-M), ULT- accessory pin (ULT-A), ULT- Splendor SAP (ULT-S), Rely X U200 (U200-M), U200-A and U200-S. The specimens were sectioned (cervical, middle and apical thirds) and submitted to the push-out test using the universal testing machine EMIC DL200MF. The data obtained were submitted to the Kolmogorov-Smirnov test, and later to the analysis of variance (ANOVA), complemented by the Student-Newman-Kells (SNK) multiple comparison test. The proportions of the type of failure were compared using the Z test. The significance level was 5% for all tests. The interaction Rely-X U200 and Splendor SAP System was the only group with no statistically significant difference, in all thirds. With the use of the Rely-X U200, the modeled retainer performed better in the middle third. The lowest bond values were in the apical region. The use of accessory retainers promoted adequate values in the cervical and middle thirds. For Rely-X Ultimate, the modeled retainer had the lowest strength values. The same happened with the middle and apical third of the group with accessory pins. There is an influence of luting agents and posts systems on bond strength values. The failure pattern is directly related to the retention system*luting agents*root third interaction.
Keywords: Materials science; Post and core technique; Tooth, nonvital.

Resumo
Este estudo teve por objetivo comparar o efeito dos sistemas de retenção intra-radicular e o agente cimentante na resistência de união. Foram utilizados trinta dentes bovinos unirradiculares. Os corpos-de-prova foram randomicamente agrupados em: Rely X Ultimate- pino modelado (ULT-M), ULT- pino acessório (ULT-A), ULT- Splendor SAP (ULT-S), Rely X U200 (U200-M), U200-A e U200-S. Os espécimes foram seccionados (terços cervical, médio e apical), e submetidos ao teste de push-out través da máquina de ensaio universal EMIC DL200MF. Os dados obtidos foram submetidos ao teste de Kolmogorov-Smirnov, e posteriormente a análise de variância (ANOVA), complementada pelo teste de comparações múltiplas de Student-Newman-Kells (SNK). O as proporções do tipo de falha foram comparadas pelo teste Z. O nível de significância foi de 5% para todos os testes. A interação Rely-X U200 e Sistema Splendor SAP foi o único grupo sem diferença estatística significativa, em todos os terços. Com a utilização do Rely-X U200, o retentor modelado apresentou melhor desempenho no terço médio. Os menores valores de união foram na região apical. A utilização de retentores acessórios promoveu adequados valores nos terços cervicais e médio. Para o Rely-X Ultimate, o retentor modelado obteve os menores valores de resistência. O mesmo ocorreu com o terço médio e apical do grupo com pinos acessórios. Conclui-se que há influência dos agentes cimentantes e dos sistemas de retenção nos valores de resistência de união. O padrão de falha está diretamente relacionado com a interação sistema de retenção*agente cimentantes*terço.
Palavras-chave: Ciência dos materiais; Técnica para retentor intrarradicular; Dente não vital.

Resumen
El objetivo de este estudio es comparar el efecto de los sistemas de retención intrarradicular y del agente de cementación sobre la fuerza de adhesión. Se utilizaron 30 dientes de bovino no enraizados. Los especímenes se agruparon aleatoriamente en: Rely X Ultimate- pasador modelado (ULT-M), ULT- pasador accesorio (ULT-A), ULT- Splendor SAP (ULT-S), Rely X U200 (U200-M), U200-A y U200-S. Las muestras se seccionaron (tercios cervical, medio y apical) y se sometieron a la prueba de empuje con la máquina de ensayo universal EMIC DL200MF. Los datos obtenidos se sometieron a la prueba de Kolmogorov-Smirnov y, posteriormente, al análisis de la varianza (ANOVA),

complementado con la prueba de comparaciones múltiples de Student-Newman-Kells (SNK). Las proporciones del tipo de fallo se compararon mediante la prueba Z. El nivel de significación fue del 5% para todas las pruebas. La interacción Rely-X U200 y el sistema SAP Splendor fue el único grupo sin diferencias estadísticamente significativas, en todos los tercios. Con el uso de Rely-X U200, el retenedor modelado presentó un mejor rendimiento en el tercio medio. Los valores de unión más bajos se encontraban en la región apical. El uso de retenedores accesorios proporcionó valores adecuados en los tercios cervical y medio. Para el Rely-X Ultimate, el retenedor modelado obtuvo los valores más bajos de resistencia. Lo mismo ocurrió en los tercios medio y apical del grupo con clavijas accesorias. Se puede concluir que existe una influencia de los agentes de cementación y de los sistemas de retención en los valores de resistencia de la adhesión. El patrón de fallo está directamente relacionado con la interacción sistema de retención*agente cementante*tercera.
Palabras clave: Ciencia de los materiales; Técnica de perno muñón; Diente no vital.

1. Introduction

The rehabilitation of teeth with extensive loss of coronary structure, endodontically treated, presents difficulties to restorative dentistry, since these elements are fragile and more susceptible to fractures when compared to vital teeth (Pereira, et al., 2006; Oliveira, et al., 2008; Zogheib, et al., 2008; Jindal, et al.,2012; Kumagae, et al., 2012; Franco, et al., 2014; Ramírez-Sebastià, et al., 2012; Seto, et al., 2013; Tey, et al., 2014; Amarnath, et al., 2015; Lin, et al., 2018).

The approach by means of endodontic treatment and the use of intra-rooted retention systems has been scientifically considered adequate due to the high success rates and maintenance of the dental remnant (Pereira, et al., 2006; Oliveira, et al., 2008; Zogheib, et al., 2008; Kumagae, et al., 2012; Jindal, et al., 2012; Ramírez-Sebastià, et al., 2012, Seto, et al., 2013; Tey, et al., 2014; Franco, et al., 2014; Amarnath, et al., 2015; Lin, et al., 2018).

The success of rehabilitation treatment in non-vital teeth that need anchorage by using posts is directly related to the quality of endodontic treatment, as well as to the bond of the dental remnant to the prosthetic restoration (Almohareb, 2017).

The preparation of the root canal itself should be minimally invasive, preserving the maximum thickness of the dentin, especially in the buccolingual direction, because it is in this region that will be possible to observe the greatest vector of resistance to root fracture. At the end, the ideal root canal should be as narrow as possible, and the retainer (post) should not exceed one third of the root diameter (Teófilo, et al., 2005).

The cleaning of the root canal, after preparation for post cementation, is essential on the assumption that residues (debris) arising from the clearance will negatively influence the future bond of the post to intra-radicular dentin walls. The use of chlorhexidine followed by EDTA is an important step in the pre-treatment of the inner surface of the canal root, considering the adhesive procedures for post insertion (Oliveira, et al., 2018).

Regarding the types of luting agents, the resin type, their use between the tooth and the post aims to increase retention, consequently the bond strength values, improving the physical-mechanical properties, besides favoring the aesthetics (Albarello, 2017). With the technological advance, the development of a self-adhesive resin cement aims to provide a stronger bond to the dentin, besides suppressing the step of previous acid etching of the substrate, which in turn facilitated the technique, decreased the possibility of failure and reduced the operator's work time (Corrêa Netto, et al., 2014; Mishra, et al., 2020).

Intra-radicular retention systems can be classified in different ways, i.e., by design (individualized or standardized), by material (metal or non-metal), by geometry (parallel or conical), by configuration (knurled, smooth or threaded), or by retention method (passive or active). The choice for one of these types can be considered a complex and inaccurate exercise, as no system is ideal for all clinical situations, and the large supply of types available in the market has made the choice process difficult, as each combination of retainer/adhesive protocol has proven to be a satisfactory alternative. Thus, when making the choice, the professional should take into consideration the advantages, disadvantages, limitations, and indications of each type of retainer and adhesive system (Teófilo, et al., 2005).

Individualization or customization of the post is premised on shortening the cementation line between the tooth and the

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prefabricated intra-radicular system (post) (Lins, et al., 2019). Another possibility is the use of accessory posts that increase the adaptation of the main retainer (Li, et al., 2011).

Posts increasingly resistant, anatomical, and aesthetic are developed. Recently, a retention system was available on the market, called Splendor SAP, whose differential is not requiring a specific preparation with respect to the configuration of the canal root. This system has a specific drill for preparing the canal root that will receive the post, and if there is poor adjustment of the walls, a ring (sleeve) is installed, which makes the system unique. However, the literature is still scarce regarding its efficiency (Lopes, et al., 2021).

In view of the above, it is important to know the evolution of intra-radicular retention systems, the methods of preparing the intra-canal dentin substrate, and the adhesive protocols indicated for luting of intra-radicular posts, in order to achieve an adequate evidence-based clinical practice. The null hypothesis is that there is no influence of the luting agents and/or intra-radicular retention systems on the values of bond strength.

2. Methodology

Experimental groups

The sample size determination (n=5 teeth or n=10 discs) was obtained through previous study (Carvalho, et al., 2017) and two 1-mm discs were obtained from the each third of each root.

For the accomplishment of this study were selected intra-radicular posts, accessory posts, two adhesive luting and one endodontic luting. The commercial brands, composition and manufacturers are described in Table 1.

Table 1. Description of the materials used in the study.

Material	Composition	Brand
Fiberglass post - Exacto	*fiberglass, epoxy resin*	*Angelus Indústria de Produtos Odontológicos S/A - Londrina/PR*
Splendor SAP system	*fiberglass, epoxy resin*	*Angelus Indústria de Produtos Odontológicos S/A - Londrina/PR*
Acessory post - Reforpin	*fiberglass, epoxy resin*	*Angelus Indústria de Produtos Odontológicos S/A - Londrina/PR*
RelyX Ultimate	*Ingredients: Glass powder, surface modified with 2-propenoic, 2-methyl-, 3-(trimethoxysilyl) propyl and phenyltrimethoxy silane, 2-propanoic,2-methyl-, 1,1-[hydroxymethyl-1,2-ethanediyl] ester, reaction products with 2-hydroxy-1,3-propanediyl-dimethacrylate and phosphorus oxide, triethinelloglycol dimethacrylate (TEGDMA), silane treated silica, chemical glass oxides (nonfibrous), sodium persulfate, tert-butyl 3,5,5-trimethyl peroxyhexanoate, acetic acid, copper (+2) sla monohydrate*	*3M/ESPE Produtos Odontológicos - Sumaré/SP*
RelyX U200	*Ingredients: Glass powder, surface modified with 2-propenoic, 2-methyl-, 3-(trimethoxysilyl) propyl and phenyltrimethoxy silane, 2-propenoic acid, 2-methyl-, 1,1-[hydroxymethyl-1,2-ethanediyl] ester, reaction products with 2-hydroxy-1, 3-propanediyl dimethacrylate and phosphorus oxide, triethyneloglycol dimethacrylate (TEGDMA), silane treated silica, chemical glass oxides (nonfibrous), sodium persulfate, tert-butyl 3,5,5-trimethyl peroxyhexanoate, acetic acid, copper sodium (+2) monohydrate*	*3M/ESPE Produtos Odontológicos - Sumaré/SP*

Material	**Composition**	**Brand**
Adper Single Bond Universal	*2-Hydroxyethyl methacrylate, Bisphenol A diglycidyl ether dimethacrylate (BisGMA), Decamethylene dimethacrylate, Ethanol,Silane treated silica, Water, Decanediolphosphatometacrylate,Copolymer of acrylic and itaconic acidCaphorquinone,N,N-Dimethylbenzocaine*	*3M/ESPE Produtos Odontológicos - Sumaré/SP LOTE 2000800629*
AH Plus	Paste A (amber color): bisphenol-A epoxy resin, bisphenol-B epoxy resin, calcium tungstate, zirconium oxide, silica, iron oxide pigments Paste B (white color): dibenzyl diamine, aminoadamantane, tricyclododecane-diamine, calcium tungstate, zirconium oxide	Dentsply Sirona

Source: Information obtained from the manufacturer.

This study evaluated the push out bond strength, considering the groups presented in Table 2. The adhesive protocol was performed according to the manufacturer's instructions

Table 2. Groups studied.

Material	**RelyX Ultimate (n=5)***	**RelyX U200** (n=5)**
Fiberglass post (Exacto) customized	ULT-M	U200-M
Fiberglass post + acessory post (Exacto + Reforpin)	ULT-A	U200-A
Splendor SAP system	ULT-S	U200-S

Source: Authors.

Push out bond strength test - The materials used in the study are described in Table 1 and Table 2.

Samples - Thirty healthy bovine teeth (Silva et al., 2019) were used decoronated, freshly extracted, cleaned with pumice paste and water with the aid of Robinson brushes and rubber cups, coupled in straight piece and micromotor (Kavo, São Paulo, SP), stored and kept in thymol solution with saline solution to preserve the organic part of the elements.

Sample preparation - Endodontic access was performed on all teeth as well as instrumentation using rotary instruments. Each tooth was considered as a sample unit for a single group. All procedures were performed by a single experienced operator (VTLV). The root canals were instrumented using NiTi Reciproc R50 (VDW, Munich, Germany) instruments driven by the VDW Silver motor (VDW, Munich, Germany). The chemical-mechanical preparation was performed with 5% sodium hypochlorite. The last irrigation was performed with EDTA (Biodinâmica Quim. e Farm. Ltda, Iiporã, Paraná, Brazil) followed by saline solution and the canal was dried with absorbent paper point (Dentsply indústria e comércio Ltda, Pirassununga, São Paulo, Brazil). The obturation was performed with gutta-percha cone from the own system and the technique adopted will be thermoplastic. The endodontic cement used was AH Plus (Dentsply ind e com Ltda, Pirassununga, São Paulo, Brazil) based on epoxy resin. The teeth were then stored in 0.9% saline solution for 24 hours for total setting of the cement and hydration before post cementation.

Canal root preparation - To standardize the samples, the drill number 3 was used, referring to the model of Exacto intra-radicular retainer (Angelus Ind. de Prod. Odontol, Joinville, Santa Catarina, Brazil), corresponding to the largest diameter compatible with the bovine tooth.

The group that used the model Exacto intra-rooted retainer together with the Reforpin accessory retainers (Angelus Ind. de Prod. Odontol, Joinville, Santa Catarina, Brazil) followed the same installation parameters as the group that used only the model Exacto retainer, differentiating them, with the use of the Reforpin model retainer that occupied areas in the cervical region of the preparation where the diameter was larger than the selected retainer.

The group that used the Splendor SAP retainer (Angelus Ind. de Prod. Odontol, Joinville, Santa Catarina, Brazil) differed only by using the preparation bur that had a single diameter, since the proposal for the use of this retainer is the adaptation to any root canal diameter adapting a sleeve to the main retainer.

The initial removal of the filling material was performed using a number 3 wide bur (Angelus Ind. de Prod. Odontol, Joinville, Santa Catarina, Brazil), protocol performed in all groups (Shaped: Exacto; Accessory: Exacto+Reforpin; Splendor Sap). The modeled group used only the wide bur number 3 and the others used the specific bur with the diameter referring to the selected retainer. After preparation and removal of the filling material the canal was rinsed with distilled water to remove residues of the filling material and endodontic cement.

Bonding/luting procedures

The canal root were dried with air jets and absorbent paper points (Dentsply indústria e comércio Ltda, Pirassununga, São Paulo, Brazil). The luting agents were manipulated according to the manufacturer's instructions. In addition, cement was inserted into the surface of the post by inserting it into the canal root, turning it clockwise, under moderate digital pressure, for 5s. The excess cement, in the cervical portion, was removed with a dentin spoon. Photoactivation on the glass fiber post used in the (customized) group was performed with a Radii-cal LED photoactivator, power 1200mW/cm2, (SDI, Victoria, Australia) for 40 seconds. All procedures were performed by a single operator (FW) with extensive experience.

All teeth were stored in 100% humidity at 37oC for 24h to allow the cement to fully set in a microprocessor oven for bacteriological culture. Sterilifer ind. e com. LTDA. (São Paulo, Brazil).

Preparation of specimens for push-out bond strength testing

The root of each specimen was embedded in sticky wax in a 4X4mm acrylic base to allow for precision cutting. A double-sided diamond blade, attached to a Labcut 1010 precision cutter (Labcut 1010 Low Speed Diamond Saw-Extec - USA) was used for cutting at a speed of 250 rpm, under constant cooling with distilled water. The first cut point was established at 1 mm from the most coronal region to standardize the slices. Subsequent cuts were 1.5 mm, following the apical direction. The thickness of the slices was checked with a digital caliper with precision of 0.01 mm. All slices were marked on the cervical side to guide the correct positioning of the samples.

The mechanical test was performed in a universal testing machine EMIC DL-200MF (São José dos Pinhais, PR, Brazil) with a 500N load cell. The tip of the extrusion cylinder was 1 mm in diameter, and the test speed was 0.5 mm/min. Each specimen was positioned on a steel plate, and clamped, leaving the pin centered in a 3mm diameter hole in the plate, creating an escape area. The load was applied in the apico-cervical direction until it was possible to observe the displacement of the pin.

To obtain the data the formula R (resistance) = F (force necessary for extrusion) / SL (area of the pin/dentin interface) was used, and SL=π(R+r) Vh2+(R-r)2.

Failure mode at the bond interface

The samples were analyzed through an OPTICAM Stereo Microscope at 60X magnification to observe the fracture sites

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and then classify the failure type as: cohesive, adhesive or mixed.

Statistical analysis

The results of the push out bond strength were submitted to the Shapiro-Wilk normality test. When the normality of the data was verified, the tension for removal of the medium cervical and apical thirds were analyzed through the variance analysis test (one-way ANOVA), complemented by the Student-Newman-Kells (SNK) multiple comparisons test.

The percentages of the failure types were compared by the Z test for comparison of two proportions. A 5% significance level was used for all tests.

3. Results

The (ANOVA) and the causes of intragroup variation are presented in Table 3, demonstrating that different luting agents and intra-radicular posts systems influence the bond strength.

Table 3. Results of the push-out push out test in the thirds (cervical, middle or apical), different superscript letters indicate intragroup statistical difference.

	Cervical	**Middle**	**Apical**
U200-M	3,31 (0,59)^{A}	4,95 (0,97)^{B}	2,95 (1,04)^{A}
U200-A	5,36 (1,64)^{A}	4,34 (1,68)^{A}	2,52 (0,89)^{B}
U200-S	2,49 (0,36) ^{A}	2,95 (0,72) ^{A}	3,21 (0,84)^{A}
ULT-M	3,59 (1,9) ^{A}	3,3 (1,24) ^{A}	1,93 (0,5)^{B}
ULT-A	3,58 (1,00)^{A}	2,53 (0,72)^{B}	2,46 (0,79)^{B}
ULT-S	6,02 (1,07)^{A}	5,09 (1,17)^{B}	2,28 (0,59)^{C}

Source: Authors.

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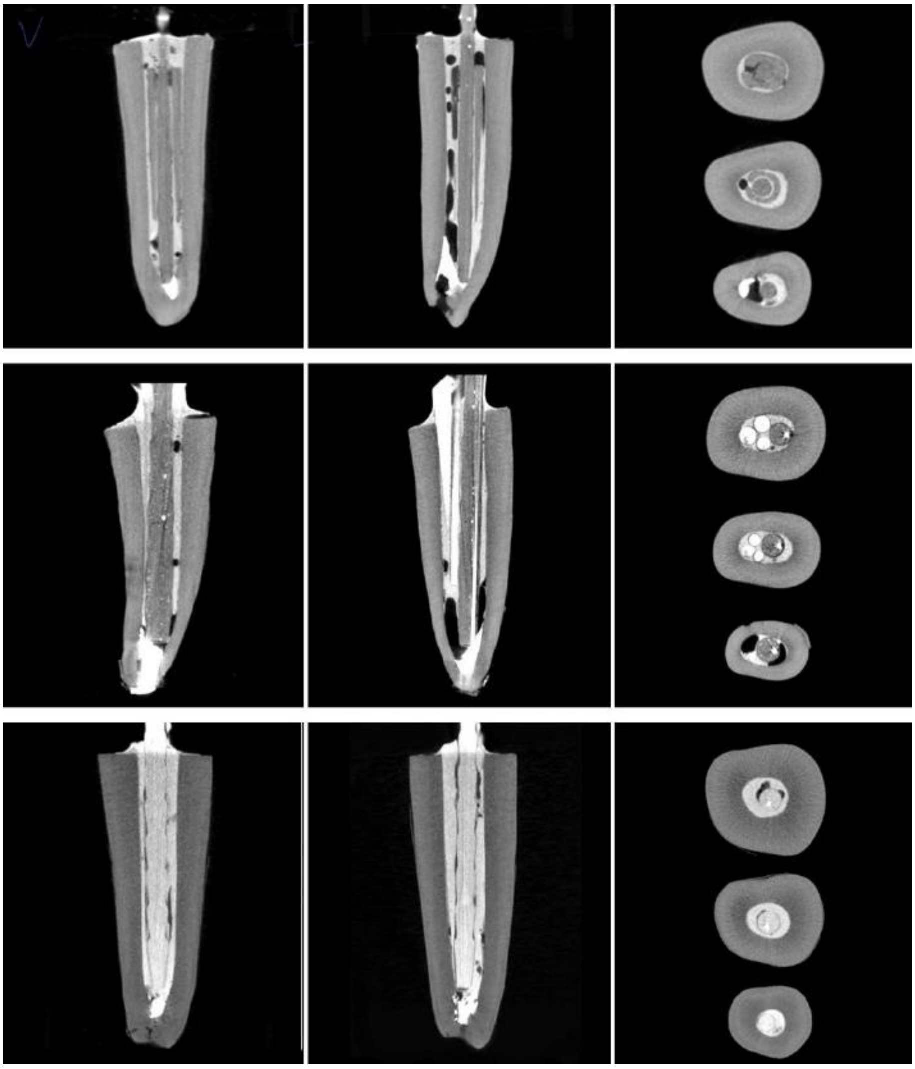
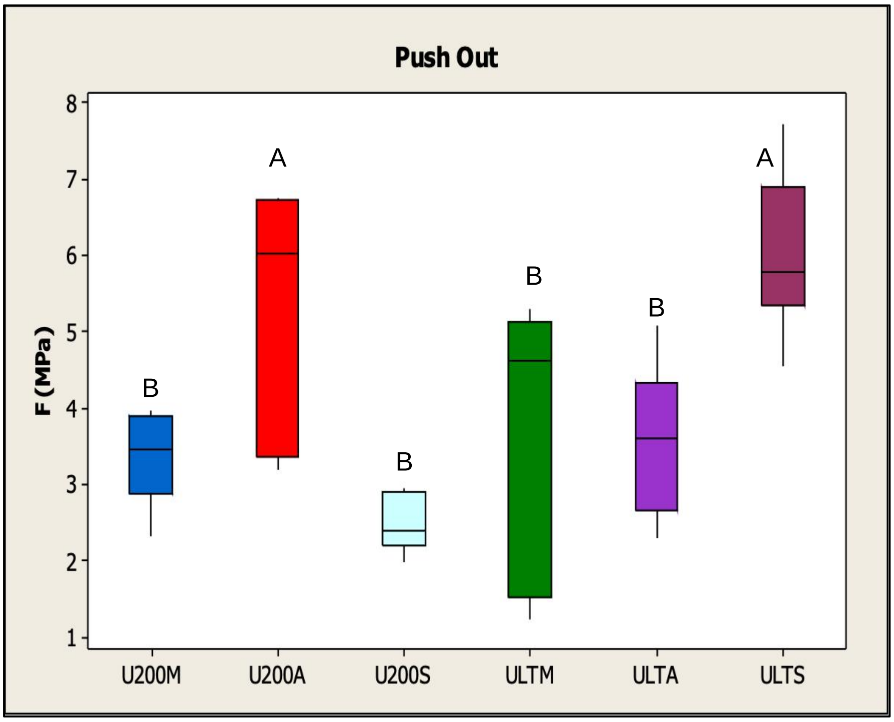
Figure 1. Microtomography of the (A) Splendor SAP system, (B) accessory post and (C) customized post indicating luting defects in the three thirds (cervical, middle and apical). It is also possible to observe the distribution of the luting agent thickness.



Source: Authors.

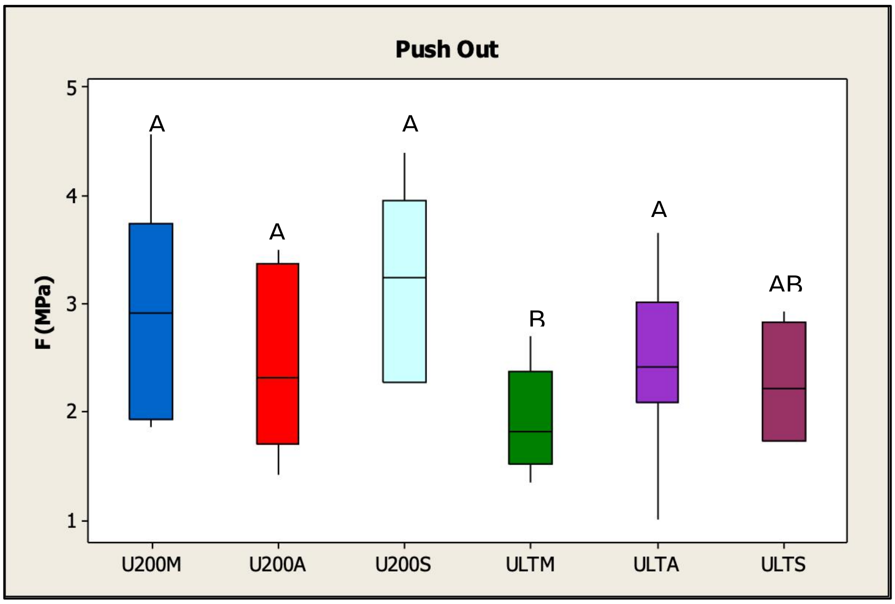
The comparisons of the cervical, middle and apical thirds are shown in the Figures 2, 3 and 4 and Table 4, which is possible to observe that there is influence on the values of bond strength.

Figure 2. Comparison of the cervical thirds of the groups studied. Different superscript letters indicate statistical difference between groups.



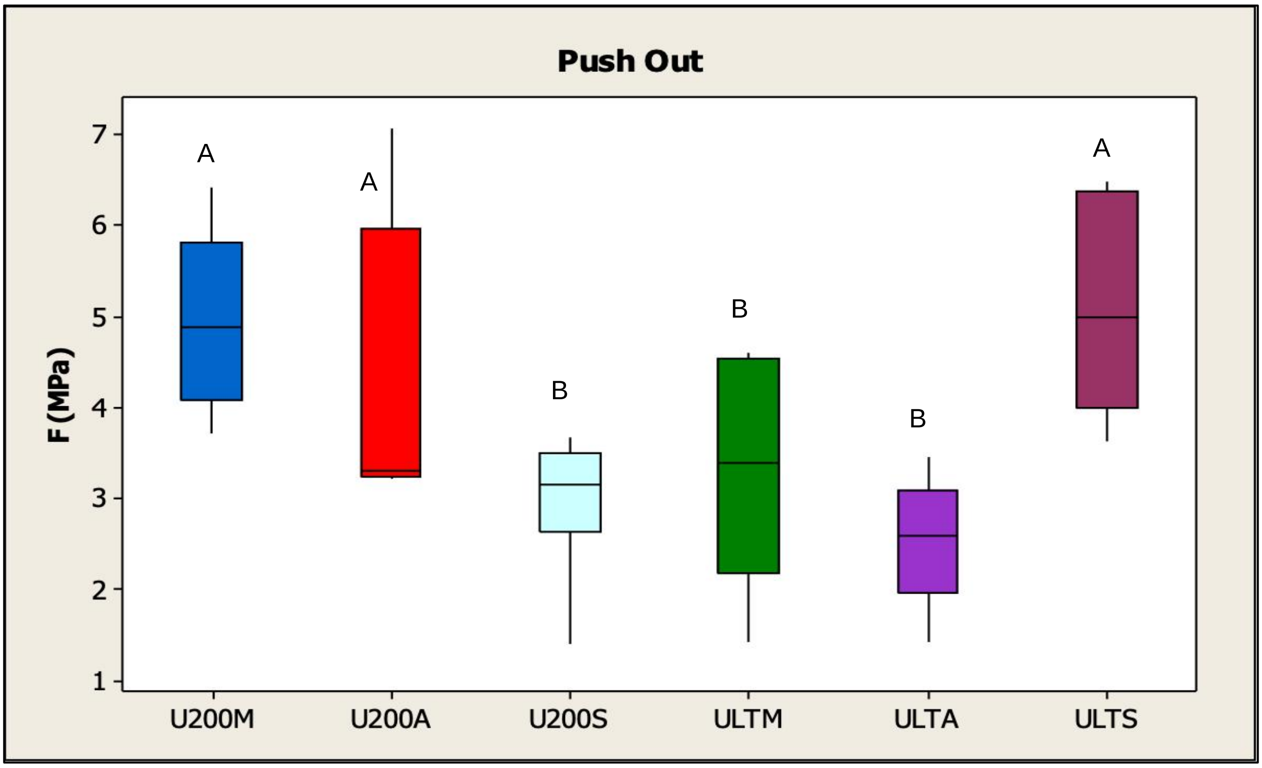
Source: Authors.

Figure 3. Comparison of the average thirds of the groups studied. Different superscript letters indicate statistical difference.



Source: Authors.

Figure 4. Comparison of the apical thirds of the groups studied. Different superscript letters indicate statistical difference



Source: Authors.

Table 4. Percentage result (%) of fracture mode in the thirds (cervical, middle or apical).

		U200 - M	U200 - A	U200-S	ULT-M	ULT-A	ULT-S
Cervical	**Adhesive**	100	83	100	80	83	83
	Cohesive	-	17	-	20	17	-
	Mixed	-	-	-	-	-	17
Middle	**Adhesive**	83	100	100	50	83	100
	Cohesive	17	-	-	50	17	-
	Mixed	-	-	-	-	-	-
Apical	**Adhesive**	100	83	100	80	87,5	100
	Cohesive	-	17	-	20	-	-
	Mixed	-	-	-	-	12,5	-

Source: Authors.

4. Discussion

The results obtained in this study demonstrate that different luting agents and intra-radicular posts systems influence the bond strength. Therefore, the first hypothesis of the study was accepted. The interaction of the intra-root retention system with the luting agents showed different performances in the root thirds. This can possibly be explained by both the chemical difference in the nature of the activators of the luting agents, as well as by the composition and geometry of the intra-rooted retention systems.

Considering the intra-group thirds, it was possible to observe that when the Rely-X U200 luting agent was used, the only intra-rooted system that presented performance without statistically significant difference, in the three thirds, was the Splendor SAP. It is believed that the adaptation of the fiberglass post and the sleeve provide a more homogeneous distribution in thickness of the luting agent along the whole root length, being responsible for the non-occurrence of difference in the bonding values between the studied thirds ($p>0.05$), corroborating the findings Lopes et al. (2021).

The U200-M group showed higher bond strength in the middle third ($p<0.05$). It is believed that these findings occurred due to the greater thickness of the cementing agent in the cervical region, and the greater difficulty of the cement flowing in the apical region. A possible explanation for the results in the cervical third may be the greater thickness of the cementation line, making the interface critical to the stability of the bond (D'Arcangelo, et al., 2007). Regarding the apical portion, it is believed that this is due to the difficulty of flow of the cementing agent, incomplete polymerization of the material, formation of voids/ bubbles (Mishra, et al., 2020). The latter can be observed in Figure 1, which illustrates the presence of defects in the filling of the canal root.

A possibility of improvement in the flow of the luting agent would be the use of a lentulo bur, however the heat generated for insertion of the material, could on the other hand accelerate the polymerization reaction, reducing the working time (Souza et al., 2015).

This way, this study did not use light activation, through the use of photoactivators, in order to reduce the volume of contraction by polymerization (Prakki, et al., 2001), allowing the polymerization only by chemical reaction. Thus, and in view of the results obtained, it is believed that the study of the same groups, now aided by insertion tips and/or photoactivation are an interesting source of comparative analysis of the performance of the cementing agent.

The use of accessory posts (U200-A group) provided adequate resistance in the cervical and middle thirds, but the same occurred in the apical third as in the U200-M group. These findings reinforce that regions with lower cementation line present higher bond strength values (D'Arcangelo, et al., 2007) and that the apical third is the region with the lowest bond strength values (Mishra, et al., 2020).

Considering the Rely-X Ultimate luting agent it was possible to observe that the ULT-M group presented a lower bond value in the apical third probably due to difficulty of cement flowing ($p<0.05$). The same occurred with the middle and apical third of the ULT-A group ($p<0.05$). It is believed that the flow of Rely-X Ultimate is lower than Rely-X U200, perhaps because it has in its composition more filler particles, making it more viscous. Another possibility of interference in bond strength values is the need of using a universal adhesive, either by an unsatisfactory bond or by the creation of another interface, which, in turn, decreases the efficacy of the bond. Such findings are controversial in the literature, while Lopes et al. (2021) report no difference between self-adhesive and conventional cements, Sarkis-Onofre et al. (2014) and Pereira et al. (2021) state that self-adhesive cements show better performance in bonding with fiberglass pins. It is believed that the absence of photoactivation may have been responsible for the results obtained.

Observing the inter-group findings, in the cervical third, it was possible to observe that the bond strength values were not influenced by the cementing agent, but by the variation of the cementing agent thickness, due to the gap to be filled in the third in question. Thus, in the middle third, the data obtained reinforce the findings of the cervical third, i.e., by presenting a smaller gap to be filled by the cementing agent, the thickness of the cementation line is smaller, and consequently, the bond strength values are higher. The variation of the findings in the apical third reinforce that the difficulty of flow, formation of bubbles/emptiness reduce the bond strength values, as mentioned previously.

Regarding the fracture mode, the findings illustrate the data obtained from the mechanical push out test, i.e. adhesive failures in the groups with higher volume of luting agent, mixed and cohesive failures (in the cement) in the groups whose intrinsic strength of the material was lower than the union at the tooth and intra-radicular system interface.

It should be noted that among the limitations of this study is the possibility of comparison with only one study, and for this reason, inferences should be made with caution. It is important that more studies be conducted in vitro and in vivo for a more stronger comparison.

Moreover, specifically regarding the Splendor SAP system, as it is a material that has had very few in vitro studies published, for an indication with greater consistency and evidence of the Splendor SAP system more laboratory and clinical studies need to be developed, if possible with the maximum of interactions with other materials already consolidated, in order to obtain reliable data that allow its clinical indication.

5. Conclusion

Based on the data obtained in this study it can be concluded that there is influence of the cementing agents and/or intra-radicular retention systems used on the values of bond strength. The failure pattern is directly related to the interaction retention system - luting agent and third. And, the interaction Rely-X U200 and Splendor SAP system was the group with homogeneous results, without statistically significant difference, in all thirds.

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