

Laís Carvalho Martins

Resistência de União e Características Interfaciais de Pinos de Fibra de Vidro Convencionais e Associados a Luva de Fibra de Vidro em Canais Radiculares Regulares ou Alargados.

Bond Strength and Interfacial Characteristics of Conventional Fiberglass Posts and Fiberglass Sleeve Associated Posts in Regular or Flared Root Canals.

Tese apresentada à Faculdade de Odontologia da Universidade Federal de Uberlândia, como requisito parcial, para obtenção do Título de Doutor em Odontologia na Área de Concentração de Clínica Odontológica Integrada.

Uberlândia, Julho de 2024.

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Orientador: Prof. Dr. Paulo César de Freitas Santos Filho

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ATA DE DEFESA - PÓS-GRADUAÇÃO

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Reuniu-se no Anfiteatro/Sala 4LA23 - Faculdade de Odontologia - Campus Umuarama, da Universidade Federal de Uberlândia, a Banca Examinadora, designada pelo Colegiado do Programa de Pós-graduação em Odontologia,, assim composta: Professores Doutores: Laís Rani Sales Oliveira (UFJF) participou da defesa de Tese por meio de vídeo-conferência desde a cidade de Governador Valadares/MG; Gilberto Antônio Borges (UNIUBE) participou da defesa de Tese por meio de vídeo-conferência desde a cidade de Uberaba/MG; Karla Zancopé (UFU). Hugo Lemes Carlo (UFU); Paulo César Freitas Santos Filho (UFU) orientador(a) do(a) candidato(a).

Iniciando os trabalhos o(a) presidente da mesa, Dr(a). Paulo César Freitas Santos Filho, apresentou a Comissão Examinadora e o candidato(a), agradeceu a presença do público, e concedeu ao Discente a palavra para a exposição do seu trabalho. A duração da apresentação do Discente e o tempo de arguição e resposta foram conforme as normas do Programa.

A seguir o senhor(a) presidente concedeu a palavra, pela ordem sucessivamente, aos(às) examinadores(as), que passaram a arguir o(a) candidato(a). Ultimada a arguição, que se desenvolveu dentro dos termos regimentais, a Banca, em sessão secreta, atribuiu o resultado final, considerando o(a) candidato(a):

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O competente diploma será expedido após cumprimento dos demais requisitos, conforme as normas do Programa, a legislação pertinente e a regulamentação interna da UFU.

Nada mais havendo a tratar foram encerrados os trabalhos. Foi lavrada a presente ata que após lida e achada conforme foi assinada pela Banca Examinadora.



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DEDICATÓRIA

**A Deus, Aos meus pais, a minha família, ao meu
marido e todas as pessoas que foram fundamentais
nesta conquista.**

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colocar pessoas tão incríveis em meu caminho que me
incentivam e apoiam.

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“Feliz aquele que transfere o que sabe e aprende o que ensina”.

Cora Coralina

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RESUMO

Resistência de União e Características Interfaciais de Pinos de Fibra de Vidro Convencionais e Associados a Luva de Fibra de Vidro em Canais Radiculares Regulares ou Alargados – Laís Carvalho Martins – Tese de Doutorado – Programa de Pós-graduação em Odontologia – Faculdade de Odontologia – Universidade Federal de Uberlândia

RESUMO

O uso de retentores reforçados por fibra de vidro é consolidado na reabilitação de dentes tratados endodonticamente com extensa perda de estrutura coronária. Recentemente, pinos de fibra “universais” foram introduzidos visando facilitar o uso e indicação destes componentes. Assim, o objetivo geral deste estudo foi avaliar diferentes tipos de pino de fibra de vidro associados a uma luva de fibra de vidro, de tamanho universal ou tamanho reduzido comparados aos pinos de fibra de vidro utilizados com técnicas convencionais de reanatomização com resina composta, por meio de testes de resistência de união e análise de bolhas e porosidades empregando microtomografia computadorizada (Micro-CT). O estudo foi dividido em 3 objetivos específicos: **Objetivo 1-** Avaliar a interface, resistência de união e padrão de falha em raízes bovinas tratadas endodonticamente fragilizadas ou não, reabilitadas com diferentes tipos de pinos de fibra de vidro (Splendor Sap e Exacto). **Objetivo 2-** Avaliar a interface, resistência de união e padrão de falha de raízes bovinas tratadas endodonticamente reabilitadas com pinos de fibra de vidro de pequeno diâmetro associados ou não a luva de fibra de vidro. **Objetivo 3-** Avaliar por meio de Micro-CT a reabilitação de raízes fragilizadas ou não, com cimentação de pinos de fibra convencionais, convencionais reanatomizados e pinos de fibra de vidro associados a luvas de fibra de vidro. Pode-se concluir que a evolução dos retentores reforçados por fibra possibilitou novas alternativas quanto ao uso deste material de forma mais simplificada buscando facilitar o seu uso clínico, bem como alternativas mais conservadoras que evitem desgastes adicionais ao remanescente dentinário. As luvas de fibra de vidro se mostram como uma boa alternativa ao reembasamento (reanatomização) dos pinos de fibra convencionais em casos de raízes com canais alargados e os pinos de fibra de pequeno diâmetro são boa opção para canais radiculares de pequeno diâmetro ou atrésicos.

Palavras chaves: Dentes tratados endodonticamente, Resistência de união por push-out, Pino de fibra de vidro, Adesão, Canal radicular.

ABSTRACT

Resistência de União e Características Interfaciais de Pinos de Fibra de Vidro Convencionais e Associados a Luva de Fibra de Vidro em Canais Radiculares Regulares ou Alargados – Laís

Carvalho Martins – Tese de Doutorado – Programa de Pós-graduação em Odontologia –
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ABSTRACT

The use of fiberglass-reinforced posts is well-established in the rehabilitation of endodontically treated teeth with extensive loss of crown structure. Recently, “universal” fiber posts have been introduced to facilitate the use and indication of these components. Thus, the general objective of this study was to evaluate different types of fiberglass posts associated with a fiberglass sleeve, of universal size or reduced size, compared to fiberglass posts used with conventional re-anatomization techniques, through bond strength tests and analysis of voids and porosities using micro-computed tomography (Micro-CT). The study was divided into 3 specific objectives: **Objective 1-** To evaluate the interface, bond strength and failure pattern in endodontically treated bovine roots, flared or regular, rehabilitated with different types of fiberglass posts (Splendor Sap and Exacto). **Objective 2** - To evaluate the interface, bond strength and failure pattern of endodontically treated bovine roots rehabilitated with small diameter fiberglass posts associated or not with fiberglass sleeves. **Objective 3** - To evaluate, by means of Micro-CT, the rehabilitation of flared or regular, with cementation of conventional fiber posts, conventional re-anatomized posts and fiberglass posts associated with fiberglass sleeves. It can be concluded that the evolution of fiber-reinforced posts has enabled new alternatives regarding the use of this material in a more simplified way, seeking to facilitate its clinical use, as well as more conservative alternatives that avoid additional wear to the remaining dentin. Fiberglass sleeves are a good alternative to relining (re-anatomization) of conventional fiber posts in cases of roots with flared and regular canals and small diameter fiber posts are a good option for small diameter or atretic root canals.

Keywords: Endodontically treated teeth, Push-out bond strength, Fiberglass post, Adhesion, Root canal.

INTRODUÇÃO E REFERENCIAL

TEÓRICO

Resistência de União e Características Interfaciais de Pinos de Fibra de Vidro Convencionais e Associados a Luva de Fibra de Vidro em Canais Radiculares Regulares ou Alargados – Laís Carvalho Martins – Tese de Doutorado – Programa de Pós-graduação em Odontologia – Faculdade de Odontologia – Universidade Federal de Uberlândia

INTRODUÇÃO E REFERENCIAL TEÓRICO

O comportamento biomecânico dos dentes tratados endodonticamente deve ser criteriosamente avaliado uma vez que todo processo restaurador é considerado crítico (SOARES et al, 2007). Dentre os fatores que determinam a necessidade do tratamento endodôntico estão traumas dentários extensos e cáries profundas, que associados ao tratamento endodôntico resultam na perda de grande quantidade de estrutura coronária e determinam a necessidade da utilização de retentores intrarradiculares como forma adicional de estabilizar o material restaurador (ASSIF & GORFIL, 1994; FERRARI et al, 2012; NAUMANN et al, 2012; BORGES et al, 2018).

Os pinos ideais devem ter propriedades físicas específicas, como o módulo de elasticidade, resistência à compressão e resistência à flexão, semelhantes aos da estrutura dental, possibilitando união efetiva à dentina com resultados estéticos adequados (ASSIF et al, 1989; MA et al, 2011; LAMICHHANE et al, 2014; PEREIRA et al, 2014). Levando esses fatores em consideração, os pinos de fibra são usualmente o material de escolha para restaurações de dentes tratados endodonticamente e com grande perda estrutural (BITTER et al, 2007; GORACCI & FERRARI 2011), pois módulo de elasticidade próximo ao das estruturas dentais, além de promoverem melhor distribuição de tensões (RODOVIC et al, 2009) e oferecerem possibilidade de adesão às paredes dos canais radiculares (GORACCI & FERRARI, 2011).

Embora os pinos de vidro sejam a opção mais empregada atualmente na reabilitação de dentes tratados endodonticamente, fatores como tratamento endodôntico, tipo de pino utilizado, sistemas adesivos/cimento, tipo de restauração/material restaurador e remanescente radicular devem ser considerados durante a escolha dos materiais restauradores para que se possa garantir longevidade e sucesso das reabilitações (DIETSCHI et al, 2008; DIETSCHI et al, 2007).

Uma das dificuldades clínicas do uso de pinos de fibra de vidro é determinar, entre várias opções disponíveis no mercado qual o tipo retentor intrarradicular indicado para cada caso. Considerando que durante a escolha

do tipo de pino, um dos fatores avaliados é que para cada tipo/quantidade de remanescente se faça a seleção de calibre/tamanho adequados, ou seja, é necessário que no consultório estejam disponíveis opções de pinos diferentes. Considerando isso, as empresas de materiais têm investido em inovações no que tange os tipos de pino de fibra de a fim de facilitar o uso dos retentores além de garantir resultados satisfatórios que propiciem longevidade ao processo restaurador. Como nos casos dos pinos de fibra fresados que são personalizados, garantindo melhor adequação ao canal, obtidos a partir de blocos pré-fabricados de resina reforçados por fibra (LIU et al, 2010; TSINTSADZE et al, 2017). Essa opção possibilita a fresagem do pino/núcleo em corpo único, visando eliminar a necessidade de núcleo de preenchimento em resina composta, reduzindo as etapas clínicas de cimentação (TSINTSADZE et al, 2018). Porém ainda não existem evidências clínicas suficientes de que o uso destes materiais em dentes tratados endodonticamente tragam melhoras significativas em relação a facilidade de uso e a necessidade de equipamentos de fresagem dificulta o emprego dos mesmos no dia a dia (GONZAGA & CORRER, 2017).

Uma alternativa viável para uso de retentores radiculares de forma simplificada e com baixo custo é o emprego de pinos “universais”, ou seja, um único pino que possa ser indicado tanto para canais atrésicos, regulares ou mais largos (DOS SANTOS et al, 2023). O que possibilita o emprego desses pinos independente da configuração do canal é que o sistema utiliza uma “luva” de fibra de vidro, a qual é inserida no canal até que haja retenção mecânica de acordo com o espaço interno do conduto. Isso ocorre de forma que em condutos mais amplos a luva seja inserida em maior profundidade e em canais de menor diâmetro, em menor profundidade. Dessa forma o canal é preenchido de maneira adequada sem necessidade de reanatomização de pinos com materiais resinosos ou mesmo com uso de camada espessas de cimento resinoso, pode resultar na diminuição do risco de falha do complexo restaurador (PENTEADO et al, 2023).

OBJETIVOS

Resistência de União e Características Interfaciais de Pinos de Fibra de Vidro Convencionais e Associados a Luva de Fibra de Vidro em Canais Radiculares Regulares ou Alargados – Laís Carvalho Martins – Tese de Doutorado – Programa de Pós-graduação em Odontologia – Faculdade de Odontologia – Universidade Federal de Uberlândia

2. OBJETIVOS

Objetivo Geral

O objetivo geral deste estudo foi avaliar diferentes tipos de pino de fibra de vidro associados a uma luva de fibra de vidro, de tamanho universal ou tamanho reduzido comparados aos pinos de fibra de vidro utilizados com técnicas convencionais de reanatomização como resina composta, por meio de testes de resistência de união e análise de bolhas e porosidades, empregando microtomografia computadorizada (Micro-CT).

Objetivos específicos

Objetivo específico 1-

Capítulo 1 - Evaluation of different types of fiberglass posts in flared and regular root canals.

O objetivo deste estudo foi avaliar a interface, resistência de união e padrão de falha em raízes bovinas tratadas endodonticamente fragilizadas ou não, reabilitadas com 2 tipos de pinos de fibra de vidro (Splendor Sap e Exacto).

Objetivo específico 2

Capítulo 2 - Evaluation of new small-diameter fiber posts in regular and atresic root canals: An *in vitro* study.

O objetivo deste estudo foi avaliar a interface, resistência de união e padrão de falha de raízes bovinas tratadas endodonticamente reabilitadas com pinos de fibra de vidro de pequeno diâmetro associados ou não a luva de fibra de vidro.

Objetivo específico 3

Capítulo 3 – Effect of void and porosity formation according to fiberglass post type on flared or regular canal roots: A Micro-CT evaluation.

O objetivo deste estudo foi avaliar por meio de Micro-CT a reabilitação de raízes fragilizadas ou não, com cimentação de pinos de fibra convencionais, convencionais reanatomizados com resina composta e pinos de fibra de vidro associados a luvas de fibra de vidro.

Capítulos

Resistência de União e Características Interfaciais de Pinos de Fibra de Vidro Convencionais e Associados a Luva de Fibra de Vidro em Canais Radiculares Regulares ou Alargados – Laís Carvalho Martins – Tese de Doutorado – Programa de Pós-graduação em Odontologia – Faculdade de Odontologia – Universidade Federal de Uberlândia

3. CAPÍTULOS

3.1 Capítulo 1

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Conflict of interest statement

The Authors declare no conflict of interest.

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Evaluation of different types of fiberglass posts in flared and regular root canals.

Abstract

Introduction:

Fiberglass posts are used in the rehabilitation of endodontically treated teeth and adaptation to the canal is a determining factor.

Objective:

This study aimed to evaluate the push-out bond strength (PBS) and failure mode of different types of fiberglass posts, associated or not with a fiberglass sleeve (Exacto and Splendor SAP) in different types of root canals (flared and regular).

Method & Materials:

Forty bovine roots were selected and divided into four groups (n=10). The canals were instrumented, and the fiber posts were cemented with dual self-adhesive resin cement. The roots were sectioned in the cervical, middle and apical thirds with a thickness of 1 mm. The specimens were randomly divided into four groups (n=10) according to the post system and root canal configuration: a) Exacto + flared canal roots (ExcFI), b) Exact + regular canal roots (Exc), c) Splendor Sap + flared canal roots (SPrFI), and d) Splendor Sap + regular canal roots (Splr). The PBS test was performed in a mechanical testing machine (EMIC). Statistical analysis: PBS values were recorded, and data were analyzed by ANOVA with repeated measures followed by Tukey HSD test. To determine the failure mode, a stereomicroscope with 40× magnification and 2.5D analysis was used.

Results:

SPrFI showed significantly higher bond strength in the cervical third than SPr and Exc. However, SPr, Exc and ExcFI did not show differences between them. Furthermore, similar bond strength was observed between SPrFI and ExcFI. The failure mode was not influenced by the post system ($p=0.144$) or root third ($p=0.146$). All experimental groups showed prevalence of adhesive failures.

Conclusion:

The groups that used the Splendor system showed similar results to conventional posts anatomized with resin, with no statistical differences in PBS for the middle and apical thirds.

Clinical significance: The results of this study can help dentists to select which types of fiberglass posts can be used to rehabilitate endodontically treated teeth, ensuring good adhesive resistance and consequently clinical success.

Keywords: Endodontically treated teeth, Push-out bond strength, Fiberglass post, Adhesion, Root canal.

1. Introduction

Fiberglass posts (FGP) have recognized popularity in the dental field because of their benefits in terms of ease of handling, mechanical properties, and aesthetics [1]. They are materials that support the stress distribution in a uniform way on the root surface due to similar elastic modulus to dentin [2], [3], [4].

The use of FGP in flared roots or wide canals is a challenge, since these materials have standardized geometry, making it difficult to fully adapt to the root canal walls, especially in the cervical third, requiring a thick layer of resin cement [5], [6]. The greater the thickness of the cement line, the greater the stress levels of polymerization shrinkage, therefore thick layers of resin cement can induce structural discontinuities at the adhesive interface, consequently increasing the risk of failure after post cementation [7], [8].

One way to reduce this effect is to anatomize the posts with resin composite (anatomical posts), which reduces the volume of the luting cement providing better adaptation to the canal wall [9]. A limitation of the post anatomization is the technical difficulty of the procedure, so new types of posts and accessories were introduced to facilitate clinical application and guarantee satisfactory long-term results such as the FGP combined with fiber sleeves, which is classified as “universal” [10], [11].

Fiberglass sleeves were introduced in the dental market to improve the adaptation of the FGP to the canal without the need for relining or other clinical steps. They are currently available through a new system of FGP, which has the advantage of not requiring specific preparation in relation to the configuration of the root of the canal, because in situations where the post is not capable of adjusting to the canal walls, a sleeve is used to improve this contact, making this system unique [12]. The FGP associated with fiber sleeve is presented as a low-cost alternative to simplify the use of intra-radicular posts, as it presents a single diameter post that can be indicated for both narrow and wide canals, varying the amount of sleeve insertion according to the width of the root canal [13]

Thus, this study aimed to evaluate the performance of FGPs associated or not with a glass fiber sleeve in flared and regular root canals in terms of bond strength to dentin. The two null hypotheses tested were: 1) there are no differences in the bond strength of the distinct types of FGP for the different canal configurations; 2) there are no differences in the bond strength of the different regions to the root canal walls.

2. Material and methods

Specimens selection

Forty bovine teeth with a root length of 15 mm and similar anatomical size and shape (root volume within 10% of the mean) were selected. The specimens were then stored in distilled water at 4 °C until use. This study was performed only after review by the Animal Use Ethics Committee (CEUA), which was exempt from evaluation, as it is a study that used bovine teeth and does not interfere with the slaughter process, since it had already been performed previously for production purposes.

The specimens were randomly divided into four groups (n=10) according to the post system and root canal configuration: a) Exacto + flared canal roots (ExcFI), b) Exact + regular canal roots (Exc), c) Splendor Sap + flared canal roots (SPrFI), and d) Splendor Sap + regular canal roots (Splr).

Root canal preparation

The crowns were sectioned perpendicularly to the long axis using a water-cooled diamond disk (n° 7020; KG Sorensen, Barueri, Brazil) up to 15.0 mm from the apical limit and removed. The root canals were endodontically instrumented using a 10 K file (Dentsply Malleifer; Petrópolis, RJ, Brazil) which was introduced into the root canal until it was visible in the apical foramen. Root canals were instrumented to their full-length using No. Drills 2 and 3 Gates-Glidden (Dentsply Maillefer, Ballaigues, Switzerland). Then, a number 4 Gates Glidden bur (Dentsply Malleifer) was used in the cervical and middle thirds of the root canal. Once this was done, the specimens were stored in distilled water at 4 °C [14].

Preparation for post-placement

Fifty per cent of the specimen from the Exacto and Splendor Sap groups had their root flared using a cylindrical diamond bur so that the wall had a minimum dentin thickness of 1.5 mm. The space for cementing the posts into the roots was obtained using a specific drill for each post system following the manufacturer's instructions with the same dimensions as the FGP selected. The root was cleaned by abundant irrigation with distilled water and then humidity control was performed using absorbent paper cones. The preparation with the specific drill for each post and the weakening of the roots of the enlarged canal are shown in Figure 1.

Fiberglass post cementation

For the ExcFI group, the post was anatomized using resin composite (Z350, 3M ESPE, Sumaré, SP, Brazil) before the cementation. Therefore, the FGP were treated with 35% hydrogen peroxide for 1 min (Clariant, Angelus; Londrina, PR, Brazil), washed with distilled water, and then air-dried for 20 seconds (SSPlus, Maringa, PR, Brazil). Subsequently, a silane agent was applied to the post for 1 min (Silano, Angelus; Londrina, PR, Brazil). Then, a simplified adhesive system (Single Bond 2, 3M ESPE, Sumaré, SP, Brazil) was applied in two layers to all surfaces, and light cured on each face for 20 seconds. After that, the composite resin was applied to the post, which was not light cured. To prepare the canal of the anatomized FGPs, water-soluble gel was applied, and the excess was removed with absorbent paper cones. Then, the post anatomized with composite resin was inserted in the root canal and light-cured for 3 seconds. The post was removed from the root and light-cured for 20 seconds on each side. Reanatomization of the FGPs for the Ext FI group with composite resin is shown in Figure 2. [15]

The FGP conditioning protocol was the same for all groups. The FGP and sleeves were treated with 35% hydrogen peroxide for 1 minute, washed with distilled water and then air-dried. Subsequently, a silane agent was applied to the post for 1 min (Silane, Angelus; Londrina, PR, Brazil). The conditioning of FGPs and fiberglass sleeves is shown in Figure 3. Canal cleaning and conditioning was also standardized for all groups. Canals were cleaned by active irrigation with sodium hypochlorite for 1 minute, EDTA for 3 minutes and distilled water for 1 minute. Humidity control was performed with absorbent paper cones.

Cleaning and treatment protocols were also performed for the cementation of all groups. Cementation was performed with dual self-adhesive resin cement (RelyX U200, 3M ESPE, Sumaré, SP, Brazil) which was inserted into the root canal using an Endotip (3M ESPE, Sumaré, SP, Brazil) to minimize the presence of voids [16]. The self-mixing tip was positioned as apically as possible and as the cement was injected, the syringe was slowly removed.

For the Exc and ExcFI groups, first the self-adhesive cement was inserted with an endotip tip in the apical coronal direction and then the FGP was positioned in the center of the canal. For the Splr and SPrFI groups, after insertion of the self-adhesive cement, the FGP was first placed in the center of the canal and then the sleeve was inserted, involving the previously placed post, until it was locked inside the canal.

Excess resin cement was removed following 1 minute and after 5 minutes (under load - 500g), the resin cement was light cured on each coronal surface (occlusal, buccal, lingual, medial, distal) for 40s (Valo Cordless, Ultradent, Indaiatuba, SP, Brazil). The materials used are shown in Table 1.

Push-Out Bond Strength test (PBS)

Ten specimens from each group were prepared for the mechanical push-out bond strength test after storage for 7 days in distilled water at 37°C.

The roots were fixed in a 20 mm x 20 mm acrylic plate with a cutting edge and sectioned with a water-cooled low-speed diamond disc on a precision mill (Isomet 1000; Buehler) to obtain two slices, 1.0 mm thick each, for each third of the root (apical, middle and cervical). The diameter and thickness of the specimens were measured using a stereomicroscope digital camera at 40x magnification with a 2.5D analysis (Mitutoyo; Tokyo, Japan) and a digital micrometer with an accuracy of ± 0.01 mm.

Each slice was prepared and stored for 24 hours in distilled water at 37°C before being subjected to the bond strength test. Load application tips with different sizes were used for the cervical, middle, and apical third. For the cervical third a base of 2.5 mm and a tip of 1.3 mm was used, for the middle third a base of 2.2 mm and a tip of 1.2 mm was used, and for the apical third a base of 2.0 mm and a tip of 1.0 mm was used [15]. The push-out bond strength was performed using a mechanical Testing Machine (EMIC DL 2000, São José dos Pinhais, Brazil) containing a load cell of 5 KgF. The slices were subjected to compression load with a constant speed of 0.5 mm/min in the apex/crown direction, until the failure.

The maximum load at failure was converted MPa, calculated using the following formula: $F(N)/Area$. The area was calculated using the following formula: $A=\pi(r_1+R_2) \sqrt{r_1-R_2)^2+h^2}$; where π is a constant value of 3.14, r and R are the smallest and largest radii, respectively, of the cross-section of the tapered post, and h is the section thickness.

Failure mode classification

The fractured specimens were analyzed under a stereoscopic microscope at 40x magnification (Mitutoyo, Tokyo, Japan) with 2.5D analysis. Failures were classified as follows: (Adhesive I) adhesive between post and resin cement; (Adhesive II) adhesive between the resin cement and the root dentin; (Adhesive III) adhesive inside the FGP and sleeve; (Cohesive I) cohesive in dentin; (Cohesive II) cohesive in FGP; (Cohesive III) cohesive in cement; and (Mixed) mixed, with resin cement covering parts of the post surface.

Data analysis

Data was tested for normality and homoscedasticity with Shapiro–Wilk and Levene tests, respectively. The push-out bond strength data were analyzed using Two-way ANOVA with repeated measures and Tukey HSD test. The failure modes were evaluated qualitatively followed by the chi-square test. Statistical analysis was performed using Jamovi 2.2.5 statistical software package (dev.jamovi.org). The significance level was set at 0,05 for all the data analyses.

3. Results

The mean bond strength values and standard deviation for the groups according to post system and root third are shown in Table 2. Two-way ANOVA with repeated measures showed a significant interaction between both factors ($p = 0.042$).

Post system presented differences on PBS only at the cervical root third. SPrFI had significantly higher bond strength at cervical third than Splr and Exc. However, Splr, Exc, and ExcFI showed no significant differences. Also, similar push-out bond strength was observed between SPrFI and ExcFI.

The different types of failures observed for the specimens after the PBS test are illustrated in Figure 4, and the failure mode distribution (%) for each group is shown in Figure 5. The failure mode wasn't influenced by the post system ($p = 0.144$) or root third ($p = 0.146$). All experimental groups exhibited a prevalence of adhesive failures (Types I, II, and III).

4. Discussion

This study analyzed the effects of two types of FGPs, associated or not with a fiberglass sleeve, in two types of root canals, flared and regular, on the results of push-out bond strength.

The evolution of dental materials and techniques simplify the clinical procedures, reducing the error rate and ensuring better results in rehabilitation techniques. The adaptation of the FGP to the root canal is a critical factor that can interfere with adhesion, especially in flared or oval canals [1], [17]. The fiberglass sleeve emerges as a possibility for relining FGPs that dispenses with the conventional technique with resin composite, which is difficult to and requires more clinical time.

The SPr group showed significantly higher bond strength when compared to the Exc and SPrFI groups, therefore, the first null hypothesis was rejected. The post system showed differences in PBS only in the cervical third of the root, with SPrFI presenting significantly higher bond strength in the cervical third than SPr and Exc, thus, the second null hypothesis was also rejected.

The push-out test offers bond strength values from different locations of the root canal and was used in the present study because it is the most reliable test to evaluate the bond strength of the FGP posts to dentin [3], [17]. It is necessary to consider criteria that influence the results of bond strength to push-out, such as the diameter of the loading tip and the base orifice of the device used, besides the thickness of the specimen, which must be standardized [18], [19], [20]

The PBS results obtained in this study showed that there was no statistical difference in relation to the apical third, and this can be attributed to the type of resin cement and the high-power photopolymerization device used during the cementation process of the fiberglass posts. Self-adhesive dual-curing cement presents considerably higher values in the literature regarding adhesive strength, when compared to conventional dual-curing cement. This is closely related to the lower number of clinical steps of self-adhesive cements and consequently to the easy cementation technique [8], [17]. A previous systematic review adopted a statistical approach to assess the influence of resin cement and adhesives on FGP retention and demonstrated that self-adhesive types of cement perform better [21], [22]. It is known that adhesive failure of FGP has been described as the most recurrent complication of cemented posts [17], [23], [24].

The fact that there were no statistical differences between the root thirds can be considered the care that was taken during the execution of the cementation technique [25]. According to Silva et al. 2019 the use of dual automix self-adhesive cements associated with an endotip can promote a more continuous cementation line, as it facilitates the correct insertion of the cement, considerably reduces the number of voids (mainly in the apical thirds) and consequently increases the bond strength values. Also, this can help to justify the fact that there is no statistical difference between the groups [17].

Although the lower values were obtained by the ExcFI group, it is important to emphasize that these results show the advantage of posts with better adaptation to the root canal walls, since, in situations where the FGP are not well adapted to the walls, the bond strength may present lower results once it is known that the greater the thickness of the cement layers, the greater risk of bond failures. This is especially true in the cervical third, where posts with reduced diameter probably need a thick layer of resin cement [26], [27], [28].

Well-fitting posts and thin layers of resin cement are essential to provide better luting to root dentin [4], [17], as thick layers of cement decrease the bond strength, as a greater volume of cement leads to increased volumetric shrinkage, generating greater stress at the adhesive interface and causing the greater formation of cracks and voids inside the root canal [1].

The filling obtained with the anatomization using resin composite was an important factor for the bond strength in the cervical third since the intimate contact between the anatomized post associated with a thin cement layer is an important factor for improving the adhesive strength [9], [11], [28], [29]. While for the flared Exacto group, the technique of resin anatomized-FGP resulted in higher bond strength results.

For both the flared Splendor and the regular Splendor groups, the presence of the post associated with the sleeve, both made with fiberglass, luted with the dual self-adhesive resin cement promoted excellent results for the bond strength in the cervical third, as the sleeve is inserted into the canal until there is micromechanical retention, allowing the root can be filled desirably.

In this study, the type of FGP, type of root canal and type of third did not influence the failure mode and the result of the experiment shows a prevalence of adhesive failures, so it is important to emphasize the importance of the cementation stage, improving the adaptation of the post to the canal, using FGP reanatomization techniques with resin composites or the use of devices such as posts and sleeves.

A limitation of the Splendor Sap system may be associated with the number of interfaces, which is higher when compared to conventional posts since its design has a post associated with a fiberglass sleeve. Voids that can be introduced into the cement layer because of insertion, may act as contributing factors that can affect the quality of the luting [24]. Therefore, tests that allow the evaluation of adhesive interfaces, such as studies on the analysis of the interface using the micro-computed tomography technique, are a good option to be used in future studies, as it enables visualization of three-dimensional and high-resolution images, through the digital union of hundreds of cross-sections.

This study has intrinsic limitations. Although the results show that the Splendor system presents relevant values of bond strength when compared to the other FGP systems tested, the increase of an adhesive interface between the post and the fiberglass sleeve may be a limitation of these posts, therefore studies that evaluate the adhesive interfaces are important. The use of bovine teeth was considered to facilitate the standardization of the specimens, limiting the influence of factors other than those under study.

5. Conclusions

Based on the results of this study, it was concluded that:

- The posts associated with the sleeve were effective, as they presented bond strength levels like the anatomization of the FGP with resin composite, which may be associated with a better adaptation created in the cervical third, reducing the cementation line.
- This study suggests that the new FGP system may be clinically useful for the rehabilitation of endodontically treated teeth.
- The fiberglass posts combined with the fiberglass sleeve can be applied in wide or narrow canals and are a good option to simplify the clinical application of posts.

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Conflicts of interest

The authors deny any conflicts of interest related to this study.

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Figure legends

Figure 1. Preparation for placing the FGP. Figure A: Number 3 Exacto FGP system drill used for Exc and ExcFl groups. Figure B: Splendor Sap Post System Drill used for Splr and Splrfr groups. Figure C: Cylindrical diamond bur used to simulate widened of flared canal root.

Figure 2. FGP anatomized: (A) Exacto post in a flared root group with a composite resin before cementation, (B) FGP anatomized positioned at the root.

Figure 3. Surface treatment of FGP and sleeves. (A-C) FGP and sleeves were treated with 35% hydrogen peroxide for 1 min, washed with distilled water, and then air-dried. Subsequently, a silane agent was applied to the post for 1 min.

Figure 4. Frequency of failure modes (%). Different cores aloud indicate which type of failure occurred in each group.

Figure 5. Failure pattern analysis. (A) Type I adhesive failure; (B) Type II adhesive failure; (C) Type III adhesive failure; (D) Type I cohesive failure; (D) Type I cohesive failure; (E) Type II cohesive failure; (F) Type III cohesive failure; (G) Mixed failure.

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Figure 1. Preparation for post-placement.

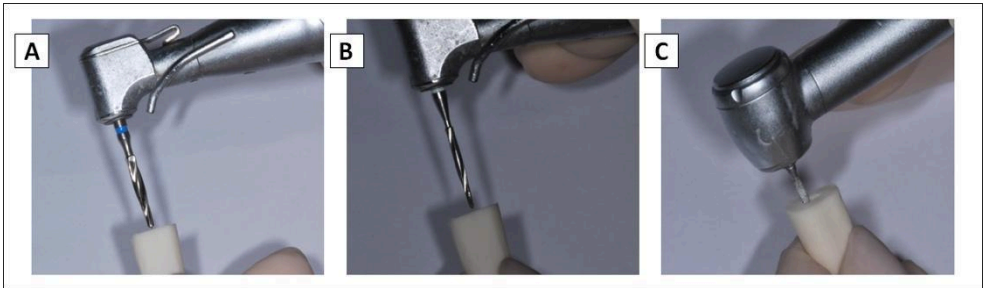


Figure 2. Fiberglass post anatomized.

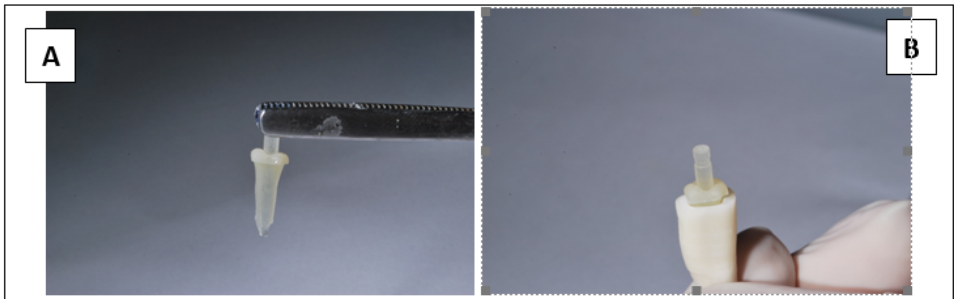


Figure 3. Surface treatment of fiberglass posts and sleeves.

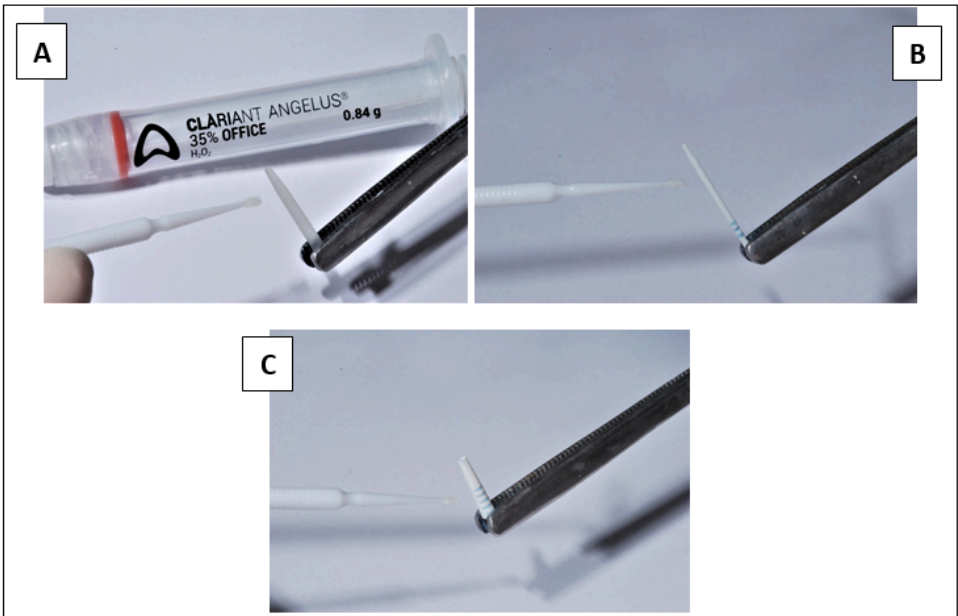


Figure 4. Frequency of failure modes (%).

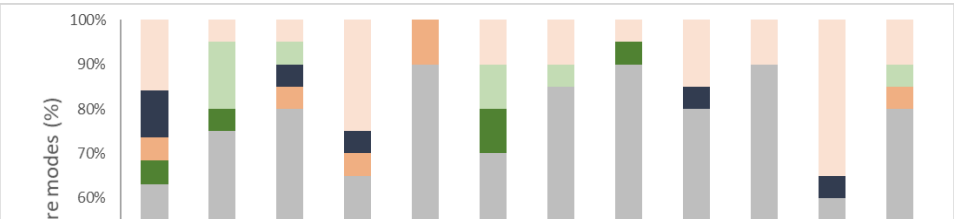
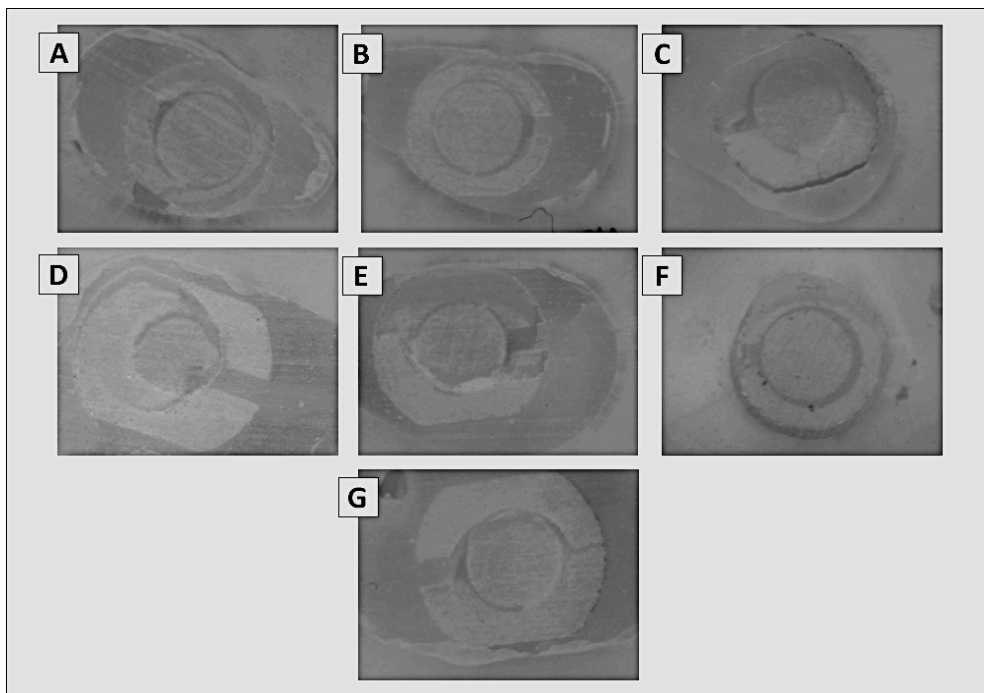


Figure 5. Failure pattern analysis.



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Table 1. Materials, manufacturer, and batch of products used.

Material	Manufacturer	Batch
RelyX TM U200	3M ESPE, Sumaré, SP, BRA	2113200890
Silane	Angelus; Londrina, PR, BRA	56547
Hydrogen Peroxide 35%	Angelus; Londrina, PR, BRA	595105
Resin Composite Z350	3M ESPE, Sumaré, SP, BRA	2110200248
Adper Single Bond	3M ESPE, Sumaré, SP, BRA	080621

Exacto nº 3	Angelus; Londrina, PR, BRA	52948
Splendor Sap	Angelus; Londrina, PR, BRA	102437

Table 2. Mean push-out bond strength (MPa) values and standard deviation [$\pm$] according to the experimental groups.

Fiberglass Post Group	Cervical third	Middle Third	Apical third
Splendor flared - SplFI	11.7 $\pm$ 1.06 Aa	11.8 $\pm$ 1.43 Aa	9.11 $\pm$ 2.59 Aa
Splendor- Spl	7.88 $\pm$ 1.75 BCa	8.14 $\pm$ 2.29 Aa	9.01 $\pm$ 3.45 Aa
Exacto - Exc	7.61 $\pm$ 2.97 Ca	8.3 $\pm$ 2.02 Aa	7.74 $\pm$ 3.1 Aa
Exacto flared - ExcFI	11.1 $\pm$ 2.73 ABa	12.2 $\pm$ 4.22 Aa	9.69 $\pm$ 4.95 Aa

Different capital letters in columns indicate significant differences between post systems in the same root third, and different lowercase letters in rows indicate significant intragroup differences between the root thirds (Two-way ANOVA with repeated measures and Tukey HSD test – $p < .05$).

Capítulos

Resistência de União e Características Interfaciais de Pinos de Fibra de Vidro Convencionais e Associados a Luva de Fibra de Vidro em Canais Radiculares Regulares ou Alargados – Laís Carvalho Martins – Tese de Doutorado – Programa de Pós-graduação em Odontologia – Faculdade de Odontologia – Universidade Federal de Uberlândia

3.2 Capítulo 2

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Title: Evaluation of the bond strength of new small-diameter fiber posts: An *in vitro* study.

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Evaluation of the bond strength of new small-diameter fiber posts: An *in vitro* study.

Abstract

Objectives: This study evaluated the push-out bond strength (PBS) of reduced-diameter fiberglass posts (FGPs) (Whitepost DC FIT 0.4 and Endo Taper) by using bovine teeth. **Materials and methods:** The root canals were instrumented with rotary endodontic files using the crown-apex technique, and dual-cure self-adhesive resin cement was used for cementation of the specimens. The bovine roots were sectioned into cervical, middle, and apical thirds with a thickness of 1 mm. The PBS test was performed using a universal testing machine (EMIC) by selecting the tips of the load applicators according to the root thirds. Statistical analysis: The PBS values were recorded, and the repeated-measures ANOVA test and the Tukey HSD test were used to analyze the data. **Results:** The post system showed differences in PBS only in the apical third of the root, where the FIT post showed significantly higher bond strength than the Endo Taper system ($p < 0.001$). Comparing the intragroup differences, the lowest PBS occurred in the cervical third for FIT and in the apical third for Endo Taper. **Conclusions:** The type of post did not influence the bond strength of the posts with reduction for the cervical and middle thirds of the root canal; however, the Endo Taper system, which is associated with a sleeve, showed lower bond strength in the apical third than the FIT post.

Keywords: Endodontically treated teeth; Push-out bond strength; Fiberglass posts.

1. Introduction

Fiberglass posts (FGPs) are commonly used to restore endodontically treated teeth with insufficient coronal structure to retain a restoration. ^(1, 2) The

mechanical properties of these materials associated with the ease of use contribute to their clinical success.^(3,4) FGPs also have similar elastic modulus to dentin, favoring biomechanical behavior in endodontically treated teeth and reducing the probability of catastrophic failures.⁽⁵⁾

However, FGP displacement associated mainly with adhesive failures is a clinical disadvantage of these materials.^(6, 7) Root canal geometry and diameter can affect the longevity and stability of FGPs, potentially allowing the formation of thick cement lines and increasing failure chances.^(8,9) Therefore, the literature has extensively covered some FGP systems and techniques intending to reduce the cementation line.^(10, 11)

FGP relining materials such as resin composites, are commonly used for this purpose. Current studies have shown higher bond strength to the root canal when relining FGPs.⁽¹²⁾ However, this technique may promote higher failure chances due to the increased number of clinical steps.^(12, 13) Hence, a new FGP system which combines a fiberglass post with a fiberglass sleeve (Splendor SAP; Angelus) was introduced in the market, and some investigations showed fatigue resistance and stress distribution like conventional resin-relined posts.⁶ However, a concern regarding FGP systems is related to the structure loss caused during root canal preparation.^(6, 14)

The loss of remaining dentin may occur from the endodontic treatment to the root canal preparation to receive FGPs.⁽¹⁵⁾ FGP diameters may compromise treatment success, as FGPs with increased diameters require additional wear on root canal walls. Conversely, loose FGPs that poorly adapt to the root canal walls favor the formation of thick cementation lines, increasing the chance of adhesive failures and displacement.

Recent research shows that posts with reduced diameters have been designed to follow the same principles of conservative endodontic treatment.⁽¹⁶⁾ To associate these factors, which may help better adapt the FGP to the root canal, a new FGP concept (Endo Taper, FGM) was designed intending to preserve the root canal structure without compromising the bond strength of the restorative set. This system consists of a set of small-diameter post associated with a fiberglass sleeve that fits into the cervical and middle thirds of the root

canal. These FGPs are available in five different diameters (#20, #25, #30, #40, and #50), and the post must be compatible with the number of the last rotary file used for the endodontic treatment to adapt well to the root canal walls without unnecessarily wearing the dentin.

Thus, this study assessed the bond strength of small-diameter FGPs with and without a fiberglass sleeve to the root canal walls. We tested two null hypotheses: 1) Bond strength would not differ among FGP types; and 2) Bond strength would not differ among root canal wall regions.

2. Material and methods

Sample selection

For this study, 20 bovine teeth were selected with a root length of 15 mm and similar size and anatomical shape (root volume within 10% of the average). The specimens were stored in 4°C distilled water until use.

The system post number was first selected based on the manufacturer's instructions, evaluating the taper and tip (mm) of the post and the fiberglass sleeve. Also, the post and sleeve diameters were measured according to each number. This measurement provided the selection of the #40 Endo Taper post, based on the measurement of the post number and post and sleeve diameters, which were like the other FGP system (DC FIT 0.4).

The specimens were randomly divided into two groups (n=10) according to the FGP system: a) Whitepost DC FIT 0.4 (Whitepost System, FGM, Joinville, SC, Brazil) and b) Endo Taper (Endo Taper, Angelus, Londrina – PR, Brazil) (Fig. 1).

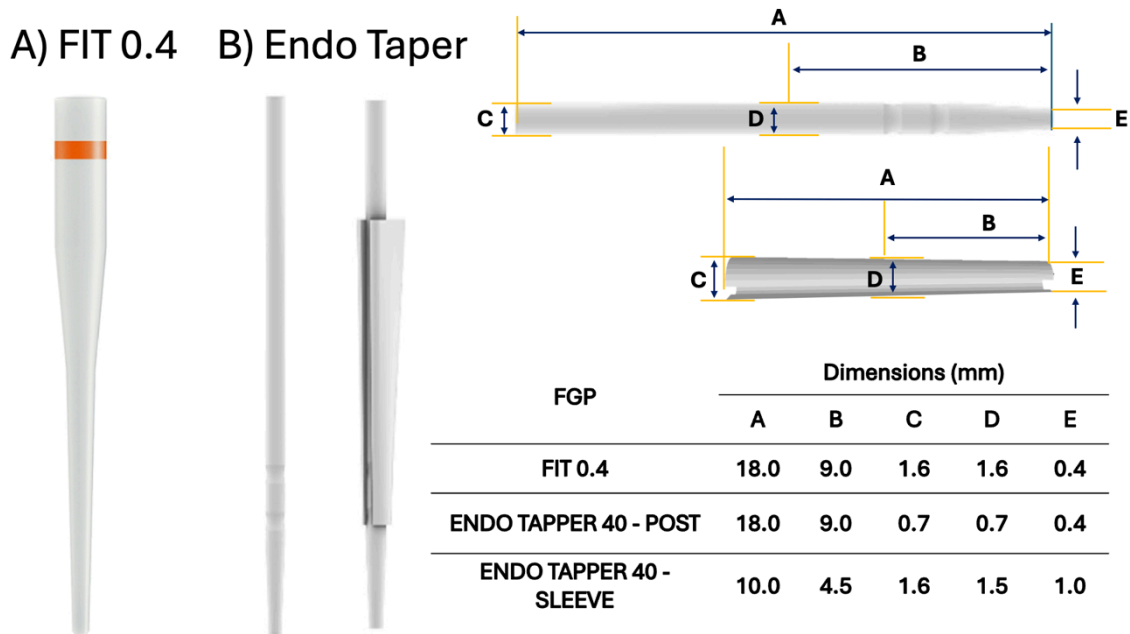


Figure 1. Dimensions of the Whitepost FIT 0.4 and Endo Taper according to manufacturer's information.

Root canal preparation

The crowns were sectioned perpendicularly to the long axis using a water-cooled diamond disc (#7020; KG Sorensen, Barueri, Brazil) up to 15.0 mm from the apical limit. The root canals were endodontically instrumented using a 10 K-file (Dentsply Malleifer; Petrópolis, RJ, Brazil) introduced into the root canal until it was visible in the apical foramen. The established working length was 1.0 mm below the apical limit. The root canals were modeled with 40.05 rotary instruments (Lima Prodesign Logic, Easy, City, State, Country) using the crown apex technique. A rotary kit aided the preparation of five specimens and was then replaced. The root canals were irrigated with 2.5% sodium hypochlorite (Cloro Rio; São José do Rio Preto, SP, Brazil) using a syringe and a 27-gauge long needle. Final irrigation was made with 17% ethylenediaminetetraacetic acid (EDTA, Bioquímica; Ibiporã, PR, Brazil) for three minutes, followed by a 2.5% NaOCl solution (Cloro Rio) for one minute and 5 ml of a physiological saline solution (LBS; São Paulo, SP, Brazil) to remove any remaining residues. The instrumented root canals were dried with sterile paper points (Dentsply Malleifer) and then immediately obturated using

lateral condensation technique with a master gutta-percha cone (F4 ProTaper Universal, Dentsply Malleifer) and accessory cones of conventional gutta-percha and water-based calcium hydroxide cement (Sealer 26, Dentsply-Sirona; São Paulo, SP, Brazil). Resin-modified glass ionomer cement (Vitremer, 3M Oral Care; St Paul, MN, USA) sealed the root canal opening. Endodontically treated roots were stored at 37°C and 100% relative humidity for seven days.

Post space preparation

A heated instrument (Paiva condenser, Golgran; São Paulo, SP, Brazil) removed the gutta-percha to a 10-mm depth. The root canals were actively cleaned using agitation of the chemical substances (Easy Clean, Easy). The cleaning protocol comprised the active application of a 2.5% hypochlorite solution and 17% EDTA for three 20-second cycles each and a final washing with abundant distilled water irrigation.

Fiberglass post surface treatment

The FGPs were treated with 35% hydrogen peroxide for one minute (Clariant, Angelus; Londrina, PR, Brazil), washed with distilled water, and dried with air spray for 20 seconds.⁽¹⁷⁾ Subsequently, the FGPs received a silane agent actively applied for one minute and volatilized for another one minute (Silano, Angelus; Londrina, PR, Brazil). The Endo Taper system followed the same treatment protocol for FGPs in fiberglass sleeves.

Fiberglass post cementation

FGPs were cemented with dual-cure self-adhesive resin cement (RelyX U200, 3M ESPE, Sumaré, SP, Brazil) inserted into the root canal using an EndoTIP (3M ESPE, Sumaré, SP, Brazil) to minimize voids⁽¹⁸⁾. The self-mixing tip was positioned as apically as possible, and the syringe was slowly removed as the cement was injected. Regarding the Whitepost DC FIT 0.4 group, as for the Endo Taper groups, after inserting the self-adhesive cement, the FGP was

first centered in the root canal, and the sleeve was inserted between the previously placed post until locked inside the root canal.

Excess resin cement was removed following 1 minute and after 5 minutes (under load - 500g), the resin cement was light cured on each coronal surface (occlusal, buccal, lingual, medial, distal) for 40s (Valo Cordless, Ultradent, Indaiatuba, SP, Brazil). The materials used in the study are described in Table 1.

Push-out bond strength test (PBS)

Ten specimens from each group were prepared for mechanical bond strength testing and stored in 37°C distilled water for seven days. The roots were fixed in a 20x20mm acrylic plate with a cutting edge and sectioned with a water-cooled low-speed diamond disc on a precision mill (Isomet 1000; Buehler). That provided two 1.0-mm-thick slices each from each root region (apical, middle, and cervical). A digital stereomicroscopic camera with 40x magnification and 2.5D analysis (Mitutoyo; Tokyo, Japan) and a digital micrometer with 0.01mm accuracy were used to measure the diameter and thickness of the specimens.

Each slice was prepared and stored for 24 hours in 37°C distilled water before the bond strength test. The cervical, middle, and apical thirds relied on load applicator tips with different sizes. The tips and bases selected for the test were defined according to the post diameter for each third. The cervical third used a 2.2 mm base and a 1.0 mm tip, the middle third used a 2.0 mm base and a 0.8 mm tip, and the apical third used a 2.0 mm base and a 0.5 mm tip.

The PBS was performed in a universal testing machine (EMIC DL 2000, São José dos Pinhais, Brazil) with a 5KgF load cell. The slices received a compression load at a constant speed of 0.5 mm/min in the apex/crown direction until rupture. The maximum load at failure was converted into MPa and according to the following formula:

$$A = \pi(r_1 + R_2) \sqrt{r_1 - R_2)^2 + h^2} \pi(r_1 + R_2) \sqrt{r_1 - R_2)^2 + h^2};$$

where π is a constant value of 3.14, r and R are the smallest and the largest radii of the cross-sectioned tapered post, respectively, and h is the thickness of the section.

Failure mode classification

The fractured specimens were analyzed under a stereoscopic magnifying microscope with a 40x magnification (Mitutoyo, Tokyo, Japan) and 2.5D analysis for investigating the failure site. Failures were classified as follows: Adhesive I - adhesive between the dentin and resin cement; Adhesive II - adhesive between the fiberglass post/sleeve and resin cement; Adhesive III - adhesive inside the fiber post and fiberglass sleeve; Cohesive I - cohesive in cement; Cohesive II - cohesive in dentin; Cohesive III - cohesive at the post; Cohesive IV - cohesive in the fiberglass sleeve; and Mixed - adhesive and cohesive failures.

Data analysis

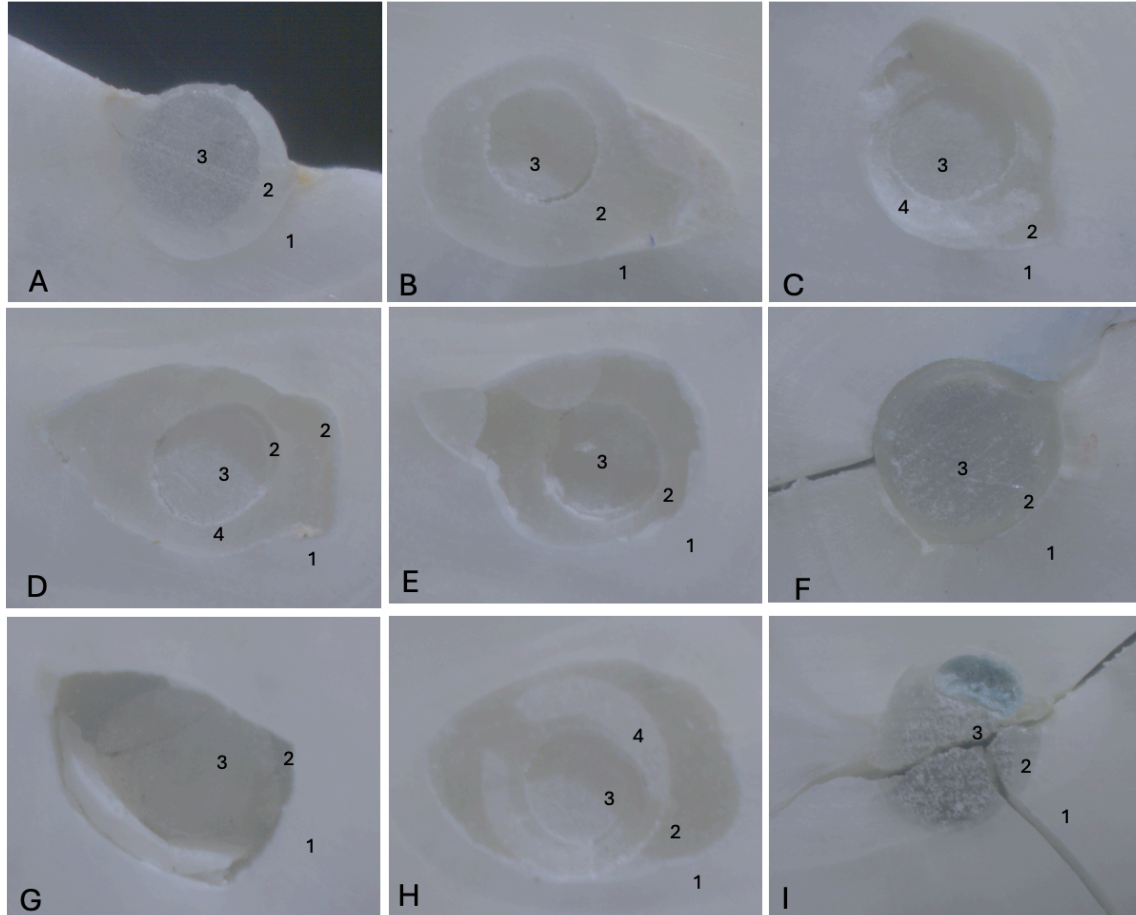
The data was tested using Shapiro–Wilk and Levene tests normality and homoscedasticity. Two-way ANOVA with repeated measures and Tukey HSD tests analyzed the push-out bond strength data, comparing post systems. Failure modes were evaluated qualitatively, followed by the chi-square test. The statistical analysis used the Jamovi 2.2.5 statistical software package (dev.jamovi.org). The established significance level was 95% for all data analyses.

3. Results

The mean bond strength values and standard deviation according to post system and root third are shown in Table 2. Two-way ANOVA with repeated measures showed a significant interaction between both factors ($p < 0.001$). The post system presented significant PBS differences only at the apical root third, where the FIT post had significantly higher bond strength than the Endo Taper system. When comparing intragroup differences, the lowest push-out bond

strength occurred in the cervical third for FIT and the apical third for Endo Taper.

The different types of failures observed in the specimens after the PBS



test are illustrated in Figure 2, and the failure mode distribution (%) for each group is shown in Figure 3. Post system influenced the failure mode only at the cervical root third ($p=0.047$). The FIT post showed more Adhesive I and Cohesive I failures, while the Endo Taper system involving the tapered sleeve had more Adhesive I and Cohesive III failures.

Figure 2. Failure pattern analysis: A- Adhesive I: adhesive between the dentin and resin cement; B- Adhesive II: adhesive between the post and resin cement; C- Adhesive II: adhesive between the fiberglass sleeve and resin cement; D- Adhesive III: adhesive between the fiber post and fiberglass sleeve; E- Cohesive I: cohesive in cement; F- Cohesive II: cohesive in dentin; G- Cohesive III: cohesive at the post; H- Cohesive IV: cohesive in the fiberglass sleeve; I - Mixed: adhesive and cohesive failures. 1- Dentin; 2- Resin cement; 3- Fiberglass post; 4- Fiberglass sleeve.

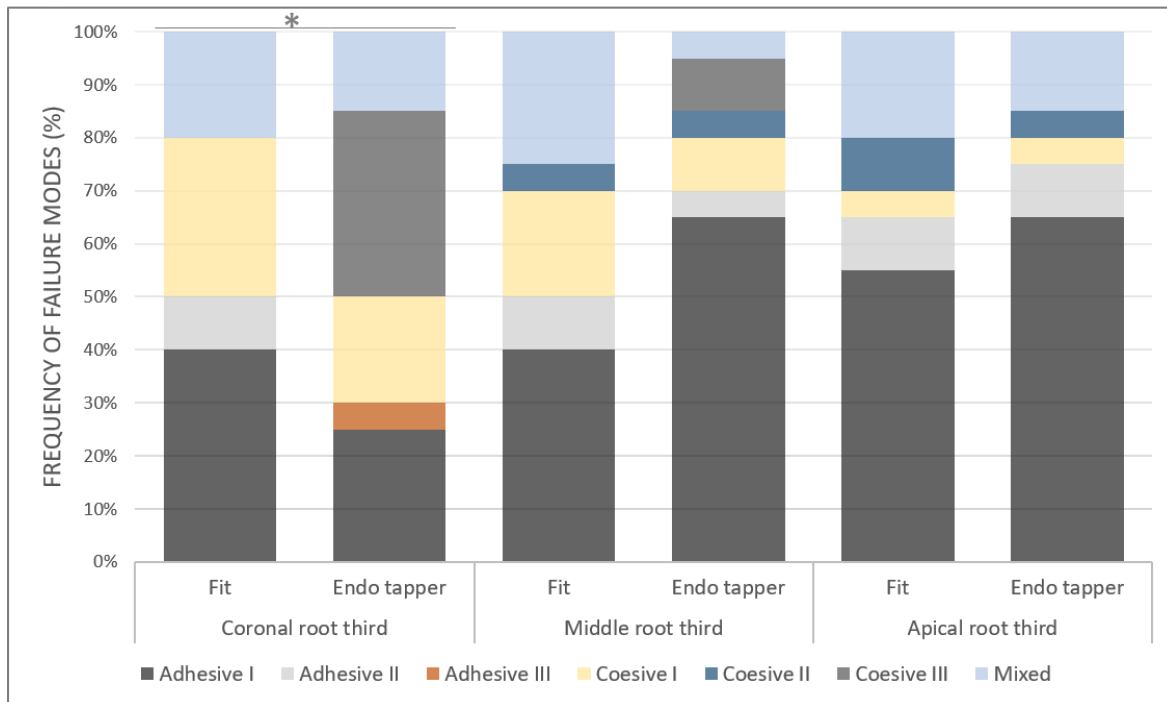


Figure 3. Frequency (percentage) of failure modes for all groups (n=10).

4. Discussion

The present study analyzed the effects of two fiberglass posts (FGPs) with reduced diameters, associated or not with a fiberglass sleeve (Endo Taper), on the bond strength to root canal dentin. Both null hypotheses of the present study were rejected, such as the bond strength of different FGPs and the root canal thirds were statistically differed. The evolution of dental materials and techniques promotes the possibility of more conservative clinical interventions. ^(2, 19) FGPs are extensively used to rehabilitate endodontically treated teeth; however, sometimes conventional fiber posts favor loss of structure inside the root canal due to preparation, further weakening the involved teeth. ^(3, 16, 20)

The new small-gauge post system with a sleeve (Endo Taper) showed lower bond strength in the apical third of the root compared to the FIT system. This difference may be due to the distinct anatomical shapes of the two

systems. Before initiating this study, the analyzed post systems were selected based on respective diameters. Initially, the diameter selection relied on measurements provided by the manufacturers. However, during specimen preparation, the diameters were assessed with a digital caliper, showing discrepancies between the apical third values of the Endo Taper system regarding the information provided by the manufacturer. Following cementation, post measurements from stereoscopic images on each root third confirmed the previous data obtained with caliper measurements. The middle and cervical third diameters agreed with the dimensions provided by the manufacturer.

The lower bond strength values of the Endo Taper system in the apical third might be related to the smaller diameter of the post in the apical region (Endo Taper: Ø 0.3 mm; FIT: Ø 0.4 mmWave). The smaller diameter of the Endo Taper fiberglass post system in the apical third generates a thicker cementation line and, consequently, lower bond strength in this region.^(5, 27, 28, 29) In the cervical and middle thirds, the diameter of Endo Taper system is also smaller compared to the FIT post; however, the sleeve reached these thirds, increasing fiberglass thickness, providing better adaptation and reducing cement thickness in these root thirds.⁽³⁰⁾ However, the sleeve does not compensate for the reduced diameter in the apical third, as it does not reach this third. Even though the FIT post does not have a sleeve system, it shows increased diameters in the cervical and middle thirds, so the post type did not influence bond strength in these regions.

The post system influenced the fracture distribution only in the cervical third of the root. The FIT system showed more Adhesive I and Cohesive I failures, and the Endo Taper system had more Adhesive I and Cohesive III failures involving the tapered sleeve. The fiberglass sleeve on the cervical region might have influenced the higher bond strength values, and it was decisive for the failure mode.

This study found higher bond strength for the FIT system to the apical third. When comparing the bond strength of conventional to self-adhesive cement, the literature shows that conventional cement typically exhibits higher resistance values in the cervical third.³¹ However, these values are often

decreased when assessed in the apical third. This trend is associated to challenges during acid etching, humidity management, light range depth, and the depth and density of dentinal tubules in that specific region.^(24, 25)

Conversely, self-adhesive resin cements demonstrate a different performance. In these cases, the bond strength in the apical third is usually similar or even superior to the other thirds.³² Self-adhesive resin cements rely less on technical precision, and the number of inorganic particles in self-adhesive cements is significantly higher than in conventional cements.^(32, 33) That might be responsible for reduced polymerization shrinkage and cementation failures, consequently making adhesion comparable or better in the apical region,⁽²⁶⁾ as observed in our study.

The present study supports the use of small-diameter post systems, especially in lower incisors and other teeth with reduced canal diameters. Traditional systems often require dentin wear at the roots of these teeth due to the diameter of posts. For FGPs with reduced diameters, post space preparation does not need additional drills, as it uses the same instruments from the rotary endodontic treatment system, thus reducing treatment costs. Furthermore, the rapid and effective insertion of fiberglass sleeves enhances the adaptability of FGPs to the cervical third of the root. However, due to the smaller diameter, Endo Taper bond strength was reduced by around 50% in the apical third compared to the FIT system. This fact indicates that manufacturers need to enhance and standardize the geometry of posts at this region.

Limitations of this study include although the results show that the different types of small diameter fiberglass posts presented similar results to each other, the lack of comparison of reduced diameter FGPs with conventional diameter FGPs may be a factor to be considered for future studies.⁽³⁴⁾ The use of bovine teeth was considered to facilitate the standardization of the specimens, limiting the influence of factors other than those under study.⁽³⁵⁾ Randomized clinical trials, essential for modern clinical practice and strong evidence bases to inform clinical judgments and health policies, should be used to validate the clinical application of these systems.

5. Conclusions

The posts systems with reduced diameter did not affect the bond strength to the cervical and middle thirds of the root canal. However, in the apical third, the Endo Taper system associated with fiberglass sleeve- showed lower bond strength than the sleeveless FIT post.

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Conflicts of interest

The authors deny any conflicts of interest related to this study.

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Figure captions.

Figure 1. Dimensions of the Whitepost FIT 0.4 and Endo Taper according to manufacturer's information.

Figure 2. Failure pattern analysis: A- Adhesive I: adhesive between the dentin and resin cement; B- Adhesive II: adhesive between the post and resin cement; C- Adhesive II: adhesive between the fiberglass sleeve and resin cement; D- Adhesive III: adhesive between the fiber post and fiberglass sleeve; E- Cohesive I: cohesive in cement; F- Cohesive II: cohesive in dentin; G- Cohesive III: cohesive at the post; H- Cohesive IV: cohesive in the fiberglass sleeve; I - Mixed: adhesive and cohesive failures. 1- Dentin; 2- Resin cement; 3- Fiberglass post; 4- Fiberglass sleeve.

Figure 3. Frequency (percentage) of failure modes for all groups (n=10).

List of tables

Table 1- Mean ($\pm$ SD) push-out bond strength of experimental groups according to post system and root third.

Post system	Root third					
	Cervical		Middle		Apical	
FIT	8.44	± 2.2 6	Ab	12.5	± 2.6 1	Aa 11.50 ± 3.0 1 Aa
Endo Taper	11.90	± 3.4 0	Aa	9.27	± 4.9 3	Aab 5.78 ± 3.4 9 Bb

Different capital letters in columns indicate significant differences between post systems in the same root third, and different lowercase letters in rows indicate significant intragroup differences between the root thirds (Two- ANOVA way with repeated measures and Tukey HSD test – $p < .05$).

Capítulos

Resistência de União e Características Interfaciais de Pinos de Fibra de Vidro Convencionais e Associados a Luva de Fibra de Vidro em Canais Radiculares Regulares ou Alargados – Laís

3.3 Capítulo 3

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Title: Effect of void and porosity formation according to fiberglass post type on flared or regular roots: A Micro-CT evaluation.

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Effect of void and porosity formation according to fiberglass post type on flared or regular roots: A Micro-CT evaluation.

Abstract

Fiberglass posts (FGPs) are prefabricated and commercially available in different diameters, therefore the correct selection of the post to be used is essential. A new FGP system associated with a fiberglass sleeve was introduced to the dental market to improve the adaptation of the fiberglass posts to root canals. The purpose of this study was to evaluate the influence of FGP types and fiberglass sleeve on the cementation of posts in flared or regular roots using microcomputed tomography (micro-CT). Twenty bovine teeth were selected, with a root length of 15 mm, of similar size and anatomical shape. The FGPs were tested according to four groups (n=5): a) Exacto + flared root canal (Exacto F, b) Exacto + regular root canal (Exacto), c) Splendor Sap + flared root canal (Splendor F), and d) Splendor Sap + regular root canal (Splendor). Each specimen was air-dried, mounted in a custom fixture, and scanned by using a high-resolution micro-CT system (SkyScan 1272, Bruker; Kontich, Belgium). Total void volume and total porosity volume were analyzed using one-way ANOVA. ANOVA with repeated measures (root third), was used to evaluate the influence of root depth. Both tests were followed by the Tukey HSD test. The significance level was set at 5% and statistical analysis was performed using the Jamovi (v.2.2.5). One-way ANOVA showed significant differences in porosity volume throughout the tooth, with significant difference in void volume in the tooth between resin/sleeve and post, and significant difference in void volume at the cement-tooth interface. ANOVA with repeated measures indicated that the porosity volume is not significant in the distinct root regions and there was a significant difference in the void volume between resin/sleeve and post. The posts associated with the sleeve and conventional posts relined with resin

composite in flared roots showed increased number of voids compared to the Splendor and Exacto systems not relined in regular root canals, which presented similar values between them.

1. Introduction

Fiberglass posts (FGP) are restorative materials commonly used in the rehabilitation of endodontically treated teeth with large coronal loss, with the aim of improving the retention of restorations.^{1,2,3} The modulus of elasticity of these posts is like dentin and this factor is fundamental for the reduced fracture rates when compared to cast posts and cores.^{4,5} However, a concern related to these materials is the long-term retention to the root canal.⁶ Even with the evolution of dental techniques and resin cements used to improve the bond strength of FGPs to the root canal, the adhesive failures are still a common clinical finding related to the use of these materials.^{6,7}

FGPs are commercially available in different diameters, therefore the correct selection the post is essential, and errors in this stage can lead to future problems, as FGPs are not anatomical posts.^{8,9} Wide root canals or those with an oval conformation can impair the adaptation of the post to the internal walls, favoring an increase in the cement line thickness, a factor that can also impact adhesive failures.¹⁰ A solution that can be applied in flared or oval root canals is to perform relining of the prefabricated FGPs using resin-based materials to favor better adaptation of this restorative set to the internal walls.¹¹ This approach promotes a reanatomization of the posts, consequently reducing the thickness of the cementation line.^{10, 11, 12}

Reanatomization of FGPs using resin composite has shown good results in relation to bond strength; however, the increased clinical steps for relining the post may favor failures and thus impair cementation.^{13, 14} Therefore, new types of posts and/or accessories have been introduced to facilitate clinical application.¹⁵ The FGP systems associated with a fiberglass sleeve (Splendor Sap) was introduced to the dental market to improve the adaptation of the fiberglass post to the root canal without the need for relining or other clinical

steps. This system is indicated for use in atresic or wide canals, without the need for additional preparation of the canal walls or FGP relining.^{16, 17}

A possible limitation of this system is the formation of an additional adhesive interface between the fiberglass sleeve and the FGP, which can favor the formation of voids, interfering with the adhesive strength of the restorative set. Microcomputed tomography (micro-CT) is a non-destructive 3D analysis that allows the reproduction of internal and external dental anatomy with detailed visualization, allowing qualitative and quantitative analysis.^{13, 18} In addition, this methodology allows evaluation of flaws or defects, as well as the formation of voids allowing the specification and volumetric evaluation of internal and external structures, as a whole or separately.^{18, 19}

Therefore, the aim of this study was to evaluate the influence of the sleeve on the cementation of fiberglass posts in flared using micro-CT analysis. The null hypothesis tested is that no differences would be detected in void or porosity volume regardless of the presence of the sleeve, diameter or third of the root canal evaluated.

2. Material and methods

Specimen selection

Twenty bovine teeth with 15 mm root length, similar size and anatomy (root volume within 10% of the average) were selected. The specimens were stored in distilled water at 4 °C until use. Specimens were randomly divided into four groups (n=5) according to FGP and root canal configuration: a) Exacto + flared root canal (Exacto F), b) Exact + regular root canal (Exacto), c) Splendor Sap + flared root canal (Splendor F), and d) Splendor Sap + regular root canal (Splendor).

Root canal preparation

The crowns were sectioned perpendicularly to the long axis with a water-cooled diamond disc (n° 7020; KG Sorensen, Barueri, Brazil) up to 15.0 mm from the apical limit and removed. The root canals were endodontically instrumented with a 10 K file (Dentsply Malleifer; Petrópolis, RJ, Brazil) which was introduced into the root canal until it was visible in the apical foramen. The

root canals were instrumented along their entire length using No. 2 and 3 Gates-Glidden Drills (Dentsply Maillefer, Ballaigues, Switzerland). Next, a Gates Glidden number 4 drill (Dentsply Maillefer) was used in the cervical and middle thirds of the root canal. After, the specimens were stored in distilled water at 4°C.

Post space preparation

Half of the specimens from the Exacto and Splendor Sap groups had their roots flared with a cylindrical diamond bur so that the wall had a minimum dentin thickness of 1.5 mm. The post space was obtained using a specific drill for each post system following the manufacturer's instructions with the same dimensions as the FGP selected. The root was cleaned with abundant irrigation with distilled water and then humidity control was carried out with absorbent paper cones. The preparation with the specific drill for each post and the root canal flaring are shown in Figure 1.

FGP cementation

For the Exacto F group, the FGP was anatomized with composite resin (Z350, 3M ESPE, Sumaré, SP, Brazil) before cementation. For this procedure, FGPs were treated with 35% hydrogen peroxide for 1 min (Clariant, Angelus; Londrina, PR, Brazil), washed with distilled water and then air-dried for 20 seconds.²⁰ Subsequently, a silane agent was applied to the post for 1 min (Silano, Angelus; Londrina, PR, Brazil). Then, a simplified adhesive system (Single Bond 2, 3M ESPE, Sumaré, SP, Brazil) was applied in two layers to all surfaces and light-cured on each side for 20 seconds. Then, the resin composite was applied to the FGP, the root canal was isolated with water-soluble gel, and the excess was removed with an absorbent paper cone. Then, the FGP anatomized with the uncured resin composite was inserted into the canal and photoactivated for 3 seconds. Then, the FGP was removed from the root canal and photoactivation was performed for 20 seconds on each aspect.

The surface treatment protocol was the same for all groups. The FGP and fiberglass sleeves were treated with 35% hydrogen peroxide for 1 minute, washed with distilled water, and then air-dried. Subsequently, a silane agent was applied to the post for 1 min (Silane, Angelus; Londrina, PR, Brazil). Canal cleaning and conditioning were also standardized for all groups. The canals were cleaned by active irrigation with 2.5% sodium hypochlorite for 1 minute, 17% for 3 minutes and distilled water for 1 minute. Humidity control was carried out with absorbent paper cones.

Cementation was performed with dual-cure self-adhesive resin cement (RelyX U200, 3M ESPE, Sumaré, SP, Brazil), which was inserted into the root canal using an Endotip (3M ESPE, Sumaré, SP, Brazil) to minimize the presence of voids. The self-mixing tip was positioned as apically as possible and as the cement was injected, the syringe was slowly removed.

For the Exacto and Exacto F groups, first the self-adhesive cement was inserted with an endotip in the cervical apical direction and then the post was positioned in the center of the canal with the aid of clamp.

For the Splendor and Splendor F groups, after insertion of the self-adhesive cement, the FGP was first placed centered in the canal and then the sleeve was inserted, involving the previously placed post, until it locked inside the canal.

Excess resin cement was removed following 1 minute and after 5 minutes (under load - 500g), the resin cement was light cured on each coronal surface (occlusal, buccal, lingual, medial, distal) for 40s (Valo Cordless, Ultradent, Indaiatuba, SP, Brazil). The materials used in the study are described in Table 1.

Micro-CT Analysis

Each specimen was air dried, mounted on a custom attachment and scanned using a high-resolution micro-CT system (SkyScan 1272, Bruker; Kontich, Belgium). The scanner operated at 100 kV and 100 mA (0.11-mm Cu filter). The resolution used was 1224/820 cross-sectional pixel size, and the intersection distances were 20 µm. This resulted in 380 transverse cross

sections per specimen. The scanning parameters were: 180-degree rotation around the vertical axis, camera exposure time of 1000 ms, rotation step of 0.5 degrees, frame average of 2, and random movement of 20. Each specimen was scanned for a total of 35 min 41 s. Images of each specimen were reconstructed using NRecon version 1.6.10.1 (Bruker). For each root, approximately 380 slices were made per specimen. CTAn v.1.14.4.1 software (Bruker) which were used for 3D quantitative analysis (volume of resin cement in mm³ and volume of porosity (%)) of each root canal. The 3D analysis provided the quantitative porosity, which corresponds to the percentage (%) void volume within the resin cement layer. The influence of the type of resin cement, cement mixing and insertion method in the root canal, and different root sections (apical, middle, and cervical slices) were analyzed. CTVol software (v.2.2.3.0, Bruker) was used for three-dimensional visualization and qualitative evaluation of the specimens.

Data analysis

The data was tested using Shapiro–Wilk and Levene tests normality and homoscedasticity. The total volume of voids and porosities on resin cement, resin and on fiberglass sleeve were analyzed using 1-way ANOVA (post system). The repeated measurement (root depth) analyzed the porosities on radicular third and all data were submitted to Tukey HSD test. The significance level was set at 5% and all statistical analyses were performed using Jamovi 2.2.5 (dev.jamovi.org).

3. Results

Representative 2D and 3D micro-CT images of porosity in the root, resin/fiberglass sleeve and resin cement after post-cementation are shown in Figures 1 and 2, respectively. One-way ANOVA indicated a significant effect of intrarradicular post system on total porosity volume ($P < 0.001$). Exacto F and Splendor F systems exhibited a higher porosity volume along the root compared to Exacto and Splendor, which presented similar results. Additionally, Exacto F presented the highest porosity in resin composite ($P < 0.001$). The porosity volume in the fiberglass sleeve of Splendor F was lower than that of Exacto F

but higher compared to Exacto and Splendor, which did not differ from each other. Both Exacto F and Splendor F exhibited a higher volume of voids in the resin cement ($P < 0.001$) (Table 1).

Table 1- Total volume of porosities (mm^3) and standard deviation ($\pm$) on root, resin/fiberglass sleeve and resin cement according to the post system and root canal configuration.

<i>Post</i>	<i>Total</i>		<i>Resin/fiberglass sleeve</i>		<i>Resin cement</i>	
Exacto F	0.39 ± 0.04	A	0.65 ± 0.04	A	0.65 ± 0.04	A
Exacto	0.01 ± 0.02	B	$0.01 \pm 5.54\text{e-}4$	C	0.07 ± 0.01	B
Splendor F	0.38 ± 0.02	A	0.33 ± 0.02	B	0.68 ± 0.05	A
Splendor	$1.96\text{e-}4 \pm 1.02\text{e-}4$	B	0.01 ± 0.00	C	0.06 ± 0.00	B

Mean values followed by different letters on columns shows significant differences (Tukey HSD test, $p < 0.05$).

Total porosity volume was not affected by the root third ($P = 0.829$). Similarly, the volume of voids in the cement showed no dependence on the root third ($P = 0.353$). However, Exacto F presented higher porosity in the resin composite resin layer than Exacto and Splendor. Splendor F, Splendor, and Exacto did not differ from each other regarding porosity, while Exacto F and Splendor F were also similar (Figure 2).

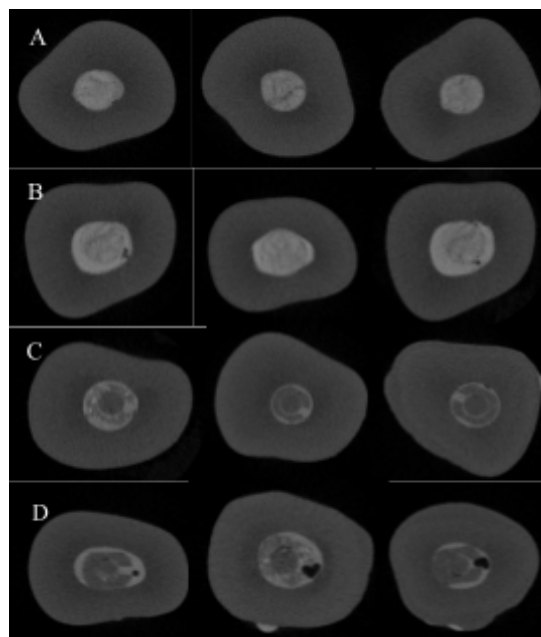


Figure 1. 2D micro-CT images of endodontically treated root canals, flared or not, using different FGPs: (a) regular root canal with Exacto; (b) flared root canal with Exacto relined with composite resin; (c) regular root canal with Splendor post + sleeve; (d) flared root canal with Splendor post + sleeve.

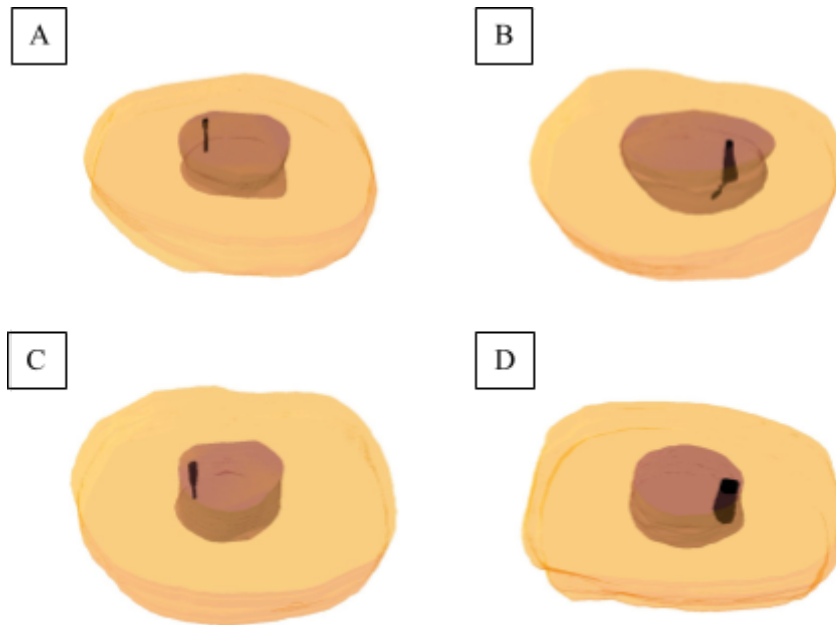


Figure 2. 3D micro-CT images of endodontically treated root canals, flared or not, using different fiberglass FGPs: (a) regular root canal with Exacto; (b) flared root canal with Exacto relined with composite resin; (c) regular root canal with Splendor post + sleeve; (d) flared root canal with Splendor post + sleeve.

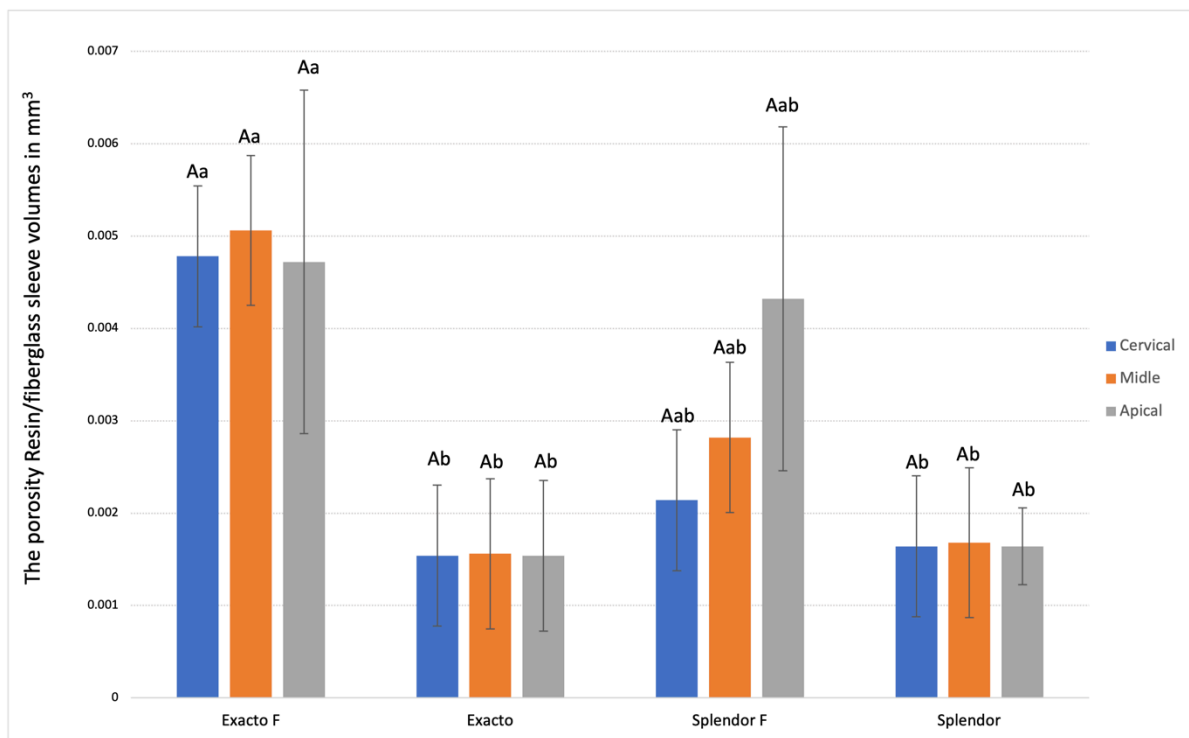


Figure 3 - Mean volume of porosity (mm³) and standard deviation at the resin/fiberglass sleeve according to post system and root thirds. Mean values followed by different letters show significant difference (Tukey HSD test, $p < 0.05$). Upper-case letters for root region comparisons, and lower-case letters for post system comparisons.

4. Discussion

This study analyzed the effects of two types of fiberglass posts (FGPs) associated or not with a fiberglass sleeve (Splendor and Splendor F, respectively), and combined or not resin composite relining (Exacto and Exacto F, respectively) on the void and porosity formation in the cement layer. The null hypothesis tested was rejected as the presence of voids and porosity and their regional distribution were affected by the type of FGP and root canal conformation (Exacto and Splendor) and root canal (flared or regular).

The Splendor post system brings the possibility of application in root canals of different diameters, from the most atretic to the widest. The fiber sleeve of this system is responsible for promoting better adaptation of the post to the internal walls of the root canals, thus avoiding the formation of a thick cement line that could affect the bond strength of FGPs to the root canal.^{21, 22} The possibility of using a single diameter FGP for different root canals also facilitates the application of these materials, since the clinician will not need having FGPs with different diameters. Even techniques such as reanatomization of the FGPs with composite resin for flared root canals are not necessary with the FPG + sleeve system.^{23, 24, 25}

In previous studies, the FGPs associated with fiberglass sleeve showed significantly higher bond strength values when compared to conventional fiberglass posts without sleeves or when relining with resin composite was performed.^{21, 22} Although this system has presented significant bond strength, a limitation is the increase in the formation of voids at the adhesive interface, since the Splendor system is composed of a post and a sleeve which are adhered inside the root canal during cementation. Thus, an additional adhesive interface is created between the post and sleeve in this system.²⁵

When evaluating the different groups, Exacto F and Splendor F exhibited greater volume of porosity and total formation of voids compared to the other

groups in regular root canals. Exacto and Splendor presented lower porosity when compared to Exacto F and Splendor F. This result was obtained because the groups with flared roots had a greater quantity of material (resin/glove) which favored the greater formation of voids and porosity.

In the evaluation of voids, Exacto F presented a greater volume of voids when compared to the other groups. It can be stated that despite relining posts with composite resin favors better adhesion by reducing the cementation line, the use of this technique favors formation of voids at the resin interface when compared to the sleeve combined to FGP groups.^{25, 26} According to a recent study evaluating the adhesive resistance between the Splendor system and post milled by CAD-CAM, FGPs associated with a fiberglass sleeve showed an adhesive failure rate of 40% at the cement/post interface, probably due to the existence of an additional interface between the dentin/sleeve and the post.²⁷

When evaluating voids and porosity formation in each third (cervical, middle and apical), the porosity volume was not significant, and this may be because when evaluating each third separately the values were not able to affect the results. Although the formation of voids per third showed a significant difference between the groups, with Exacto F and Splendor F being similar and presenting a greater volume, the amount of material needed to reline this area also justifies this difference.^{28, 29}

According to Gama et al. (2021) the formation of voids occurs due to air entrapment during cement handling, therefore the thinner the layer, the lower the chance of voids and cracks forming. Therefore, this study simulated both root canal configurations (flared and regular), as in these clinical situations the increase in the cementation line is critical.^{30, 31} Although the number of voids was higher in the flared root canals, this situation was found in both FGP systems and was not significantly different from each other. Therefore, using the Splendor system can be indicated in these situations.

5. Conclusions

Based on the results of this study, it was concluded that:

- The fiberglass posts combined with the sleeve, or the conventional posts relined with resin composite showed a higher number of voids in flared roots than the posts used alone in regular root canals.
- In relation to void formation, the use of the new FGP system combined with fiberglass sleeve showed these materials as clinically useful for the rehabilitation of endodontically treated teeth.

Conflicts of interest

The authors deny any conflicts of interest related to this study.

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Figure legends.

Figure 1. Micro-CT images of endodontically treated roots, flared or regular, using different fiberglass posts. (a) root regular with Exacto post; (b) root flared with Exacto post reanatomized with composite resin; (c) root regular with Splendor post (sleeve); (d) flared root with Splendor post (sleeve).

Figure 2. 3D micro-CT images of endodontically treated roots, flared or not, using different fiberglass posts. (a) root regular with Exacto post; (b) root flared with Exacto pin reanatomized with composite resin; (c) regular root with Splendor post (sleeve); (d) flared root with Splendor post (sleeve).

Figure 3. The porosity of resin/fiberglass sleeve in volumes in mm³ (mean and standard deviation) by post system and root thirds. Mean values followed by different letters differ statistically significantly among them (Tukey's test, $p < 0.05$). Upper-case letters indicate comparison of root regions, and lower-case letters indicate comparison of posts.

List of Figures.

Figure 1. Micro-CT images of endodontically treated roots, flared or regular, using different fiberglass posts.

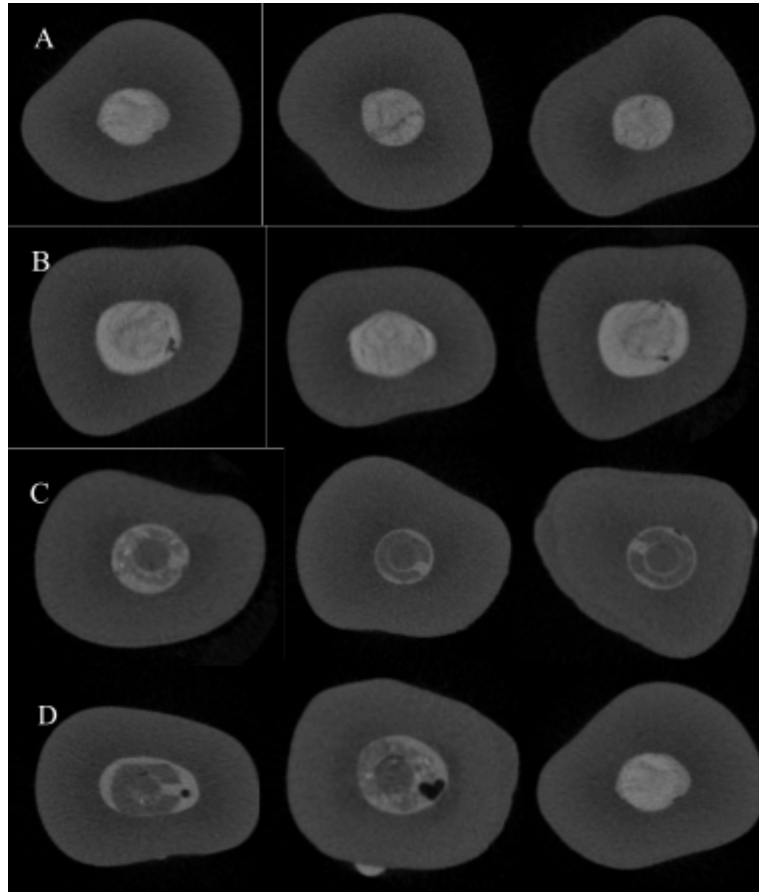


Figure 2. 3D micro-CT images of endodontically treated roots, flared or regular, using different fiberglass posts.

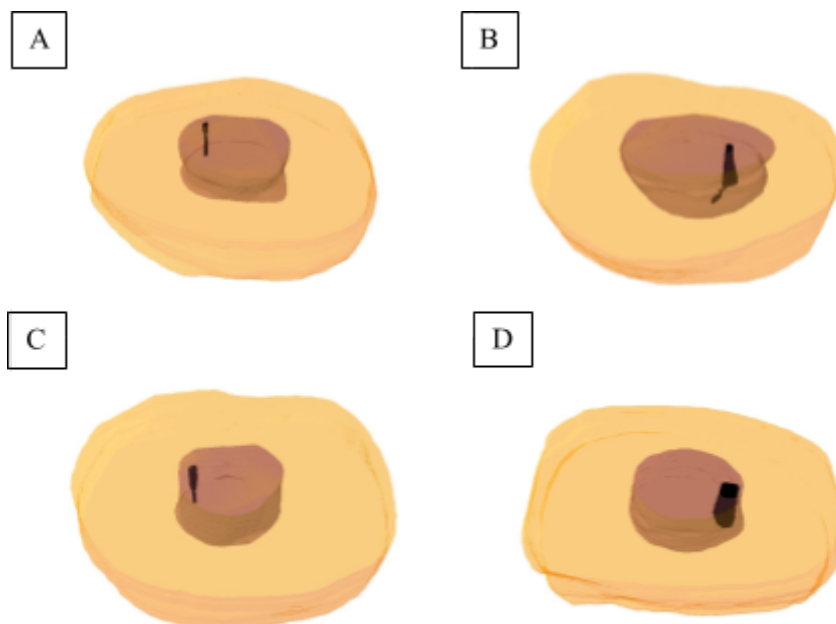
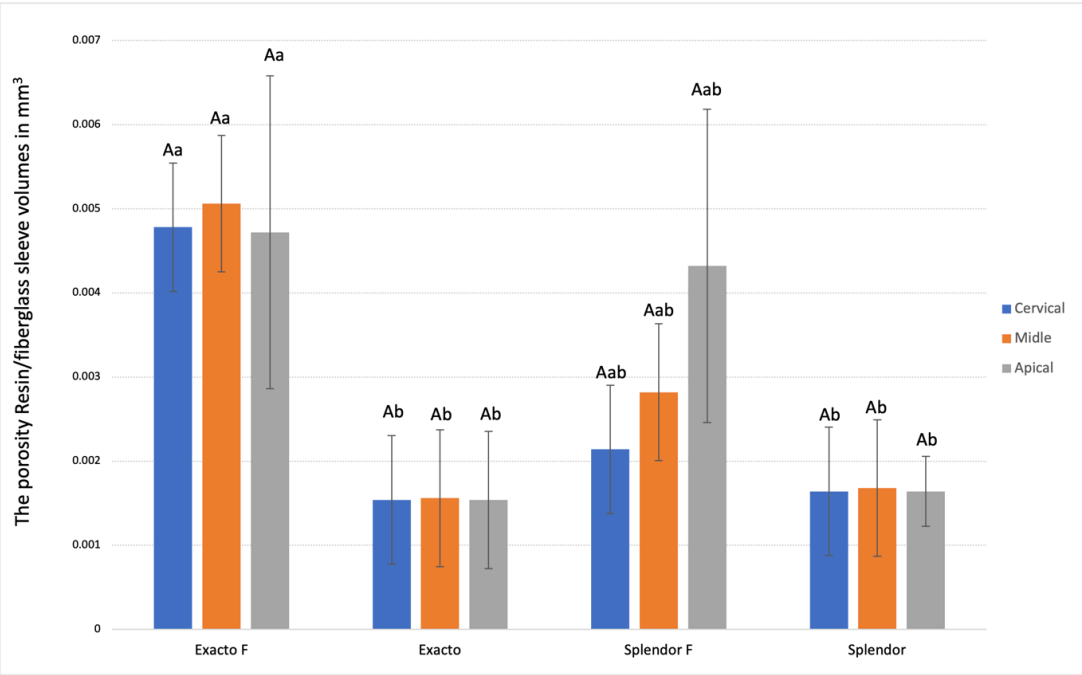


Figure 3. The porosity of resin/fiberglass sleeve in volumes in mm³ (mean and standard deviation) by post system and root thirds.



C onclusões

Resistência de União e Características Interfaciais de Pinos de Fibra de Vidro Convencionais e Associados a Luva de Fibra de Vidro em Canais Radiculares Regulares ou Alargados – Laís Carvalho Martins – Tese de Doutorado – Programa de Pós-graduação em Odontologia – Faculdade de Odontologia – Universidade Federal de Uberlândia

Com base nos resultados deste estudo, concluiu-se que:

- Os pinos de fibra de vidro associados à luva de fibra de vidro foram eficazes, pois apresentaram níveis de resistência adesiva semelhantes aos da anatomização convencional do FGP com resina composta, o que pode estar associado a uma melhor adaptação criada no terço cervical, reduzindo a linha de cimentação.
- Este estudo sugere que, em relação à resistência de união, o uso do sistema Splendor Sap pode ser clinicamente útil para a reabilitação de dentes tratados endodonticamente.
- Os pinos de fibra de vidro associados a luva de fibra de vidro podem ser aplicados em canais largos ou estreitos e são uma boa opção para facilitar a aplicação clínica de pinos de fibra de vidro.
- Os pinos de fibra de vidro de pequeno diâmetro não afetaram a resistência de união aos terços cervical e médio do canal radicular. Entretanto, no terço apical, o sistema Endo Tapper apresentou menor resistência de união que o pino FIT.
- Os pinos associados à luva de fibra de vidro e pinos convencionais reembasados com resina composta em raízes enfraquecidas apresentaram maior número de bolhas que os sistemas Splendor e Exacto não reanatomizados em raízes não fragilizadas.
- Em relação à formação de bolhas, a utilização do novo sistema pinos de fibra de vidro mostrou estes materiais como clinicamente úteis para a reabilitação de dentes tratados endodonticamente.

R

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It is advisable that authors prepare their manuscript using the template available on the Web, which will assist in preparation of the manuscript according to the journal's format. [Download the Template](#).

Manuscript Section For Papers

Manuscripts submitted for research and review articles in the respective journal should be divided into the following sections:

- Title
- Title page
- Structured Abstract
- Keywords
- Text organization
- Conclusion
- List of abbreviations (if any)
- Consent for Publication
- Availability of Data and Materials
- Funding
- Conflict of interest
- Acknowledgements
- References
- Appendices
- Figures/illustrations (if any)
- Chemical structures (if any)
- Tables and captions (if any)
- Supportive/supplementary material (if any)

Title

The title should be precise and brief and must not be of more than 120 characters. Authors should avoid the use of non-standard abbreviations and question marks in titles. The title must be written in title case except for articles, conjunctions and prepositions.

As recommended by the reporting guidelines, information about the study should be a part of the title (particularly for randomized or clinical trials, systematic reviews and meta analyses).

Authors should also provide a short ‘running title’. The title, running title, by line correspondent footnote and the keywords should be written as presented in the original manuscript.

Title Page

The title page should include paper title, author(s) full name and affiliation, corresponding author(s) names and complete affiliation/address, along with phone, fax and email.

Structured Abstract:

The abstract of an article should be a clear, concise and accurate summary, having no more than 250 words, and including the explicit sub-headings (as in-line or run-in headings in bold). Use of abbreviations should be avoided and the references should not be cited in the abstract.

All the original research articles, systematic reviews and meta-analyses must be accompanied by a structured abstract. Ideally, each abstract should include the following sub-headings, but these may vary according to the requirements of the article.

Introduction/Objective: Summarize the objective or purpose of the research in a few sentences.

Methods: Give a brief description of the research design, methodology, and other relevant details about the conduct of the study.

Results: Outline the main conclusions or findings of the study, often with statistical data or significant findings.

Conclusion: Provide an overview of the study's key findings and any implications

The headings can vary but must state the purpose of the study, details of the participants, measurements, methods, main findings and conclusion.

Keywords

6 to 8 keywords must be provided. Keywords should be important and relevant so that researchers in this field be search for them so that and your paper should appear in top in a database search. The keywords should be contained in the title and they should appear several times in the article. In biomedical fields, MeSH terms are a good 'common vocabulary' source to draw keywords from <https://www.nlm.nih.gov/mesh/meshhome.html>.

Text Organization

The main text should begin on a separate page and should be divided into title page, abstract and the main text. The text may be subdivided further according to the areas to be discussed, which should be followed by the List of Abbreviations (if any), Conflict of Interest, Acknowledgements and Reference sections. For review, the manuscript should be divided into title page, abstract and the main text. The text may be subdivided further according to the areas to be discussed, which should be followed by the Acknowledgements and Reference sections. The Review Article should mention any previous important recent and old reviews in the field and contain a comprehensive discussion starting with the general background of the field. It should then discuss the salient features of recent developments. The authors should avoid presenting any data or material which has already been published in a previous review. The authors are advised to present and discuss their observations in brief.

For Research Articles the manuscript should begin with the title page and abstract followed by the main text, which must be structured into separate sections as **Introduction, Materials and Methods, Results, Discussion, Conclusion, Ethics Approval and Consent to Participate, Human and Animal Rights, Conflict of Interest, Acknowledgements and References.**

All randomized clinical trials must include a flow diagram and authors should provide a complete randomized trial checklist (see CONSORT Flow Diagram and Checklist; (www.consort-statement.org) and a trial protocol. For further details, please visit complete guidelines at: <http://www.icmje.org/recommendations/browse/publishing-and-editorial-issues/clinical-trial-registration.html>

For case reports, the authors should follow the [CARE guidelines](#). The [CARE checklist](#) should be submitted as a separate file.

The manuscript style must be uniform throughout the text and 10 Times New Roman fonts should be used. The full term for an abbreviation should precede its first appearance in the text unless it is a standard unit of measurement. The reference numbers should be given in square brackets in the text. Italics should be used for Binomial names of organisms (Genus and Species), for emphasis and for unfamiliar words or phrases. Non-assimilated words from Latin or other languages should also be italicized *e.g. per se, et al., etc.*

Section Headings

Section headings should be numbered sequentially, left aligned and have the first letter capitalized, starting with the introduction. Sub-section headings however, should be in lower-case and italicized with their initials capitalized. They should be numbered as 1.1, 1.2, *etc.*

INTRODUCTION

The introduction section should include the background and aims of the research in a comprehensive manner.

MATERIALS AND METHODS

This section provides details of the methodology used along with information on any previous efforts with corresponding references. Any details for further modifications and research should be included. Sufficient details should be provided to the reader about the original data source in order to enable the analysis, appropriateness and verification of the results reported in the study.

It is important that the ‘Method Section’ should be sufficiently detailed with respect to the data presented, and the results produced from it. This section should include all the information and protocols gathered for the study at the time when it was written. If the study is funded or financially supported by an organization to conduct the research, then it should be mentioned in the Method Section. Methods must be result-oriented. The statement regarding the approval by an independent local, regional or national review committee (e.g. name of ethic committee and institutional review board) should be part of the Method Section.

Transparent reporting on AI and AI-assisted Technologies

Authors who use AI tools for the production of images or graphical elements of the paper, or in the collection and analysis of data, must disclose the use of such tools in the Materials and Methods (or similar section) of the paper, stating how the AI tool was used and which tool was used.

Authors are fully responsible for the content of their manuscript, including parts produced with the assistance of an AI tool, and are thus liable for any breach of publication ethics.

Bentham Open will assess whether the manner AI was used and declared is reasonable and compliant with its published principles and practices. After publication, content may be rejected or changed due to inadequate declaration or the specific circumstances of its use.

EXPERIMENTAL

Repeated information should not be reported in the text of an article. A calculation section must include experimental data, facts and practical development from a theoretical perspective.

RESULTS

The important and main findings of the study should come first in the Results Section. The tables, figures and references should be given in a sequence to emphasize the important information or observations related to the research. The repetition of data in tables and figures should be avoided. Results should be precise.

DISCUSSION

This should explore the significance of the results of the work, present a reproducible procedure and emphasize the importance of the article in light of the recent developments in the field. Extensive citations and discussion of published literature should be avoided.

This section of research articles should discuss the implications of the findings in the context of existing research and highlight the study's limitations. The authors should justify the sample size according to the study purpose and methods.

The results and discussion may be presented together under one heading of “Results and Discussion”. Alternatively, they may be presented under two separate sections (“Results” Section and “Discussion” Sections). Short sub-headings may be added in each section if required.

CONCLUSION

A small paragraph summarizing the contents of the article, presenting the final outcome of the research or proposing further study on the subject, may be given at the end of the article under the Conclusion section.

FUNDING

The authors need to declare the funding sources of their manuscripts clearly by providing the name of the funding agency or financial support along with the allotted grant/award number in round brackets (if applied), for instance, “This work was financially supported by [Name of the funding agency] (Grant number XXX).

Similarly, if a paper does not have any specific funding source, and is part of the employment of the authors, then the name of the employer will be required. Authors will have to clearly state that the funder was involved in writing, editing, approval, or decision to publish the article.

Greek Symbols and Special Characters

Greek symbols and special characters often undergo formatting changes and get corrupted or lost during the preparation of manuscripts for publication. To ensure that all special characters used are embedded in the text, these special characters should be inserted as a symbol but should not be a result of any format styling (*Symbol* font face) otherwise they will be lost during conversion to PDF/XML.

Authors are encouraged to consult reporting guidelines. These guidelines provide a set of recommendations comprising a list of items relevant to their specific research design. All kinds of measurements should be reported only in International System of Units (SI). Chemical equations, chemical names, mathematical usage, unit of measurements, chemical and physical quantity & units must conform to SI and Chemical Abstracts or IUPAC.

List of Abbreviations (if any)

If abbreviations are used in the text either they should be defined in the text where first used, or a list of abbreviations should be provided.

Registration of Systematic Reviews

Bentham Open supports retrospective registration of systematic reviews, in a suitable registry (such as [PROSPERO](#)). The registered systematic review must include the registration number as the last line of the manuscript abstract.

Appendices

In case there is a need to present lengthy, but essential methodological details, use Appendices, which can be a part of the article. An appendix must not exceed three pages (Times New Roman, 10-point fonts, 900 max. words per page). The information should be provided in a condensed form, ruling out the need for full sentences. A single appendix should be titled as APPENDIX, while more than one can be titled as APPENDIX A, APPENDIX B, and so on.

Supportive/Supplementary Material (if any)

We do encourage the authors to append supportive material, for example a PowerPoint file containing a talk about the study, a PowerPoint file containing additional screenshots, a Word, RTF, or PDF document showing the original instrument(s) used, a video, or the original data (SAS/SPSS files, Excel files, Access Db files, etc.) provided it is inevitable or endorsed by the journal's Editor.

Published/reproduced material should not be included unless you have obtained written permission from the copyright holder, which must be forwarded to the Editorial Office in case of acceptance of your article for publication.

Supportive/Supplementary material intended for publication must be numbered and referred to in the manuscript but should not be a part of the submitted paper. In-text citations as well as a section with the heading "Supportive/Supplementary Material" before the "References" section should be provided. Here, list all Supportive/Supplementary Material and include a brief caption line for each file describing its contents.

Any additional files will be linked to the final published article in the form supplied by the author, but will not be displayed within the paper. They will be made available in exactly the same form as originally provided only on our Website. It should also be made sure that each additional file is a single table, figure or movie (please do not upload linked worksheets or PDF files larger than one sheet). Supportive/Supplementary material must be provided in a single zipped file not larger than 4 MB.

Authors must clearly indicate if these files are not for publication but meant for the reviewers'/editors' perusal only.

RESEARCH ETHICS AND POLICIES

CONFLICT OF INTEREST

AUTHORS

All potential conflicts of interest (competing interests) that could have a direct or indirect influence on the work must be disclosed by the authors. Even if an author does not have a conflict, disclosing affiliations and interests allows for a more comprehensive and open approach, which leads to a more accurate and objective evaluation of the work. Conflicts of interest, whether genuine or imagined, are a perspective to which the readers are entitled.

The publication of a conflict statement in the article itself, as well as the submission of the conflict disclosure form, is required for all types of papers. It is not necessarily the case that a monetary relationship with examination support or funding for counseling work is inappropriate. Even if the authors do not have any conflict of interest, they still need to provide a confirmation statement in their manuscripts, i.e., “The author(s) confirm(s) that there is no conflict of interest related to the manuscript.”

The following are some examples of potential conflicts of interest that are directly or indirectly related to the research:

Financial competing interests include (but are not limited to):

- Type of support/grant number
- Institutional Conflicts of Interest
- Funds received by the author
- Funds received by the institution
- Travel allowances for the research
- Funds received for article preparation and reviewing
- Funds for conducting review activities
- Support provided for article writing assistance, for drugs, equipment, etc
- Paid lectures
- Pending fund or grant

Financial conflicts of interest can be personal as well as institutional. A personal conflict of interest occurs when a contributor involved in the publication process either receives an amount of money or expects to receive some financial help (including any other financial benefits such as patents or stocks, gifts, or services) that may impact the work related to a specific publication. More importantly, in academic research, such

financial relationships can lead to institutional conflicts of interest (COIs) because the economic interests of the institution or institutional representatives may unsuitably affect the decision-making process.

An institutional conflict of interest arises in a situation when the financial interests of an institution or any institutional official (e.g., investments held by the university in a company) have the potential to unduly influence the research conducted by its employees or students, or pose an unacceptable risk to human subjects. Such conflicts usually arise in a state of affairs where a research project directly offers assistance or a benefit to an external entity via evaluation, validation, trial, or test of an invention, product, drug, service, or technology, and the institution holds a financial interest with the external entity. Such financial interests incorporate, but are not limited to, the receipt of licensing payments or royalties from the external entity, or ownership interest with the external entity. When human subjects are involved in any research project, and the institution supports such a financial interest, the conflict of interest is speculated to be unreasonable.

Non-financial competing interests include (but are not limited to):

In addition, interests other than monetary and any funding (non-financial interests) should be declared if they are relevant to readers. Personal relationships or conflicting interests directly or indirectly related to research, as well as professional interests or personal opinions that may impact your research, are examples of these.

Intellectual property, in basic terms, refers to any intangible property that is the result of creativity, such as patents, copyrights, etc. Similarly, this section seeks to know about copyright and patent (licensed patent, pending or issued) and any payment received for intellectual property, such as:

- Patent
- Licensed Patent
- Issued Patent
- Pending Patent
- Royalties
- Licensee
- Remarks

DISCLOSURE STATEMENT

All conflict of interest disclosure forms are collected by the corresponding author. It is sufficient for the corresponding author to sign the disclosure form on behalf of all authors in author collaborations when legal agreements for representation allow it. The templates of the form can be found here.

- [Disclosure form](#)
- [ICMJE disclosure form](#)

Before the reference list, the corresponding author will include a summary statement in the text of the article that reflects what is reported in the potential conflict of interest

disclosure form (s). Author(s) may declare(s) names of reviewers who they think might have a potential conflict of interest; therefore, the Editorial Office could avoid inviting such reviewers for an unbiased opinion.

UNDISCLOSED CONFLICT OF INTEREST

Undisclosed conflict of interest cases before or after the publication of an article are dealt with as per the guidelines of COPE.

1. Undisclosed conflict of interest in a submitted article ([View COPE guidelines](#))
2. Undisclosed conflict of interest in a published article ([View COPE guidelines](#))

For more information on COIs, see the guidance from the [ICMJE](#).

PEER REVIEWERS

Bentham Open tries to conduct a transparent peer-review process with the help of reviewers who do not have any conflict of interest with the authors. In this connection, reviewers who belong to the same institute or countries as authors are not invited to review manuscripts. However, it is not possible for the Editorial Office to be aware of all competing interests; therefore, it is expected from authors to submit:

- List of reviewers who they think have a conflict of interest to ensure a transparent and unbiased review process.

The Editorial Office expects reviewers:

- Not to accept manuscript review requests if they have any potential conflict of interest and inform the Editorial Office accordingly.
- To decline review requests if they have recently published or submitted an article with any of the authors listed in the manuscript.
- To inform the Editorial Office if they have any personal relationship with the authors or work in the same institutes as of authors, which could affect the review transparency.
- To abstain from reviewing and informing the Editorial Office/Editor-in-Chief/Handling Editors about any scientific misconduct or fraud, plagiarism, conflict of interest, or any other unethical behavior related to the manuscript.

During the submission of review comments, reviewers are asked to reconfirm that they do not have any conflict of interest related to the article. After confirming the below statement, they can submit their comments.

“I hereby confirm that I don’t have any conflict of interest related to the manuscript.”

If, however, there are still any remaining interests, then reviewers must mention those in the ‘Confidential’ section of the review form.

Reviewers are not encouraged to contact authors directly regarding any of their conflicts of interest. Peer reviewers should follow journals’ policies in situations they consider to represent a conflict.

UNDISCLOSED CONFLICT OF INTEREST

If reviewers intentionally do not disclose any conflict of interest, they will be blacklisted for any future peer-reviewing activity of the journal.

The Editorial Office always ensures that an author, if added after peer review activity of a manuscript, is not part of the reviewers' list who have conducted a peer review of the same manuscript.

EDITORS

Editors must not review submitted manuscripts if they have any personal, professional or financial involvement/conflict of interest with the authors of the manuscript. Every participant involved in the peer review process, including editorial board members, reviewers, and editors, must declare any potential conflicts of interest to ensure a transparent and unbiased review activity.

Editors-in-Chief or Editors who are responsible for the initial and final decision should recuse themselves to review or take decisions on any manuscript that is written by authors affiliated with the same institute as of editor, or if they have been a family member, competitor, collaborator, or have published any manuscript in the last 3 years with the authors associated with the manuscript. They can however nominate someone else on the Board who could provide a neutral opinion on the manuscript.

The Editorial office recommends editors to follow [COPE](#) and [WAME](#) guidelines to process such manuscripts which involves their personal relationship.

Manuscripts submission by an Editor/Editor-in-Chief

The initial and final decision on the manuscripts submitted by an Editor/Editor-in-Chief will be taken by any other member of the Board. The Editorial Office will identify members who do not have any potential conflict of interest with the Editor or Editor-in-Chief.

Acknowledgements

Any research assistants or other individuals who assisted with the research but are not listed as authors, such as those who carried out the literature review, produced, computerized, and analyzed the data, or helped with the language, writing, or proofreading of the article, or offered any comments or suggestions, should be acknowledged. Briefly, everyone who has contributed significantly to the improvement of the paper should be acknowledged. It is recommended to mention the "Declared None" if there is no acknowledgement of the study.

Guest or honorary authorship based solely on position (e.g. research supervisor, departmental head) is discouraged.

The specific requirements for authorship have been defined by the International Committee of Medical Journal Editors (www.icmje.org). Examples of authors' contributions are: 'designed research/study', 'performed research/study', 'contributed important reagents', 'collected data', 'analyzed data', 'wrote paper' etc. This information

must be included in the submitted manuscript as a separate paragraph under the heading 'Authors' Contribution'. The corresponding author is responsible for obtaining permission from all co-authors for the submission of any version of the manuscript and any changes in the authorship.

HUMAN AND ANIMAL RIGHTS

Research Involving Humans

All clinical investigations should be conducted according to the [Declaration of Helsinki](#) principles. For all manuscripts reporting data from studies involving human participants, formal review and approval by an appropriate institutional review board or ethics committee are required.

Patient Consent

Compliance with the guidelines of the International Committee of Medical Journal Editors (<http://www.icmje.org/recommendations/browse/roles-and-responsibilities/protect-ion-of-research-participants.html>) is recommended, in accordance with the patient's consent for research or participation in a study as per the applicable laws and regulations regarding the privacy and/or security of personal information, including, but not limited to, the Health Insurance Portability and Accountability Act of 1996 ("HIPAA") and other U.S. federal and state laws relating to confidentiality and security of personally distinguishable evidence, the General Data Protection Regulation (GDPR) (EU) 2016/679 and member state implementing legislation, Canada's Personal Information Protection and Electronic Documents Act, India's Information Technology Act and related Privacy Rules, (together "Data Protection and Privacy Laws").

It is the responsibility of the author to ensure that:

- Patients' names, initials, or hospital numbers are not mentioned anywhere in the manuscript (including figures).
- Authors are responsible for obtaining the patient consent-to-disclose forms for all recognizable patients in photographs, videos, or other information that may be published in the journal, in derivative works, or on the journal's website and for providing the manuscript to the recognizable patient for review before submission.
- The consent-to-disclose form should indicate specific use (publication in the medical literature in print and online, with the understanding that patients and the public will have access) of the patient's information and any images in figures or videos, and must contain the patient's signature or that of a legal guardian along with a statement that the patient or legal guardian has been offered the opportunity to review the identifying materials and the accompanying manuscript.
- If the manuscript has an individual's data, such as personal details, audio-video material, *etc.*, consent should be obtained from that individual. In the case of children, consent should be obtained from the parent or the legal guardian.
- A specific declaration of such approval and consent-to-disclose form must be made in the copyright letter and a stand-alone paragraph at the end of the article, especially in the case of human studies, where the inclusion of a statement regarding obtaining the written informed consent from each subject or subject's guardian is a must. The original form should be retained by the guarantor or the corresponding author. Editors may request to provide the original forms by fax or email.

- All such case reports require proper consent being to be obtained prior to publishing. Please refer to COPE guidelines available at <https://publicationethics.org/resources/guidelines/journals%E2%80%99best-practices-ensuring-consent-publishing-medical-case-reports>

Editors may request that authors provide documentation of the formal review and recommendation from the institutional review board or ethics committee responsible for oversight of the study. The editors reserve the right to reject manuscripts that do not comply with the above-mentioned requirements. The author will be held responsible for false statements or failure to fulfill the above-mentioned requirements.

Non-identifiable Images

Anonymous images, that do not identify the individual directly or indirectly, such as through any identifying marks or text, do not require formal consent, for example, X-rays, ultrasound images, pathology slides or laparoscopic images.

In case consent is not obtained, concealing the identity through eye bars or blurring the face would not be acceptable.

Research Involving Animals

For research involving animals, the authors should indicate whether the procedures followed were in accordance with the standards set forth in the eighth edition of “Guide for the Care and Use of Laboratory Animals” (https://grants.nih.gov/grants/olaw/guide-for-the-care-and-use-of-laboratory-animals_publication.pdf . published by the National Academy of Sciences, The National Academies Press, Washington, D.C.).

Research work on animals should be carried out in accordance with the NC3Rs ARRIVE Guidelines. For *in vivo* experiments, please visit <https://www.nc3rs.org.uk/arrive-guidelines>.

Authors should clearly state the name of the approval committee, highlighting that legal and ethical approvals were obtained prior to initiation of the research work carried out on animals, and that the experiments were performed in accordance with the relevant guidelines and regulations stated below.

- US authors should cite compliance with the US National Research Council's " [Guide for the Care and Use of Laboratory Animals](#)".
- The US Public Health Service's " [Policy on Humane Care and Use of Laboratory Animals](#)" and " [Guide for the Care and Use of Laboratory Animals](#)".
- UK authors should conform to the UK legislation under [the Animals \(Scientific Procedures\) Act 1986 Amendment Regulations \(SI 2012/3039\)](#).
- European authors outside the UK should conform to [Directive 2010/63/EU](#).
- Research on animals must adhere to the ethical guidelines of the International Council for Laboratory Animal Science (ICLAS).
- The manuscript must clearly include a declaration of compliance with relevant guidelines (e.g., the revised Animals (Scientific Procedures) Act 1986 in the UK and Directive 2010/63/EU in Europe) and/or relevant permissions or licenses obtained by

the [IUCN Policy Statement on Research Involving Species at Risk of Extinction](#) and the [Convention on the Trade in Endangered Species of Wild Fauna and Flora](#).

Animal Ethics Guidelines for Studies Involving Animal Subjects **Ethics Approval Exemption:**

If a study is exempted from ethics approval, authors must indicate the reasons for exemption in the ethical statement.

Following is an example of Ethical Statements:

"This study involving animal subjects is exempted from ethics approval for [specific reasons]. The exemption was evaluated and authorized by [Full name of ethics committee], ensuring adherence to ethical standards".

Client-Owned Animals:

Client-owned animals (non-commercially available animals such as pets or livestock) should be studied exercising best practices in veterinary care. Authors must confirm that the owner(s) (or their legal representatives) have provided written consent for this purpose.

Following is an example of Ethical Statements:

"The animal study was evaluated and authorized by [Full name of the ethics committee]. The owners provided written informed consent for their animals' involvement in this study, ensuring ethical treatment and compliance with standards."

International Standards and 3Rs Principle:

Studies involving animals must comply with internationally accepted standards and adhere to the 3Rs principles (Replace, Reduce, Refine).

- **Replace:** Whenever possible, replace animals with alternatives.
- **Reduce:** Reducing the number of animals used and
- **Refine:** Refining experimental settings can reduce animal damage.

Authors are encouraged to follow the ARRIVE guidelines (Reporting in Vivo Experiments) for reporting experiments involving live animals.

An example of Ethical Statements:

"This study adheres to internationally accepted standards for animal research, following the 3Rs principle. The ARRIVE guidelines were employed for reporting experiments involving live animals, promoting ethical research practices."

Euthanasia Protocols:

Studies on euthanasia, including chloral hydrate, ether, and chloroform overdose, are severely discouraged. Authors should include an in-depth description of any anesthetic, surgical, or euthanasia procedures conducted throughout the study.

If the experimental details explained in the study violate the standard animal research procedure, editors may seek extra documentation, such as approval forms and relevant literature citations.

Research Involving Plants

All experimental research on plants (either cultivated or wild), should comply with international guidelines. The manuscript should include a declaration of compliance of field studies with relevant guidelines and/or relevant permissions or licenses obtained by the [IUCN Policy Statement on Research Involving Species at Risk of Extinction](#) and the [Convention on the Trade in Endangered Species of Wild Fauna and Flora](#).

Hazard Study

Any unusual risks associated with the use of any chemicals, procedures, or equipment used in the work must be explicitly stated by the author in the manuscript, preferably in both the materials and methods section and the declaration section. For more information, visit The World Medical Association (<https://www.wma.net/what-we-do/public-health/chemicals>)

SEX AND GENDER EQUITY IN RESEARCH (SAGER) GUIDELINES

We strive to promote gender and sex equity in research and adhere to the guidelines of Sex and Gender Equity in Research (SAGER) to ensure inclusivity and rigor of the work. All authors submitting research papers are required to follow the [Sex and Gender Equity in Research \(SAGER\) guidelines](#). These guidelines are intended to encourage the inclusion of sex and gender considerations in research in order to improve the rigor and relevance of our publications.

The SAGER guidelines for reporting sex and gender information in methodology or study design, data analysis, results, and interpretation of findings are strongly encouraged. Authors of review articles are advised to address the methods used for selecting, locating, extracting, and synthesizing data; systematic reviews are required to do so.

RESEARCH CONDUCTED IN SPECIAL OR CRITICAL SITUATIONS

Bentham Open expects all contributors to respect the values of justice, benevolence, and autonomy when conducting research. We understand that certain situations, such as medical emergencies or humanitarian crises, may differ from non-emergency scenarios. Bentham Open recommends that research efforts should not hurt human subjects/respondents or the researchers and should be conducted with sufficient scientific rigor as permissible in these situations, respectively. Care should be taken to address potential problems faced by persons who may be victims of disasters or involved in a medical emergency. These are vulnerable individuals and their privacy and dignity should be respected. Researchers should make note of this in their research and identify potential issues in their work that may arise because of such situations.

Research directed in emergency circumstances should be to the greatest advantage of survivors involved in the research and with the goal of minimizing any future casualties. For guidance, the essential requirements of research in emergency situations are the preservation of human life, well-being and security, along with the rights to protection, privacy, and confidentiality of subjects.

UNETHICAL BEHAVIOR

Unethical behavior and misconduct may be pointed out by anyone to the editor and publisher with sufficient evidence. The editor, in consultation with the publisher, will initiate an investigation against this unethical misconduct, complete the procedure till an unbiased decision is reached, and maintain confidentiality throughout the process of the investigation. The author should be given the opportunity to reply to all minor or major accusations.

In case of serious breaches, the employer may be informed, where appropriate, by the Editor/Publisher, after reviewing all available information and evidence or after seeking help from experts in that field.

Conclusion

- Author(s) and reviewers must be informed in case of misinterpretation or mishandling of International Acceptable Standards.
- A strict notice should be sent to the author and reviewer to avoid future unethical misconduct.
- An editorial on the reported misconduct should be published, or an official notice of unethical behavior should be posted on the website.
- Official letters about this misconduct should be issued to the head of departments, funding agencies of the accused author and the reviewer, as well as Abstracting and Indexing Agencies.
- Where required, retraction and withdrawal of publication may be undertaken from the publisher's journal in discussion with the Head of the Department of the author or reviewer, and other higher authorities should be informed.
- The publisher may impose restrictions for some period on future publications from the accused author in the journals.

Consent for Publication

If the manuscript has an individual's personal data, such as personal details, audio-video material etc., consent should be obtained from that individual. In the case of children, consent should be obtained from the parent or the legal guardian.

A specific declaration of such approval and consent-to-disclose form must be made in the copyright letter and a stand-alone paragraph at the end of the article, especially in the case of human studies where the inclusion of a statement regarding obtaining the written informed consent from each subject or subject's guardian is a must. The original form should be retained by the guarantor or corresponding author. Editors may request to provide the original forms by fax or email.

POST-PUBLICATION DISCUSSIONS

Post-publication discussions are well-timed and engaging scientific remarks and justifications on research articles published in “**The Open Dentistry Journal**”. These remarks must be based on the information concurrent with the original study and not on the scientific advancements being made subsequently.

Manuscript Preparation, Submission, and Editorial Process:

- Post-publication discussion should commence with a short paragraph that outlines the summary of the article.
- Authors are advised to avoid using inciting tone in the comments and keep the message clear and concise.
- The main text should not exceed 1200 words with up to 15 references and may include one or two figures and/or tables.
- References should be submitted in the ACS or Vancouver style.
- The correspondents are recommended to contact the original authors first prior to submitting their comments to the journal, as this may resolve the issues that may arise due to some misunderstanding.
- The correspondence that has been done with the authors should also be submitted as an attachment with the manuscript.

Any queries therein should be addressed to info@benthamopen.net.

RANDOMIZED DRUG CLINICAL TRIAL STUDIES

Randomized drug clinical trial studies are biomedical or health-related interventional and/or observational research studies conducted in phases on human beings who are randomly allocated to receive or not receive a preventive, therapeutic, or diagnostic intervention that follows a pre-defined protocol. These studies are intended to determine the safety and efficacy of approaches to disease prevention, diagnosis, and treatment.

Authors of randomized controlled trials are encouraged to submit trial protocols along with their manuscripts. All clinical trials must be registered (before recruitment of the first participant) at an appropriate online public trial registry that must be independent of for-profit interest (e.g., www.clinicaltrials.gov). If you wish the editor(s) to consider an unregistered trial, please explain briefly why the trial has not been registered.

- All randomized clinical trials must include a flow diagram, and authors should provide a completed randomized trial checklist (see CONSORT Flow Diagram and Checklist at (www.consort-statement.org)) and a trial protocol. For further details, please visit the complete guidelines at: <http://www.icmje.org/recommendations/browse/publishing-and-editorial-issues/clinical-trial-registration.html>.
- Studies of diagnostic accuracy must be reported according to STARD guidelines (www.stard-statement.org).
- Observational studies (cohort, case-control, or cross-sectional designs) must be reported according to the STROBE statement and should be submitted with their protocols (www.strobe-statement.org).

- Genetic association studies must be reported according to STREGA guidelines (www.equator-network.org/reporting-guidelines/strobe-strega/).
- Systematic reviews and meta-analyses must be reported according to PRISMA guidelines (www.prisma-statement.org).
- To find the reporting guidelines, kindly visit www.equator-network.org.

Important points to remember while submitting clinical trials:

- Each manuscript should clearly state an objective or hypothesis, the design and methods (including the study setting and dates, patients or participants with inclusion and exclusion criteria, or data sources, and how these were selected for the study), the essential features of any interventions, the main outcome measures, the main results of the study, a comment section placing the results in context with the published literature and addressing study limitations, and the conclusions. Data included in research reports must be original.
- Trial registry name, registration identification number, and URL for the registry should be included at the end of the abstract and also in the space provided on the online manuscript submission form. If your research article reports the results of a controlled health care intervention, list the trial registry, along with the unique identifying number (Please note that there should be no space between the letters and numbers of your trial registration number). Studies designed for other purposes, such as to study pharmacokinetics or major toxicity (e.g., phase 1 trials), are exempted.
- All reports of randomized trials should include a section titled “Randomization and Masking”, within the methods section.
- The manuscript must include a statement identifying the institutional and/or licensing committee that has approved the experiments, including any relevant details.
- The SI system of units and the recommended international non-proprietary name (rINN) for drugs must be used. Kindly ensure that the dose, route, and frequency of administration of any drug mentioned are correct.
- Please ensure that the clinical trials sponsored by pharmaceutical companies follow the guidelines on good publication practice: (<https://www.ismpps.org/about-us>)

The editors reserve the right to reject manuscripts that do not comply with the above-mentioned requirements. The author will be held responsible for false statements or failure to fulfill the above-mentioned requirements.

REFERENCES

References should be submitted preferably in the ACS or Vancouver style. All references must be complete and accurate. The reference numbers must be finalized and the bibliography must be fully formatted before submission.

The references should be relevant to the study and refer to the original research sources. Self-citation and self-interest should be avoided by the authors, editors and peer-reviewers.

See below a few examples of references listed in the ACS and Vancouver Style:

ACS Style

In ACS style, all references should be numbered sequentially [in square brackets] in the text and listed in the same numerical order in the reference section. Superscript in the in-text citations and reference section should be avoided.

Reference Lists

Different reference formats have different rules for citation. See below for some common format examples.

Journal Article

The minimum required information for a journal article reference includes author, abbreviated journal title, year, publication, volume number, and initial page of cited article, though complete pagination is possible. Journal abbreviation and volume are *italicized*. The year of publication must be in **bold**. All authors must be cited and there should be no use of the phrase et al. Journal abbreviations should follow the Index Medicus/MEDLINE.

- [1] Bard, M.; Woods, R.A.; Bartón, D.H.; Corrie, J.E.; Widdowson, D.A. Sterol mutants of *Saccharomyces cerevisiae*: chromatographic analyses. *Lipids*, **1977**, 12(8), 645-654.
- [2] Zhang, W.; Brombosz, S.M.; Mendoza, J.L.; Moore, J.S. A high-yield, one-step synthesis of o-phenylene ethynylene cyclic trimer *via* precipitation-driven alkyne metathesis. *J. Org. Chem.*, **2005**, 70, 10198-10201.

Book Reference

- [3] Crabtree, R.H. *The Organometallic Chemistry of the Transition Metals*, 3rd ed.; Wiley & Sons: New York, **2001**.

Book Chapter Reference

- [4] Wheeler, D.M.S.; Wheeler, M.M. D. Stereoselective Syntheses of Doxorubicin and Related Compounds In: *Studies in Natural Products Chemistry*; Atta-ur-Rahman, Ed.; Elsevier Science B. V: Amsterdam, **1994**; Vol. 14, pp. 3-46.

Conference Proceedings

- [5] Jakeman, D.L.; Withers, S.G.E. In: *Carbohydrate Bioengineering: Interdisciplinary Approaches*, Proceedings of the 4th Carbohydrate Bioengineering Meeting, Stockholm, Sweden, June 10-13, 2001; Teeri, T.T.; Svensson, B.; Gilbert, H.J.; Feizi, T., Eds.; Royal Society of Chemistry: Cambridge, UK, **2002**; pp. 3-8.

URL(WebPage)

- [6] National Library of Medicine. Specialized Information Services: Toxicology and Environmental Health. (Accessed May 23, **2004**).

Patent

- [7] Hoch, J.A.; Huang, S. Screening methods for the identification of novel antibiotics. U.S. Patent 6,043,045, March 28, 2000.

Thesis

- [8] Mackel, H. *Capturing the Spectra of Silicon Solar Cells*. PhD Thesis, The Australian National University: Canberra, December **2004**.

E-citations

- [9] Citations for articles/material published exclusively online or in open access (free-to-view), must contain the accurate Web addresses (URLs) at the end of the reference(s), except those posted on an author's Web site (unless editorially essential), e.g. 'Reference: Available from: URL'.

Some important points to remember are:

- All authors must be cited and there should be no use of the phrase *et al.* should not be used.
- Date of access should be provided for online citations.
- Punctuation should be properly applied, as mentioned in the examples given above.
- Abstracts, unpublished data and personal communications (which can only be included if prior permission has been obtained) should not be given in the references section. The details may however appear in the footnotes.
- The authors are encouraged to use a recent version of EndNote (version 5 and above) or Reference Manager (version 10) when formatting their reference list, as this allows references to be automatically extracted.

Vancouver Style

In Vancouver style, all references should be numbered sequentially [in square brackets] in the text and listed in the same numerical order in the text as in the reference section. Punctuation should be properly applied as mentioned in the examples given above.

Reference Lists

Different reference formats have different rules for citation. See below for some common format examples.

Journal Article

The required information for a journal article is author, abbreviated journal title, year of publication, volume number, and initial page of cited article, though complete pagination is possible. It is necessary to list all authors if the total number of authors is six or less and for more than six authors, three authors and then *et al.* (the term "*et al.*" should be in italics) should be used. Journal abbreviations should follow the Index Medicus/MEDLINE. The first letter of the first word in the title should be capitalized. The rest of the title should be in lowercase, with the exception of proper names.

- [1] Al-Habian A, Harikumar PE, Stocker CJ, Langlands K, Selway JL. Histochemical and immunohistochemical evaluation of mouse skin histology: comparison of fixation with neutral buffered formalin and alcoholic formalin. *J Histotechnol*. 2014 Dec;37(4):115-24.
- [2] Guilbert TW, Morgan WJ, Zeiger RS, *et al*. Long-term inhaled corticosteroids in preschool children at high risk for asthma. *N Engl J Med*. 2006 May 11;354(19):1985-97.

Edited Book

- [3] Blaxter PS, Farnsworth TP. Social health and class inequalities. In: Carter C, Peel JR, Eds. *Equalities and inequalities in health*. 2nd ed. London: Academic Press 1976; pp. 165-78.

Chapter in a Book

- [4] Phillips SJ, Whisnant JP. Hypertension and stroke. In: Laragh JH, Brenner BM, Eds. *Hypertension: pathophysiology, diagnosis, and management*. 2nd ed. New York: Raven Press 1995; pp. 465-78.

Patent

- [5] Larsen CE, Trip R, Johnson CR. Methods for procedures related to the electrophysiology of the heart. US Patent 5529067, 1995.

Conference Proceedings

- [6] Kimura J, Shibasaki H, Eds. Recent advances in clinical neurophysiology. *Proceedings of the 10th International Congress of EMG and Clinical Neurophysiology*; 1995 Oct 15-19; Kyoto, Japan. Amsterdam: Elsevier 1996.

Thesis and Dissertation

- [7] Borkowski MM. Infant sleep and feeding: a telephone survey of Hispanic Americans. PhD dissertation. Mount Pleasant (MI): Central Michigan University 2002.

URL(WebPage)

- [8] Aylin P, Bottle A, Jarman B, Elliott, P. Paediatric cardiac surgical mortality in England after Bristol: descriptive analysis of hospital episode statistics 1991-2002. *BMJ* [serial on the Internet]. 2004 Oct 9; [cited: 15 October 2004]; 329: [about 10 screens].

Electronic Material

Journal Article in Electronic Format

- [9] Frangioni G, Bianchi S, Fuzzi G, Borgioli G. Dynamics of hepatic melanogenesis in newts in recovery phase from hypoxia. Open Zoo J 2009; 2: 1-7. Available from: benthamopen.com/ABSTRACT/TOZJ-2-1 [cited: 26th Jan 2009]
- [10] Abood S. Quality improvement initiative in nursing homes: the ANA acts in an advisory role. Am J Nurs [serial on the Internet]. June 2002 [cited: 12th Aug 2002]; 102(6): [about 3 p.]. Available from: www.nursingworld.org/ana/

Some important points to remember are:

- Date of access should be provided for online citations.
- Avoid using superscript in the in-text citations and reference section.
- Abstracts, unpublished data and personal communications (which can only be included if prior permission has been obtained) should not be given in the references section. The details may, however appear in the footnotes.
- The authors are encouraged to use a recent version of EndNote (version 5 and above) or Reference Manager (version 10) when formatting their reference list, as this allows references to be automatically extracted.

AVAILABILITY OF DATA AND MATERIALS

The source of data and materials should be mentioned in the manuscript in support of the findings. Sharing research data is integral to its transparency and reproducibility. Data sharing involves the citation and availability of data that support the findings of the research.

Bentham Open encourages authors to share the source of data and materials in the manuscript, in support of the findings.

Research Data Policy Types:

Four types of research data policies are mentioned below.

- **Case 1:** Data sharing and data citation
- **Case 2:** Data sharing and its evidence
- **Case 3:** Statement for Data sharing and data availability
- **Case 4:** Data sharing, evidence of data sharing and data for peer-review

Case 1: Data Sharing and Data Citation

Wherever appropriate and possible, the journal encourages authors to publish data to support their research findings in a public repository. Any datasets mentioned in the article that are available in external repositories should be cited.

How to Cite the Data?

Whether the data was developed by the author(s) or researcher(s), all publicly available data referenced in the preparation of an article should be cited in the text and reference list. The references relating to the data availability should be presented in the following format:

Example: Name of author(s), the title of data set, data repository, document version (e.g., most recent updated version), Digital Object Identifier (DOI), and Bentham Open reference style should be included in data citations.

Case 2: Data Sharing and Its Evidence

When authors submit a paper to a journal, the authors agree that the data provided in the publication, including the relevant raw data, will be freely available to any researcher who wants to use these for non-commercial reasons without jeopardizing participant anonymity.

Case 3: Statement for Data Sharing and Data Availability

Data availability declarations are required under Bentham Open research data policy types.

The statement relating to the data availability should be presented in the following format under a separate section for ‘Availability of Data and Materials’ in the manuscript:

1. *The authors confirm that the data supporting the findings of this study are available within the article and its supplementary materials.*
2. *The data that support the findings of this study are available from the corresponding author, [author initials], on special request.*
3. *The datasets generated or analysed during the current study are not publicly available due to [mention the reason(s)].*
4. *Authors who do not wish to share their data should clearly state that the data will not be shared, and thus mention as ‘Not applicable’.*
5. *The statement relating to the data should be presented in the following format:*
"The data supporting the findings of the article is available in the [repository name] at [URL], reference number [reference number]"

Additional Data Availability Statements

Authors can add or change the statement(s) above to fit their work the best. Depending on the nature of the research, several assertions may need to be merged.

Case 4: Data Sharing, Evidence of Data Sharing and Data for Peer-Review

All datasets on which the paper's conclusions are based must be made accessible to reviewers and readers, according to the journal's rules. Prior to peer review, authors must either deposit their datasets in publicly accessible repositories or provide them as supplementary materials with their submission. For further details, please visit the complete guidelines

at: <http://www.icmje.org/recommendations/browse/publishing-and-editorial-issues/clinical-trial-registration.html>

Archiving of Datasets

Authors may deposit their datasets openly to Zenodo Repository, in addition to their own or their institutional archives.

[Zenodo](#) - a repository which is funded by the European Commission, CERN, and OpenAIRE—features a Data for Policy community.

Data for Zenodo site is primarily used to host Data for Policy for conference papers and posters. However, we also encourage authors who are already submitting to Data and Policy, to use Zenodo for presenting content associated with their articles.

Additionally, Zenodo can be used as a repository to host data and other materials that are referred to in the Data Availability Statement. These may include:

- datasets
- data management plans
- software documentation
- codes
- audio and video files
- proposals
- reports, and
- technical notes

Moreover, authors who wish to cite any relevant materials could use the unique Digital Object Identifier (DOI) that Zenodo assigns to the uploaded content.

Data Access and Retention

Authors may provide the raw data in connection with a paper for editorial review and should be prepared to provide public access to such data and retain it for a reasonable time after publication.

STANDARDS OF REPORTING

The Authors are encouraged to use industry-recognized reporting guidelines in their studies, if applicable, to explain that all requirements for reporting have been adopted. Please visit Equator (www.equator-network.org) to find the most relevant reporting standards.

All authors must strictly follow the reporting guidelines below for preparing the study for publication.

- CONSORT: All randomized clinical trials must include a flow diagram and authors should provide a completed randomized trial checklist (see CONSORT Flow Diagram and Checklist (www.consort-statement.org)) and a trial protocol. For further details, please visit complete guidelines at: <http://www.icmje.org/recommendations/browse/publishing-and-editorial-issues/clinical-trial-registration.html>
- STARD and TRIPOD: Studies of diagnostic accuracy must be reported according to STARD (www.stard-statement.org) and TRIPOD guidelines (www.tripod-statement.org).

- STROBE: Observational studies (cohort, case-control, or cross-sectional designs) must be reported according to the STROBE statement, and should be submitted with their protocols (www.strobe-statement.org).
- CARE: Case reports must be reported according to CARE guidelines (www.care-statement.org).
- COREQ: Qualitative research must be reported according to COREQ guidelines (academic.oup.com/intqhc/article/19/6/349/1791966).
- CHEERS: Economic evaluations must be reported according to CHEERS guidelines (www.bmj.com/content/346/bmj.f1049).
- STREGA: Genetic association studies must be reported according to STREGA guidelines (www.equator-network.org/reporting-guidelines/strobe-strega/).
- PRISMA: Systematic reviews and meta-analyses must be reported according to PRISMA guidelines (www.prisma-statement.org).
- MOOSE: Meta-analyses of observational studies in epidemiology must be reported according to MOOSE guidelines (http://www.ijo.in/documents/14MOOSE_SS.pdf).
- EQUATOR: To find the reporting guidelines, please visits (www.equator-network.org).

FIGURES/TABLES

Figures/Illustrations (if any)

All authors must strictly follow the guidelines below for preparing illustrations for publication in *The Open Dentistry Journal*. If the figures are found to be sub-standard, then the manuscripts will be rejected.

The authors are expected to submit good quality figure(s) in PDF, PPT, MS Word, TIFF, or JPEG versions, which, if required, should be improved by themselves or by professional graphic designers of their organization/country. The authors may even consider approaching our contracted service provider [Eureka Science](http://www.eureka-science.com) for graphics enhancement services.

The graphics designing team at Eureka Science can assist in improving the quality of the images at affordable rates. Eureka Science provides special rates of **US \$155** for the improvement of up to five figures, with any additional figures being charged at **US \$25** each.

The quality of graphic enhancement services offered by Eureka Science can be viewed at <http://www.eureka-science.com/images/Binder1.pdf>, along with valuable feedback on their services at <http://www.eureka-science.com/testimonials.php>. Eureka Science can also be contacted at info@eurekascience.net.

Note: Availing graphics enhancement services does not guarantee acceptance of the manuscript for publication. The final acceptance/decision on the manuscript is taken by the EiC.

Guideline for Figures/Illustrations

Illustrations must be provided according to the following guidelines:

- Illustrations should be embedded in the text file, and must be numbered consecutively in the order of their appearance. Each figure should include only a single illustration, which should be cropped to minimize the amount of space occupied by the illustration.
- If a figure is in separate parts, all parts of the figure must be provided in a single composite illustration file.
- Photographs should be provided with a scale bar if appropriate, as well as high-resolution component files.
- All the numbers, symbols, and letters in figures should be consistent and clear throughout and large enough to remain readable when the size is reduced for publication.
- Each figure must be cited in the text in sequence.

Scaling/Resolution

Line art image type is normally an image based on lines and text. It does not contain tonal or shaded areas. The preferred file format should be TIFF or EPS, with the color mode being monochrome 1-bit or RGB, in a resolution of 900-1200 dpi.

Halftone image type is a continuous tone photograph containing no text. It should have the preferred file format TIFF, with color mode being RGB or grayscale, in a resolution of 300 dpi.

Combination image type is an image containing halftone, text, or line art elements. It should have the preferred file format TIFF, with color mode being RGB or grayscale, in a resolution of 500-900 dpi.

Formats

Illustrations may be submitted in the following file formats:

- **Illustrator**
- **EPS** (preferred format for diagrams)
- **PDF** (also suitable for diagrams)
- **PNG** (preferred format for photos or images)
- **Microsoft Word** (version 5 and above; figures must be positioned on a single page)
- **PowerPoint** (figures must be positioned on a single page)
- **TIFF**
- **JPEG** (conversion should be done using the original file)
- **BMP**
- **CDX** (ChemDraw)
- **TGF** (ISISDraw)

Bentham Open does not process figures submitted in GIF format.

For TIFF or EPS figures with considerably large file sizes, restricting the file size in online submissions is advisable. Authors may, therefore, convert their files to the JPEG format before submission as this results in significantly reduced file size and uploading time, while retaining the acceptable quality. JPEG is a lossy format. However, in order to maintain acceptable image quality, it is recommended that JPEG files are saved at High or Maximum quality.

Zipit or Stuffit tools should not be used to compress files prior to submission as the resulting compression through these tools is always negligible.

The authors must refrain from supplying:

1. Graphics embedded in word processor document (spreadsheet, presentation).
2. Files optimized for screen use (like GIF, BMP, PICT, and WPG) because of the low resolution.
3. Files with too low resolution.
4. Graphics that are disproportionately large for the content.

Technical requirements for graphics/figure submissions

The requirements for figures to be submitted are as follows:

Width = 8.5 inches (in-between the required size)

Height = 11 inches (in-between the required size)

Pixels/inches = 300 (minimum dpi)

All figures should be in vector scale (except half tone and photograph).

Image Conversion Tools

There are many software packages, most of them being either freeware or shareware, capable of converting to and from different graphics formats, including PNG.

General tools for image conversion include Graphic Converter on the Macintosh, Paint Shop Pro, for Windows, and ImageMagick, available on Macintosh, Windows and UNIX platforms.

Bitmap images (e.g. screenshots) should not be converted into EPS as they result in a much larger file size than the equivalent JPEG, TIFF, PNG or BMP, and poor quality. EPS should only be used for images produced by vector-drawing applications such as Adobe Illustrator or CorelDraw. Most vector-drawing applications can be saved in, or exported as, EPS format. If the images have been originally prepared in an MS Office application, such as Word or PowerPoint, original files should be directly uploaded to the site, instead of being converted to JPEG or another format of low quality.

Chemical Structures

Chemical structures must be prepared in ChemDraw/CDX and provided as separate files.

Structure Drawing Preferences

The structure drawing preferences must be according to the ACS style sheet, as follows:

Drawing Settings

Chain angle	120°
Bond spacing	18% of the width
Fixed length	14.4 pt (0.500cm, 0.2in)
Bold width	2.0 pt (0.071cm, 0.0278in)

Line width	0.6 pt (0.021cm, 0.0084in)
Margin width	1.6 pt (0.096cm)
Hash spacing	2.5 pt (0.088cm, 0.0347in)
Text settings	
Font	Times New Roman
Size	10 pt
Under the Preference	
Units	points
Tolerances	3 pixels
Under Page Setup Use	
Paper	US letter
Scale	100%

Tables

- Data tables should be submitted in Microsoft Word table format.
- Each table should include a title/caption being explanatory in itself with respect to the details discussed in the table. Detailed legends may then follow.
- Table number in bold font, *i.e.*, Table **1**, should follow a title. The title should be in small case with the first letter in caps. A full stop should be placed at the end of the title.
- Tables should be embedded in the text exactly according to their appropriate placement in the submitted manuscript.
- Columns and rows of data should be made visibly distinct by ensuring that the borders of each cell are displayed as black lines.
- Tables should be numbered in Arabic numerals sequentially in order of their citation in the body of the text.
- If a reference is cited in both the table and text, a lettered footnote should be inserted in the table to refer to the numbered reference in the text.
- Tabular data provided as additional files can be submitted as an Excel spreadsheet.
- It is adequate to present data in tables to avoid unnecessary repetition and reduce the length of the text.
- The citation of each table in the text must be ensured.
- Symbols and non-standard abbreviations should be explained at the end of the text.
- All references should be numbered sequentially (in square brackets) in the table and listed in the same numerical order in the reference section.

AUTHORSHIP

Authorship Criteria

Bentham Open requires that all individuals listed as authors must have made a substantial contribution to the design, performance, analysis, or reporting of the work. The role of authors is judged according to [ICMJE](#) and [COPE](#) guidelines .

Authorship Declaration

All contributing authors are required to sign a copyright letter, mentioning complete details, including full name, affiliation, email address, ORCID ID, and their role in the

article. After the successful electronic submission of a manuscript, a system-generated acknowledgement will be sent to all authors at their provided email addresses.

Authors and Institutional Affiliations

Authors must provide a final list of authors at the time of submission, ensuring the correct sequence of authors' names, which will not be added, deleted, or rearranged after the final submission of the manuscript. The email address of the principal author should be provided with an asterisk. However, the complete address, business telephone number, fax number, and e-mail address of the corresponding author must be stated to for the correspondence and galley proofs. Bentham Open recommends that all contributors regularly update their profiles on SCOPUS/ORCID and other databases.

Authors' Identification

Authors are strongly recommended to use their ORCID ID when submitting an article for consideration. Alternatively, they can acquire an ORCID ID via the submission process. For more information about ORCID IDs, visit [here](#).

Authorship and AI Tools

Bentham Open acknowledges that authors use a variety of tools for preparing articles related to their scientific works, ranging from simple ones to very significant ones.

According to the COPE (Committee on Publication Ethics) guidelines, "AI tools cannot meet the requirements for authorship as they cannot take responsibility for the submitted work. As non-legal entities, they cannot assert the presence or absence of conflicts of interest nor manage copyright and license agreements".

The pertinence of such tools may vary and evolve with public opinion, due to which the use of AI-powered language tools has led to a significant debate. These tools may generate useful results, but they can also lead to errors or misleading results; therefore, it is important to know which tools were used for evaluating and interpreting a particular scientific work.

Considering the above, we require that:

1. The authors should report any significant use of such tools in their works, such as instruments and software along with text-to-text generative AI consistent with subject standards for methodology.
2. All co-authors should sign a declaration that they take full responsibility for all of its contents, regardless of how the contents were generated. Inappropriate language, plagiarized and biased contents, errors, mistakes, incorrect references, or misleading content generated by AI language tools and the relevant results reported in scientific works are full and shared responsibility of all the authors, including co-authors.
3. AI language tools should not be listed as an author; instead, authors should follow clause (1) above.

Changes to Authorship

At the time of initial submission, the finalized list of authors in the correct sequence should be provided, which will not be changed once the publication process starts.

In exceptional cases, requests for the addition/deletion of an author may be considered by the publisher subject to a) written approval from all co-authors and b) a strong justification (which may or may not be accepted by the Publisher).

Here is some advice from COPE on authorship issues. Bentham strives to follow these guidelines.

General Advice

[Advice on how to spot authorship problems](#)

Before Publication

[Corresponding author requests addition of extra author before publication](#)

[Corresponding author requests removal of the author before publication](#)

After Publication

[Request for addition of extra author after publication](#)

[Request for removal of author after publication](#)

Non-Author Contributors

Activities such as the acquisition of funding, general supervision of a research group or general administrative support, writing assistance, technical editing, language editing, and proofreading alone do not qualify any contributor for authorship. Such contributors may be acknowledged individually or together as a group in the acknowledgement section. For more information, please refer to the acknowledgement section of the guide to authors. Persons not meeting authorship criteria can be acknowledged in the acknowledgement section of the article rather than being enlisted as authors.

Guest or Honorary Authorship

All contributing authors should contribute substantially to the article and sign the copyright letter. Bentham Open discourages authorship based solely on position (e.g., a research supervisor or a departmental head). We use [COPE guidelines](#) for identifying any suspected ghost, guest, or gift authorship.

COPYEDITING SERVICES

Authors should seek professional assistance for the correction of grammatical, scientific, and typographical errors before submission of the revised version of the article for publication.

You may use professional editing services of our nominated English Language editing organizations [TopEdit](#) or [Eureka Science](#).

Please note that we accept a language certificate, only from one of the above two language editing organizations.

PROOF CORRECTIONS

Authors will receive page proofs of their accepted papers before publication. To avoid delays in publication, proofs should be checked immediately for typographical errors and returned within 48 hours. Major changes are not acceptable at the proof stage.

The corresponding author will be solely responsible for ensuring that the revised version of the manuscript incorporating all the submitted corrections receives the approval of all the co-authors of the manuscript.

REVIEWING AND PROMPTNESS OF PUBLICATION

All papers submitted to Bentham Open for publication are immediately subjected to preliminary editorial scrutiny by the Editorial Staff and Editor-in-Chief in connection with their suitability. The Editor-in-Chief determines if the manuscript:

- (a) falls within the scope of the journal and
- (b) meets the editorial criteria of Bentham Open Publishers in terms of originality and quality.

Manuscripts that appear to be suitable are then subjected to double-blind peer review by, usually two, neutral eminent experts. The services of eminent international experts are sought through invitations to conduct the peer review of a submitted manuscript, keeping in view the scope of the manuscript and the expertise of the reviewers. The identities of both the reviewer and author are kept undisclosed to each other, ensuring anonymity and maintaining confidentiality throughout the entire review procedure. The anonymity of reviewers ensures an objective and unbiased assessment of the manuscript by the reviewers.

Before sending the manuscripts to reviewers, Bentham Open seeks consent from potential reviewers about their availability and willingness to review. Correspondence between the editorial office of the journal and the reviewers is kept confidential. The reviewers are expected to provide their reports in a timely fashion since a prompt review leads to the timely publication of a manuscript which is beneficial not only to the authors but to the scientific community as well.

The editorial process and peer-review workflow for each journal are taken care of by a team of Senior Editors, Editorial Board Members (EBMs) and dedicated Journal managers who have the required expertise in their specific fields.

Bentham Open Publishers carries out independent reviews of all articles. The reviewers are selected according to their expertise, from our, regularly updated, referee database.

On the basis of reviewer comments, the Editors may recommend acceptance, revision or rejection of a manuscript.

After a review of the manuscript by at least two independent experts, in addition to the views of the Editor, the decision is relayed to the authors, which may be categorized as:

- Requires minor changes
- Requires major changes
- Rejected with no resubmission

If an article receives two contradictory reports, the Editor-in-Chief retains the right to request additional comments and the discretion to make the final decision without waiting for additional reports, taking into consideration the content and conclusions presented in all reports. This proactive approach ensures promptness in conveying the Editor's decision, thereby facilitating swift communication with the author.

Bentham Open requests not to have the manuscripts peer-reviewed by those experts who may have competing interest with the author(s) of a submitted manuscript. It is not possible for Editors to be aware of all competing interests; it is therefore expected that the reviewers would inform the Editor-in-Chief/Handling Editor if they notice any potential competing interest during the course of review of a manuscript. Moreover, the reviewers are expected to inform the Editors or editorial office of the journal if they have a conflict of interest in carrying out the review of a manuscript submitted by any author/contributor of the manuscript.

The authors are usually requested to resubmit the revised paper within 15 days and it will then be returned to the reviewers for further evaluation. The publishers normally allow one round of revision and, in exceptional cases, a second round of revision may be allowed. If further revision is needed, then the manuscript is rejected and the author is requested to resubmit the manuscript for fresh processing.

The final decision regarding acceptance or rejection is that of the Editor-in-Chief, depending on the quality of the revision and his assessment of the quality of the manuscript. In rare cases, manuscripts recommended for publication by the referees may be rejected in the final assessment by the Editor-in-Chief.

The time frame for revision of any article may vary from one to four weeks, depending on the nature of the revision required (minor or major). However, authors who need extra time for revision should consult the Editor-in-Chief/Handling Editor with valid reasons and the submission date of the revised manuscript may be extended if the request is genuine.

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Sample Animated Abstract

Antimicrobial resistance represents a significant challenge to future healthcare provision. An acronym ESKAPEE has been derived from the names of the organisms recognised as the major threats although there are a number of other organisms, notably *Neisseria gonorrhoeae*, that have become equally challenging to treat in the clinic. These pathogens are characterised by the ability to rapidly develop and/or acquire resistance mechanisms in response to exposure to different antimicrobial agents. A key part of the armoury of these pathogens is a series of efflux pumps, which effectively exclude or reduce the intracellular concentration of a large number of antibiotics, making the pathogens significantly more resistant. These efflux pumps are the topic of considerable interest, both from the perspective of a basic understanding of efflux pump function, and its role in drug resistance, as well as the target for the development of

novel adjunct therapies. The necessity to overcome antimicrobial resistance has encouraged investigations into the characterisation of resistance-modifying efflux pump inhibitors to block the mechanisms of drug extrusion, thereby restoring antibacterial susceptibility and returning existing antibiotics to the clinic. A greater understanding of drug recognition and transport by multidrug efflux pumps is needed to develop clinically useful inhibitors, given the breadth of molecules that can be effluxed by these systems. This review discusses different bacterial EPIs originating from both natural sources and chemical synthesis, and examines the challenges in designing successful EPIs that can be useful against multidrug-resistant bacteria.

Normas do Periódico 2

Link de acesso:

https://lp.thieme.de/open-access-files/222/author_instructions.pdf

Normas do Periódico 3

Link de acesso:

<https://www.jendodon.com/content/authorinfo>

Instruções aos autores

Escopo e política

1 ESCOPO

O periódico **Journal of Applied Oral Science (JAOS)** tem como missão, a divulgação dos avanços científicos e tecnológicos conquistados pelas comunidades odontológica e fonoaudiológica, respeitando os indicadores de qualidade, a fim de que seja assegurada a sua aceitabilidade junto aos pesquisadores da área. Tem como objetivo principal publicar resultados de pesquisas originais no campo das ciências orais, com ênfase em Odontologia, Fonoaudiologia e áreas correlatas.

As submissões de relatos de casos (incluindo séries de casos e protocolos clínicos) e comunicações rápidas não são aceitas pelo JAOS e os manuscritos de revisão (incluindo revisões sistemáticas), apenas podem ser enviados a convite do editor.

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1.1 Custos de publicação

Não há cobrança aos autores para submissão nem para processamento dos artigos (APC).

2 DAS NORMAS GERAIS

2.1 Originalidade

Os trabalhos enviados para publicação **devem ser originais**, não sendo permitida a sua submissão simultânea em outro periódico, seja este de âmbito nacional ou internacional. O JAOS reserva todo o direito autoral dos

artigos publicados, inclusive tradução, permitindo, entretanto, a sua posterior reprodução como transcrição com devida citação de fonte.

2.2 Aceitação de *preprints*

O JAOS está aberto para submissões de *preprints*. Um *preprint* é definido como um manuscrito pronto para submissão a um periódico que é depositado em servidores de *preprints* confiáveis antes ou em paralelo à submissão a um periódico. Serão aceitas somente submissões de trabalhos previamente depositados nesses servidores, os quais serão devidamente avaliados quanto ao reconhecimento e à qualidade pelo JAOS.

No caso de aceitação e publicação do artigo no JAOS, os autores deverão atualizar o registro no servidor *preprint*, informando a referência completa da publicação na revista.

2.3 Dados de pesquisa e repositório de dados

Os dados de pesquisa correspondem a qualquer informação que tenha sido observada, coletada, gerada ou criada para validar os resultados da pesquisa original. Inclui dados brutos, dados processados, áudio, vídeo, código, software, algoritmos, protocolos e métodos. Embora geralmente digitais, os dados de pesquisa também incluem formatos não digitais, como cadernos de laboratório e diários.

Quando apropriado, os autores devem garantir que os dados confidenciais não sejam compartilhados para preservar a ética, legalidade e privacidade, caso contrário, o consentimento para divulgação dos dados deve ser fornecido pelos participantes envolvidos. Os dados de pesquisa que não são necessários para verificar os resultados relatados nos artigos não são cobertos por esta política.

O mecanismo preferido para compartilhar dados de pesquisa é por meio de repositório de dados, que consiste em uma ferramenta relevante para que os autores/colaboradores arquivem e compartilhem dados organizados de pesquisas originais e processadas com ou sem material suplementar. Preconiza-se incentivar boas práticas seguindo a Ciência Aberta para garantir segurança e transparência.

Entre os repositórios de dados recomendados pelo JAOS, está incluído o [repositório de dados SciELO](#). É um sistema aberto e isento de taxas, que permite aos colaboradores depositar dados de pesquisa associados a um manuscrito específico. Utilizando o SciELO Data, os autores devem apresentar os dados **SOMENTE após a aceitação do manuscrito**. O JAOS segue uma [Política de Dados de Pesquisa Tipo 3](#) e adota o [Nível 1 de Curadoria](#).

Os repositórios de dados para depositar seus dados de pesquisa estão disponíveis em <https://repositoryfinder.datacite.org/>. Para garantir a qualidade

e o reconhecimento dos dados gerados, o JAOS recomenda e segue os princípios FAIR (Encontrável, Acessível, Interoperável e Reutilizável).

Para disponibilizar esses dados de acordo com as políticas do SciELO, os autores devem preencher o formulário [Open Science Compliance](#).

Embargos ao compartilhamento de dados são permitidos. Ao publicar um conjunto de dados, o autor pode optar por adiar a data de disponibilização dos dados. Isso significa que a descrição e os arquivos desse conjunto de dados não estarão disponíveis publicamente até que a data do embargo seja atingida. Enquanto isso, outras informações sobre o conjunto de dados, como os colaboradores, o título, a citação e os artigos associados ficam disponíveis imediatamente antes do embargo.

O compartilhamento de dados de pesquisa como arquivos de informações suplementares é desencorajado. Para alguns tipos de dados, o compartilhamento de dados de pesquisa por meio de Materiais Suplementares não é permitido. Os autores são encorajados a garantir que seus conjuntos de dados sejam depositados em repositórios publicamente disponíveis apresentados no artigo principal.

O JAOS encoraja os autores a citar quaisquer dados de pesquisa publicamente disponíveis em sua lista de referência. As referências a conjuntos de dados (citações de dados) devem incluir um identificador persistente (como um DOI). As citações de conjuntos de dados, quando aparecem na lista de referências, devem incluir as informações mínimas recomendadas pelo DataCite e seguir o estilo JAOS.

Exemplo:

Mahardawi B. The role of hemostatic agents following dental extractions: a systematic review and meta-analysis [dataset]. 2022 Mar 14 [cited 2022 Apr 22]. In: Dryad [Internet]. doi: 10.5061/dryad.59zw3r297. Available from: <https://doi.org/10.5061/dryad.59zw3r297>

O JAOS incentiva que os dados de pesquisa sejam disponibilizados sob licenças abertas que permitem a reutilização livre, e recomenda a adoção da Licença CC BY 4.0 (Creative Commons Attribution 4.0 International) que autoriza o compartilhamento, o uso e a adaptação de dados de pesquisa sempre e quando o crédito aos autores é assegurado, mas o autor pode decidir qual Licença Creative Commons é a mais adequada ao tipo de dados depositados.

O JAOS exige que os autores incluam em quaisquer artigos que relatem resultados derivados de dados de pesquisa uma **Declaração de Disponibilidade de Dados**. O fornecimento de uma Declaração de Disponibilidade de Dados será verificado como condição de publicação e deve conter informações sobre onde os dados que suportam os resultados relatados no artigo podem ser encontrados, incluindo, quando aplicável, hiperlinks para conjuntos de dados publicamente arquivados analisados ou

gerados durante o estudo. Quando os dados da pesquisa não estiverem disponíveis publicamente, isso deve ser declarado no manuscrito juntamente com quaisquer condições de acesso aos dados. As Declarações de Disponibilidade de Dados geralmente assumem uma das seguintes formas:

Dados disponíveis em um repositório acessível publicamente

The datasets generated during and/or analyzed during the current study are available in the [NAME] repository, [DOI - PERSISTENT WEB LINK TO DATASETS].

Dados disponíveis mediante solicitação devido a restrições, por exemplo, privacidade ou ética

The datasets generated during and/or analyzed during the current study are not publicly available due [REASON WHY DATA ARE NOT PUBLIC] but are available from the corresponding author on reasonable request.

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Compartilhamento de dados não aplicável

No new data were created or analyzed in this study. Data sharing is not applicable to this article.

Os dados estão contidos no artigo

All data generated or analyzed during this study are included in this published article [and its supplementary information files].

Dados de terceiros

The data that support the findings of this study are available from [third party name] but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of [third party name]

Dúvidas sobre o cumprimento desta política devem ser enviadas para jaos@usp.br.

2.4 Apenas serão aceitas as submissões de trabalhos redigidos em inglês. Da mesma forma, a língua inglesa deverá ser adotada em todos os documentos durante o processo de tramitação dos artigos. O conteúdo dos textos, das citações e das referências dos trabalhos enviados e publicados são de inteira responsabilidade dos autores, não refletindo obrigatoriamente a opinião do Editor-Chefe ou Corpo Editorial.

2.5 O JAOS tem o direito de submeter todos os manuscritos ao Corpo Editorial, que está completamente autorizado a determinar a conveniência de seu conteúdo para a análise por pares (caso contrário, os manuscritos

receberão a decisão de Rejeição Imediata), e decisão subsequente de acordo com a aceitação/ rejeição, ou devolvê-los aos autores com sugestões e modificações no texto e/ou para adaptação às regras editoriais da revista. Nesse caso, o manuscrito será reavaliado pelo Editor-Chefe e Corpo Editorial.

2.6 As datas do recebimento do artigo original e de sua aceitação constarão quando da publicação no JAOS.

2.7 O JAOS é publicado exclusivamente em formato eletrônico.

3 CRITÉRIOS DE ARBITRAGEM

3.1 Pré-Análise: os manuscritos serão submetidos aos Editores-Chefes e Associados para apreciação quanto à adequação ao escopo da revista, prioridade e potencial impacto de publicação e citação, grau de novidade e metodologia. Manuscritos que não atendam ao conjunto desses requisitos nesta fase serão rejeitados e devolvidos aos autores, enquanto os manuscritos considerados apropriados seguirão o processo regular de avaliação por pares.

3.2 Revisão técnica: os trabalhos aprovados na pré-análise serão avaliados quanto ao cumprimento das normas de publicação e documentação exigidas na submissão de manuscritos pelo JAOS. Em caso de desacordo com as instruções serão devolvidos aos autores para as devidas adequações antes mesmo de serem submetidos à avaliação pelos Editores Associados e revisores.

3.3 Análise de mérito e conteúdo: os artigos aprovados pelos Editores Associados serão avaliados quanto ao mérito e método científico por no mínimo dois relatores *ad hoc* de unidades distintas à de origem do trabalho, além do Editor-Chefe.

3.3.1 Como parte do processo de avaliação, todos os manuscritos, em todas as rodadas de revisão, serão submetidos à análise por software de plágio.

3.3.2 O Editor-Chefe decidirá sobre a aceitação do manuscrito. Quando necessária revisão do original, o manuscrito será devolvido ao autor correspondente para modificação. Uma versão revisada com as alterações efetuadas deverá ser ressubmetida pelos autores e será reavaliada pelo Editor-Chefe, Editores Associados e revisores conforme a necessidade.

3.4 Após aprovação quanto ao mérito científico, os trabalhos serão submetidos à revisão final da língua inglesa, realizada por profissional autônomo indicado pelo JAOS. Nos casos de inadequação os trabalhos serão encaminhados para os autores para revisão.

3.5 Autores e revisores, durante o processo de tramitação dos artigos, não são identificados pela outra parte.

4 DA CORREÇÃO DAS PROVAS TIPOGRÁFICAS

4.1 A prova tipográfica do artigo será enviada ao autor correspondente por meio de correio eletrônico em formato PDF para aprovação final.

4.2 O autor disporá de um prazo de 48 horas para correção e devolução do original devidamente revisado, se necessário.

4.3 Apenas pequenas modificações, correções de ortografia e verificação das ilustrações serão aceitas. Modificações extensas implicarão na reapreciação pelos revisores e atraso na publicação do trabalho.

4.4 Se não houver retorno da prova em 48 horas, o Editor-Chefe considerará como final a versão sem alterações.

4.5 A inclusão de novos autores **não é permitida** nesta fase do processo de publicação.

4.6 É de inteira responsabilidade dos autores verificarem o devido uso de seus nomes científicos no manuscrito bem como de suas afiliações.

Forma e preparação de manuscritos

1 APRESENTAÇÃO DO MANUSCRITO

1.1 Estrutura do manuscrito

1.1.1 Página de rosto deverá ser submetida como arquivo suplementar e conter apenas:

O título do manuscrito em inglês.

Os nomes dos autores na ordem direta seguido da sua afiliação institucional. Para autores brasileiros as afiliações devem vir em português, em espanhol para latino-americanos e em inglês para as demais nacionalidades.

Endereço completo do autor correspondente, a quem todas as correspondências devem ser endereçadas, incluindo telefone e endereço de e-mail.

Informação sobre o depósito do manuscrito em um servidor de *preprints*, quando for o caso, indicando o endereço de acesso e número DOI, se requeridos (anexar o formulário de [Conformidade com a Ciência Aberta](#)). Citação e referenciamento dos dados de pesquisa especificando o repositório e o número DOI (anexar o formulário de [Conformidade com a Ciência Aberta](#)).

Nota obrigatória informando se o manuscrito é derivado de dissertações ou teses e seu respectivo endereço de acesso quando disponível.

1.1.2 Texto

O artigo deverá ser previamente traduzido ou revisado quanto à língua inglesa por empresa ou profissional autônomo que assegurem a qualidade do texto. Autores que tenham a língua inglesa como nativa deverão apresentar declaração na qual se responsabilizam pela redação.

Título do trabalho em inglês.

Resumo estruturado de no máximo 300 palavras em parágrafo único, contendo as seguintes subseções: breve introdução, objetivo, metodologia, resultados e conclusões.

Palavras-chave: correspondem às palavras ou expressões que identificam o conteúdo do artigo. Para determinação das palavras-chave, os autores deverão consultar a lista de assuntos do [MeSh](#) e [DeCS](#). Deve-se usar ponto final para separar as palavras-chave, que devem ter a primeira letra da primeira palavra em letra maiúscula. Ex: Dental implants. Fixed prosthesis. Photoelasticity. Passive fit.

Resumo gráfico: Um resumo gráfico é um formato visual do manuscrito para resumir os achados essenciais do estudo. Ajuda a divulgar informações fáceis e concisas, que podem ser rapidamente incorporadas pelos leitores e ajudam a ser compartilhadas, inclusive nas mídias sociais. **Portanto, o JAOS encoraja esta submissão.** Uma figura original que indique claramente a sequência descrita no manuscrito precisa ser projetada (JPEG, mínimo de 300 dpi e 1328 x 531 pixels - largura x altura) e enviada como um arquivo separado como material suplementar.

Exemplos: <https://www.instagram.com/p/CL44dlbF-wu/>
<https://www.instagram.com/p/CVh4M9aFsGw/>
<https://www.instagram.com/p/CHhyixyFkag/>

Introdução: resumo do raciocínio e a proposta do estudo, citando somente referências pertinentes. Estabelecer a hipótese do trabalho.

Metodologia: o material e os métodos são apresentados com detalhes suficientes para permitir a confirmação das observações. Incluir cidade, estado e país de todos os fabricantes depois da primeira menção dos produtos, instrumentais, softwares, equipamentos, etc. Métodos publicados devem ser referenciados e discutidos brevemente, exceto se modificações tenham sido feitas. Indicar os métodos estatísticos utilizados, se aplicável. Consultar o item 3 para princípios éticos e registro de ensaios clínicos.

Resultados: devem ser apresentados em uma sequência lógica no texto, com tabelas e ilustrações. Não repetir no texto todos os dados das tabelas e ilustrações, enfatizando somente as observações importantes. Utilizar o mínimo de tabelas e ilustrações possível.

Discussão: enfatizar os aspectos novos e importantes do estudo contextualizando com observações de investigações prévias. Não repetir em detalhes dados ou informações citadas na introdução ou resultados. Apontar as implicações de seus achados e suas limitações.

Conclusão(ões): Listar sucintamente as conclusões que podem ser extraídas da pesquisa. Não apenas reafirmar os resultados, mas estabelecer conclusões

pertinentes aos objetivos e justificadas pelos dados. Na maioria das situações, as conclusões são verdadeiras apenas para a população do experimento.

Agradecimentos (quando apropriado): agradeça aos que tenham contribuído de maneira significativa para o estudo (pessoas, laboratórios, setores etc). Especifique patrocinadores, auxílios financeiros, bolsas e programas citando o nome da organização de apoio de fomento e o número do processo.

Referências (ver item 2.3)

2 NORMALIZAÇÃO TÉCNICA

O corpo do texto do manuscrito deve ser digitado com: espaçamento de 1,5, fonte Arial, tamanho 11, 3 cm de margem de cada um dos lados, papel A4, perfazendo um total de, no máximo, 15 páginas, incluindo, portanto, figuras, tabelas, legendas das figuras e referências.

2.1 Ilustrações e Tabelas

2.1.1 As ilustrações (fotografias, gráficos, desenhos, fluxogramas etc.), serão consideradas no texto como figuras, sendo limitadas ao mínimo indispensáveis e devem ser adicionadas em arquivos separados, numeradas consecutivamente em algarismos arábicos segundo a ordem em que aparecem no texto.

2.1.2 As ilustrações deverão ser anexadas separadamente como arquivos individuais durante a submissão do artigo. Devem apresentar formato .jpg, com no mínimo 300 dpi de resolução e 10 cm de largura.

2.1.3 As tabelas deverão ser logicamente organizadas, numeradas consecutivamente em algarismos arábicos e a legenda será colocada na parte superior. As tabelas deverão ser abertas nas laterais direita e esquerda, omitindo-se as linhas internas horizontais e verticais e, também, qualquer sombreamento ou cor. As tabelas deverão ser enviadas em formato .xls.

2.1.4 As legendas das ilustrações e os títulos das tabelas deverão ser claros, concisos e localizados ao final do trabalho em forma de lista separada e precedidas da numeração correspondente.

2.1.5 As notas de rodapé de ilustrações e tabelas serão indicadas por asteriscos e restritas ao mínimo indispensável.

2.2 Citação de autores

A citação dos autores no texto poderá ser feita de duas maneiras:

1) Somente numérica: ... and interfere with the bacterial system and tissue system^{3,4,7-10}.

As referências devem ser citadas em ordem crescente no parágrafo.

2) ou alfanumérica:

Um autor: Gatewood³¹ (2012)
Dois autores: Cotti and Mercurio¹⁹ (2016)
Três autores: Azar, Safi, Nikaein²⁷ (2012)
mais que três autores: Gealh, et al.²⁸ (2014)

2.3 Referências

As Referências deverão obedecer aos requisitos "[Uniform requirements for manuscripts submitted to Biomedical Journals - Vancouver](#)".

2.3.1 Toda referência deverá ser citada no texto. Elas devem ser ordenadas de acordo com sua apresentação no texto e numeradas sequencialmente em ordem crescente. As abreviaturas dos títulos dos periódicos citados deverão estar de acordo com o padrão [MEDLINE](#).

2.3.2 Não incluir comunicações pessoais e materiais bibliográficos sem data de publicação na lista de referências.

2.3.3 Teses, dissertações, monografias e resumos não serão aceitos como referências.

2.3.4 Evitar ao máximo referências a publicações em línguas que não a inglesa (se incluídas, limitar a um número máximo de 3). O título traduzido em inglês deve ser citado entre colchetes e o idioma original inserido no final da referência.

2.3.5 Listar os nomes dos 6 primeiros autores do trabalho; excedendo este número, os 6 primeiros autores do trabalho devem ser citados, seguidos pela expressão ", et al.", não escrita em itálico e acompanhada por ponto final. Ex: Cintra LT, Samuel RO, Azuma MM, Ribeiro CP, Narciso LG, Lima VM, et al.

2.3.6 Não ultrapassar a citação de 40 referências.

Exemplos de referências:

Livro

Preedy VR, organizator. Fluorine: chemistry, analysis, function and effects. London: Royal Society of Chemistry; 2015.

Capítulo de Livro

Buzalaf CP, Leite AL, Buzalaf MA. Fluoride metabolism. In: Preedy VR, organizator. Fluorine: chemistry, analysis, function and effects. London: Royal Society of Chemistry; 2015. p. 54-72.

Artigo de periódico

Conti PC, Bonjardim LR, Stuginski-Barbosa J, Costa YM, Svensson P. Pain complications of oral implants: Is that an issue? J Oral Rehabil. 2021;48(2):195-206. doi: 10.1111/joor.13112

Artigo de periódico com idioma original que não o inglês

Schubert O, Le V, Probst F. Chancen und Risiken von Zahnimplantaten [Dental implants - opportunities and risks]. MMW Fortschr Med. 2022;164(9):50-2. German. doi: 10.1007/s15006-022-0970-4

Artigo de periódico exclusivamente na Internet (com identificador eletrônico)

Peixoto KO, Resende CM, Almeida EO, Almeida-Leite CM, Conti PC, Barbosa GA, et al. Association of sleep quality and psychological aspects with reports of bruxism and TMD in Brazilian dentists during the COVID-19 pandemic. J Appl Oral Sci [Internet]. 2021 [cited 2022 June 20];29:e20201089. Available from: <http://dx.doi.org/10.1590/1678-7757-2020-108>

Artigo de periódico com DOI

Francese MM, Gonçalves IV, Vertuan M, Souza BM, Magalhães AC. The protective effect of the experimental TiF₄ and chitosan toothpaste on erosive tooth wear in vitro. Sci Rep. 2022;12(1):7088. doi: 10.1038/s41598-022-11261-1

Artigo de periódico Epub ahead of print/In press/Forthcoming

Pucciarelli MG, Toyoshima GH, Oliveira TM, Neppelenbroek KH, Soares S. Quantifying the facial proportions in edentulous individuals before and after rehabilitation with complete dentures compared with dentate individuals: a 3D stereophotogrammetry study. J Prosthet Dent. Forthcoming 2022. doi: 10.1016/j.prosdent.2022.03.013

Preprint

Weissheimer T, Só MV, Alcalde MP, Cortez JB, Rosa RA, Vivan RR, et al. Evaluation of mechanical properties of coronal flaring nickel-titanium instruments. Research Square rs-49258/v1 [Preprint]. 2020 [cited 2020 Sept 2]. Available from: <https://doi.org/10.21203/rs.3.rs-49258/v1>

Dados de pesquisa

Mahardawi B. The role of hemostatic agents following dental extractions: a systematic review and meta-analysis [dataset]. 2022 Mar 14 [cited 2022 Apr 22]. In: Dryad [Internet]. doi: 10.5061/dryad.59zw3r297. Available from: <https://doi.org/10.5061/dryad.59zw3r297>

Artigos com mais de 6 autores:

Citam-se até os 6 primeiros seguidos da expressão " ,et al."

Bergantin BT, Di Leone CC, Cruvinel T, Wang L, Buzalaf MA, Borges AB, et al. S-PRG-based composites erosive wear resistance and the effect on surrounding enamel. Sci Rep. 2022;12(1):833. doi: 10.1038/s41598-021-03745-3

Volume com suplemento e/ou Número Especial

Ricomini AP Filho, Chávez BA, Giacaman RA, Frazão P, Cury JA. Community interventions and strategies for caries control in Latin American and Caribbean countries. Braz Oral Res. 2021;35(suppl 1):e054. doi: 10.1590/1807-3107bor-2021.vol35.0054

A exatidão das referências é de responsabilidade dos autores.

3 PRINCÍPIOS ÉTICOS E REGISTROS DE ENSAIOS CLÍNICOS

3.1 Procedimentos experimentais em animais e humanos.

O periódico JAOS endossa os princípios incorporados na Declaração de Helsinki e insiste que todas as pesquisas que envolvam seres humanos publicadas nesta Revista, sejam conduzidas em conformidade com esses princípios e com outros similares dispostos nos respectivos Comitês de Ética em Pesquisa das instituições vinculadas dos autores. No caso de experimentos com animais, estes devem seguir os mesmos princípios de ética envolvidos. Em experimentos que envolvam procedimentos cirúrgicos em animais, os autores devem descrever na seção de Metodologia, as evidências de que a dosagem anestésica produziu efeito adequado e por tempo necessário para a condução do ato cirúrgico. Todos os experimentos com humanos ou animais devem vir acompanhados de descrição, na seção de Metodologia, de que o estudo foi aprovado pelos respectivos órgãos que gerenciam a Ética em Pesquisa nas suas instituições vinculadas.

3.1.1 Artigos apresentando **estudos experimentais em humanos ou animais** deverão **obrigatoriamente** vir acompanhados de documento comprobatório da aprovação pelo Comitê de Ética enviado como material suplementar.

3.1.2 Artigos apresentando estudos em animais deverão obrigatoriamente vir acompanhados de Checklist ARRIVE devidamente preenchido. O documento está disponível no link: <https://mc04.manuscriptcentral.com/societyimages/jaos-scielo/ARRIVEChecklist.docx>

3.1.3 Certificados do Comitê de Ética emitidos em língua que não inglês, espanhol e português devem ser traduzidos para o inglês.

3.2 Registros de ensaios que envolvam seres humanos

O JAOS apoia as políticas para registro de ensaios clínicos da Organização Mundial da Saúde (OMS) e do Comitê Internacional de Editores de Revistas Médicas (ICMJE), reconhecendo a importância dessas iniciativas para o registro e divulgação internacional sobre estudos clínicos com acesso aberto. Sendo assim, somente serão aceitos para publicação os artigos de pesquisas clínicas que tenham o registro, em uma das plataformas de ensaios clínicos, validadas pelos critérios estabelecidos pela OMS e pelo ICMJE.

Entende-se por Ensaio Clínico como qualquer estudo de pesquisa que prospectiva ou retrospectivamente designa participantes humanos ou grupos de humanos para uma ou mais intervenções relacionadas à saúde para avaliar os efeitos e os resultados de saúde. Intervenções incluem, mas não se restringem a fármacos, células e outros produtos biológicos, procedimentos cirúrgicos, procedimentos radiológicos, dispositivos, tratamentos comportamentais, mudanças no processo de cuidado, cuidado preventivo etc.

3.2.1 Os artigos que envolvam **ensaios clínicos intervencionais (clinical trials)** em voluntários humanos deverão ser enviados acompanhados de dois documentos suplementares **obrigatórios**:

checklist [CONSORT 2010](#) ou [SPIRIT](#)

comprovante de número de registro da pesquisa em base que atenda às exigências da OMS e do ICMJE.

Sugestões para [autores brasileiros](#).

Sugestão para autores brasileiros ou de [outras nacionalidades](#)/ ([ISRCTN](#)).

Não serão aceitas submissões com data de registro posterior à data da submissão do artigo ao JAOS.

3.2.2 Os artigos que envolvam **ensaios clínicos observacionais** em voluntários humanos deverão ser enviados acompanhados de dois documentos suplementares **obrigatórios**:

checklist [STROBE](#).

comprovante de número de registro da pesquisa em base que atenda às exigências da OMS e do ICMJE.

Não serão aceitas submissões com data de registro posterior à data da submissão do artigo ao JAOS.

3.2.3 Os artigos que envolvam **questionários** em voluntários humanos deverão ser enviados acompanhados de dois documentos suplementares **obrigatórios**:

checklist [CHERRIES](#).

comprovante de número de registro da pesquisa em base que atenda às exigências da OMS e do ICMJE.

Não serão aceitas submissões com data de registro posterior à data da submissão do artigo ao JAOS.

3.3 Revisões Sistemáticas

As Revisões Sistemáticas **SOMENTE DEVEM SER SUBMETIDAS A CONVITE DO JAOS**. Ainda assim, apenas serão recebidas submissões de Revisões Sistemáticas de qualquer natureza (Tradicionais, Overviews, Umbrella Reviews e Scoping Reviews) desde que cumpram os seguintes requisitos **obrigatórios**:

[Checklist PRISMA 2020 statement](#) devidamente preenchido, incluindo todas as suas extensões em casos particulares.

[PROSPERO International Prospective Register of Systematic Reviews](#) ou [Open Science Framework](#)

Não serão aceitas submissões com data de registro posterior à data da submissão do artigo ao JAOS.

3.4 O Editor-Chefe e o Conselho Editorial se reservam o direito de recusar artigos que não demonstrem evidência clara de que esses princípios foram seguidos ou cujos métodos empregados forem considerados inapropriados para o uso de humanos ou animais.

4 OUTRAS QUESTÕES SERÃO RESOLVIDAS PELO EDITOR-CHEFE E CONSELHO EDITORIAL

Envio de manuscritos

1 SUBMISSÃO DO TRABALHO

1.1 Os manuscritos deverão ser submetidos por meio do endereço: <https://mc04.manuscriptcentral.com/jaos-scielo>

1.2 O **arquivo original** contendo o manuscrito deve ser submetido **sem a identificação** dos autores e afiliações.

1.3 A folha de rosto deverá ser submetida como arquivo suplementar (Title page) contendo o nome dos autores, afiliações, endereço para correspondência, citação e referenciamento do repositório de dados e endereço do servidor de *preprint* (quando requerido) e nota obrigatória quando o manuscrito for derivado de dissertação/tese.

1.4 As figuras devem ser submetidas como arquivos suplementares de acordo com as especificações do item 2.1 sobre forma e preparação dos manuscritos.

1.5 As tabelas devem ser preparadas em formato Excel e devem ser submetidas como arquivos suplementares.

1.6 Documentos comprobatórios: Documento comprobatório da aprovação pelo Comitê de Ética, [ARRIVE Checklist](#), [CONSORT Checklist](#) ou [SPIRIT Checklist](#), Registro de ensaios clínicos, [STROBE Checklist](#), [CHERRIES Checklist](#), [PRISMA Checklist](#) e [Registro PROSPERO](#) deverão ser submetidos como arquivos suplementares obrigatórios.

1.7 O comprovante de revisão da língua inglesa (termo de responsabilidade assinado ou comprovante emitido por empresa) deverá ser submetido como arquivo obrigatório.

1.8 O [formulário de submissão](#), assinado por TODOS os autores, deve ser submetido como arquivo obrigatório.

1.9 Formulário sobre [Conformidade com a Ciência Aberta](#) **DEVE** ser submetido como arquivo suplementar.

1.10 O JAOS requer a inclusão do número de registro ORCID dos autores para submissão dos manuscritos. Todos os autores devem associar o número de registro no [ORCID](#) ao seu perfil no Scholar One.