Camila Raíssa Oliveira Gontijo

Uma nova proposta de retenção intrarradicular na dentição decídua: análise biomecânica de incisivos decíduos bovinos cimentados com fibra de vidro ou pino de fibra de vidro em diferentes comprimentos de alívio

A new proposal for intraradicular retention in deciduous dentition: biomechanical analysis of bovine primary incisors cemented with pre-impregnated glass fiber or fiber post in different lengths

Dissertação apresentada à Faculdade de Odontologia da Universidade Federal de Uberlândia, para obtenção do Título de Mestre em Odontologia, Área de Clínica Odontológica Integrada.

Uberlândia, 2020

Camila Raíssa Oliveira Gontijo

Uma nova proposta de retenção intrarradicular na dentição decídua: análise biomecânica de incisivos decíduos bovinos cimentados com fibra de vidro ou pino de fibra de vidro em diferentes comprimentos de alívio

A new proposal for intraradicular retention in deciduous dentition: biomechanical analysis of bovine primary incisors cemented with pre-impregnated glass fiber or fiber post in different lengths

Dissertação apresentada à Faculdade de Odontologia da Universidade Federal de Uberlândia, para obtenção do Título de Mestre em Odontologia, Área de Clínica Odontológica Integrada.

Orientadora: Profa. Dra. Alessandra Maia de Castro
Co-orientador: Prof. Dr. Carlos José Soares

Banca Examinadora:
Profa. Dra. Alessandra Maia de Castro
Prof. Dr. Paulo César de Freitas Santos Filho
Profa. Dra. Fernanda Pereira Silva

Uberlândia, 2020

UNIVERSIDADE FEDERAL DE UBERLÂNDIA
Coordenação do Programa de Pós-Graduação em Odontologia
Av. Pará, 1720, Bloco 4L, Anexo B, Sala 35 - Bairro Umuarama, Uberlândia-MG, CEP 38400-902
Telefone: (34) 3225-8115/8108 - www.ppgoufu.com - copod@umuarama.ufu.br

ATA DE DEFESA - PÓS-GRADUAÇÃO

Programa de Pós-Graduação em:	Odontologia				
Defesa de:	Dissertação de Mestrado Acadêmico, número 373, PPGO				
Data:	Vinte de fevereiro de dois mil e vinte	Hora de início:	08:00	Hora de encerramento:	11:00
Matrícula do Discente:	11812ODO004				
Nome do Discente:	Camila Raíssa Oliveira Gontijo				
Título do Trabalho:	Uma nova proposta de retenção intrarradicular na dentição decídua: análise biomecânica de incisivos decíduos bovinos cimentados com fibra de vidro ou pino de fibra de vidro em diferentes comprimentos de alívio				
Área de concentração:	Clínica Odontológica Integrada				
Linha de pesquisa:	Propriedades Físicas e Biológicas dos materiais Odontológicos e das estruturas dentais				
Projeto de Pesquisa de vinculação:	Propriedades Físicas e Biológicas dos materiais Odontológicos e das estruturas dentais				

Reuniu-se no Anfiteatro/Sala 31 Bloco 4L Anexo A, Campus Umuarama, da Universidade Federal de Uberlândia, a Banca Examinadora, designada pelo Colegiado do Programa de Pós-graduação em Odontologia, assim composta: Professores Doutores: Paulo César de Freitas Santos Filho (UFU); Fernanda Pereira Silva (UniRV); Alessandra Maia de Castro Prado (UFU) orientador(a) do(a) candidato(a).

Iniciando os trabalhos o(a) presidente da mesa, Dr(a). Alessandra Maia de Castro Prado, 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):

Aprovada.

Esta defesa faz parte dos requisitos necessários à obtenção do título de Mestre.

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.

Documento assinado eletronicamente por **Alessandra Maia de Castro Prado**, **Professor(a) do Magistério Superior**, em 21/02/2020, às 10:50, conforme horário oficial de Brasília, com fundamento no art. 6º, § 1º, do Decreto nº 8.539, de 8 de outubro de 2015.

Documento assinado eletronicamente por **Paulo César de Freitas Santos Filho**, **Professor(a) do Magistério Superior**, em 21/02/2020, às 10:51, conforme horário oficial de Brasília, com fundamento no art. 6º, § 1º, do Decreto nº 8.539, de 8 de outubro de 2015.

Documento assinado eletronicamente por **FERNANDA PEREIRA SILVA**, **Usuário Externo**, em 21/02/2020, às 10:54, conforme horário oficial de Brasília, com fundamento no art. 6º, § 1º, do Decreto nº 8.539, de 8 de outubro de 2015.

A autenticidade deste documento pode ser conferida no site https://www.sei.ufu.br/sei/controlador_externo.php?acao=documento_conferir&id_orgao_acesso_externo=0, informando o código verificador **1833406** e o código CRC **8F04D29D**.

Referência: Processo nº 23117.005174/2020-17 SEI nº 1833406

Ficha Catalográfica Online do Sistema de Bibliotecas da UFU
com dados informados pelo(a) próprio(a) autor(a).

G641
2020

Gontijo, Camila Raíssa Oliveira, 1995-
Uma nova proposta de retenção intrarradicular na dentição decídua: análise biomecânica de incisivos decíduos bovinos cimentados com fibra de vidro ou pino de fibra de vidro em diferentes comprimentos [recurso eletrônico] / Camila Raíssa Oliveira Gontijo. - 2020.

Orientadora: Alessandra Maia de Castro.
Coorientador: Carlos José Soares.
Dissertação (Mestrado) - Universidade Federal de Uberlândia, Pós-graduação em Odontologia.
Modo de acesso: Internet.
Disponível em: http://doi.org/10.14393/ufu.di.2020.308
Inclui bibliografia.
Inclui ilustrações.

1. Odontologia. I. Castro, Alessandra Maia de,1970-, (Orient.). II. Soares, Carlos José,1965-, (Coorient.). III. Universidade Federal de Uberlândia. Pós-graduação em Odontologia. IV. Título.

CDU: 616.314

Bibliotecários responsáveis pela estrutura de acordo com o AACR2:
Gizele Cristine Nunes do Couto - CRB6/2091
Nelson Marcos Ferreira - CRB6/3074

DEDICATÓRIA

À Deus,

Senhor e Salvador da minha vida, obrigada por me abençoar e guiar os meus passos para que eu seja uma pessoa e profissional cada dia melhor. A honra e glória são do Senhor!

Aos meus pais, Cleuton e Simônia,

Obrigada por todo amor e dedicação a mim. Vocês são o meu alicerce e sem o esforço de vocês na minha criação e incentivo aos estudos eu não estaria aqui hoje. Obrigada por inúmeras vezes abrirem mão dos próprios sonhos para sonharem os meus. Essa conquista também é de vocês.

À minha irmã, Letícia,

Obrigada por ser a minha maior motivação para ser cada dia melhor. A saudade diária no decorrer desses anos e a responsabilidade de ser exemplo pra você foram o combustível para que eu permanecesse forte e chegasse até o final.

Ao meu marido, Douglas,

Obrigada por acreditar no meu potencial mais do que eu mesma e segurar a minha mão, me apoiando sempre que eu pensava não ser capaz. Você tem grande participação nessa conquista, que é nossa. Obrigada pela paciência, companheirismo e cumplicidade amor da minha vida.

À minha família,

Especialmente meus avós, tios e àqueles que sempre estiveram ao meu lado, orando e torcendo pelo

meu sucesso. Minha gratidão por todo amor.

Aos meus sogros, Elson e Súzie,

Que sempre oraram, cuidaram de mim e estiveram ao
meu lado como pais. Minha gratidão a vocês e ao meu cunhado
Guilherme por todo carinho, respeito
e amor. Vocês fazem parte dessa conquista.

AGRADECIMENTOS

À minha grande amiga Thamires Diogo Lima,

Muito obrigada por estar ao meu lado desde quando começamos a graduação e perpetuarmos a nossa amizade e companheirismo desde então. Você me fortaleceu, me incentivou a prosseguir e a me tornar cada dia melhor. Me faltam palavras para expressar a minha gratidão. Essa conquista é tão sua quanto minha!

Ao meu grande amigo Nilson de Oliveira Ferreira Neto,

Muito obrigada por me apoiar, incentivar e motivar sempre. Obrigada por estar ao meu lado nos momentos mais difíceis e também por vibrar com as minhas vitórias. Você tem grande participação nessa conquista, que também é sua!

À minha querida orientadora Profa. Dra. Alessandra Maia de Castro,

Obrigada pela honra de ter a sua orientação no mestrado. Serei eternamente grata por todo conhecimento e ensinamentos que me foram passados. Obrigada pela confiança que sempre depositou em mim. Se cheguei até aqui é porque tive ao meu lado os melhores exemplos a serem seguidos. Tenho muito orgulho de ser sua orientada e almejo um dia ter, como docente, a competência e sabedoria que você tem. Muito obrigada!

Ao meu querido coorientador Prof. Dr. Carlos José Soares,

Obrigada pelas orientações e por compartilhar seus conhecimentos para que esse trabalho fosse executado da melhor forma. Muito obrigada pela atenção e cuidado. Tenho orgulho de ter tido a oportunidade de aprender tanto sobre pesquisa com alguém tão competente.

Ao meu grande amigo Sr. Advaldo,

Obrigada por ser apoio, ombro amigo e descanso nos momentos difíceis. Agradeço também por todo carinho e torcida para que eu concluísse com êxito minha graduação e mestrado. Sentirei muita saudade.

Às colegas de pós-graduação Raíssa e Maria Tereza,
Obrigada pelo apoio, suporte e ensinamentos para a realização desse trabalho.

A todos os professores do PPGO,
Obrigada por todos os ensinamentos durante esses anos e por nos prepararem tão bem para a docência.

A toda a equipe de professores e alunos da Odontopediatria,
Obrigada por me darem a oportunidade de trabalhar com o que mais amo e ter ao meu lado pessoas competentes e humanas, com as quais aprendi tanto.

A todos os meus colegas de mestrado,
Obrigada por compartilharem suas histórias e experiências durante esses anos e por me inspirarem a ser uma profissional melhor a cada dia. Desejo muito sucesso a cada um de vocês. Obrigada por todos os momentos que passamos juntos.

À Faculdade de Odontologia da Universidade Federal de Uberlândia,
Sou muito grata e orgulhosa pela oportunidade de ter feito minha graduação e pós-graduação em uma instituição tão conceituada.

À toda equipe do CPBIO,
Obrigada pelo suporte e apoio na execução desse trabalho.

À CAPES,
Pela concessão de bolsa, durante alguns meses da pós-graduação, que foi de extrema importância para a realização e conclusão desse mestrado.

EPÍGRAFE

O tamanho dos seus sonhos deve sempre exceder a sua capacidade atual para alcançá-los. Se os seus sonhos não te assustam, eles não são grandes o suficiente.

Ellen Johnson-Sirleaf,
primeira mulher eleita chefe de estado de um país africano e prêmio nobel da paz '11.

SUMÁRIO

RESUMO

O uso de diferentes técnicas e retentores intrarradiculares para reabilitar dentes decíduos com grande destruição coronária é controverso, visto a complexidade de fatores envolvidos. O objetivo desse estudo foi avaliar, através de análises biomecânicas, dois diferentes materiais utilizados como retentores intrarradiculares cimentados em dois diferentes comprimentos. Para o estudo foram utilizadas quarenta raízes de incisivos decíduos bovinos, seccionadas com 12mm, tratadas endodonticamente, e aleatoriamente divididas em 2 grupos (n=20): pino de fibra de vidro (PFV) e fibra de vidro (FV). Posteriormente, foram divididos em 2 subgrupos (n=10), variando a extensão do retentor: 1/2 da raiz (6mm) e 1/3 da raiz (4mm). Todas as raízes foram restauradas com resina composta convencional com auxílio de matriz de cloreto de polivinila (PVC). Foram feitos testes de extensometria e resistência à fratura. Os dados obtidos foram analisados através de ANOVA two-way e Tukey, com nível de significância α=0,05. Os resultados obtidos foram semelhantes entre os grupos para o comprimento ½. Para 1/3, PFV apresentou melhores resultados ($p<0,001$) de deformação que FV. No padrão de fratura, FV se mostrou melhor, com fraturas reversíveis (tipo I). Concluindo, neste estudo, os retentores PFV e FV apresentaram resistência e deformação adequados, sendo assim, ambos são indicados para retenção intrarradicular na dentição decídua.

PALAVRAS-CHAVE: Dente decíduo, Técnica para retentor intrarradicular, Resistência à fratura.

ABSTRACT

The use of different intraradicular techniques and retainers to rehabilitate deciduous teeth with great coronary destruction is controversial, given the complexity of factors involved. The aim of this study was to evaluate, through biomechanical analyzes, two different materials used as posts system cemented in two different lengths. Forty bovine primary incisor roots were used for the study, sectioned with 12mm, treated endodontically, and randomly divided into 2 groups (n = 20): fiber post (FP) and pre-impregnated glass fiber (PGF). Subsequently, they were divided into 2 subgroups (n = 10), varying the length of the retainer: 1/2 of the root (6mm) and 1/3 of the root (4mm). All roots were restored with conventional composite resin with the aid of a polyvinyl chloride (PVC) matrix. Extensometry and fracture resistance tests were performed. The data obtained were analyzed using two-way ANOVA and Tukey, with significance level α=0.05. The results obtained were similar between groups for length ½. For 1/3, FP showed better deformation results ($p < 0.001$) than F. In the fracture pattern, F was better, with reversible fractures (type I). In conclusion, in this study, the FP and PGF retainers showed resistance and deformation, therefore, both are indicated for intraradicular retention in the primary dentition.

KEYWORDS: Primary teeth, post and core technique, fracture resistance.

REFERENCIAL TEÓRICO

Atualmente, a Odontologia e a Odontopediatria têm como foco principal oferecer aos pacientes condutas com ênfase na prevenção. Contudo, infelizmente, ainda se observa a ocorrência de cárie na primeira infância, de evolução rápida, acometendo crianças de até 5 anos e 9 meses de idade. Estas lesões envolvem principalmente os incisivos superiores, levando à grande destruição coronária e normalmente envolvimento pulpar destes elementos, sendo que, muitas vezes essa destruição impossibilita uma reabilitação direta com resina composta[1].

A perda precoce dos dentes anteriores decíduos tem grande impacto funcional e estético, pois pode resultar na diminuição da eficiência mastigatória, maloclusão, perda de espaço e da dimensão vertical, distúrbios fonéticos, desvio no padrão de deglutição, desenvolvimento de hábitos parafuncionais, além de problemas psicológicos que podem afetar o desenvolvimento comportamental da criança[2,3].

O remanescente coronário insuficiente de dentes anteriores dificulta a retenção e a resistência das restaurações. Além disto, estes dentes recebem cargas funcionais não axiais, comprometendo ainda mais a longevidade do complexo restaurador. Por muitos anos, a técnica amplamente utilizada em casos de severa destruição coronária dos dentes anteriores decíduos era a exodontia[4]. Porém, devido a fatores de exigência estética, convívio social e evolução da odontologia adesiva, desenvolveram-se técnicas capazes de fornecer restaurações eficazes, duráveis e funcionais, evitando assim a perda precoce dos elementos dentários anteriores[3].

A reabilitação adequada de dentes decíduos anteriores torna-se necessária, visando promover à criança bem estar psicossocial, além de normalizar suas funções mastigatória, fonética e estética. Os recursos protéticos na dentadura decídua não podem interferir nos processos normais de crescimento e desenvolvimento próprios da idade da criança e não devem comprometer a integridade de outros dentes[5,6].

Grande variedade de técnicas restauradoras diretas e indiretas tem

sido relatada para reabilitar dentes decíduos severamente comprometidos estruturalmente. Em muitos casos, nos quais os dentes estão gravemente destruídos, faz-se necessário o tratamento endodôntico e para viabilizar retenção e estabilidade da reconstrução coronária, faz necessária o uso de retentores intrarradiculares[7,8,9].

O uso de diferentes técnicas de retenção intrarradicular em dentes tratados endodonticamente pode aumentar a sobrevida da restauração. Entretanto, em dentes decíduos, o principal fator limitante da utilização de retentores intrarradiculares é a reabsorção radicular fisiológica. Desta forma há uma limitação da cimentação do retentor apenas no terço cervical do canal para obter retenção[10,11,12].

Os pinos intrarradiculares podem ser constituídos de variedade de materiais, incluindo resina composta, liga metálica ou material biológico[3]. Atualmente, têm se popularizado o uso de pinos de fibra de vidro e de fibra de polietileno, em alternativa aos pinos metálicos na restauração de dentes tratados endodonticamente[3,13,14]. A adesão do material restaurador à estrutura dental e ao pino de fibra, a redução do risco de fratura da raiz e a ausência de descoloração são algumas das vantagens destes retentores[15].

Em 2001 autores realizaram um estudo *in vitro* comparando os retentores intrarradiculares realizados com pino metálico pré-fabricado (FKG), núcleo metálico fundido (Níquel-Cromo) com macroretenções esféricas, pino em alfa com fio ortodôntico, pino de dente natural, reforço com fibra de polietileno (Ribbond Inc.) e preenchimento com resina composta; verificaram que os valores de resistência ao cisalhamento foram semelhantes entre os grupos e concluíram que todos estavam indicados para a reconstrução de incisivos decíduos[16].

Em 2002, um estudo avaliou a eficácia de pinos de fibra de vidro empregados na reconstrução de dentes anteriores severamente destruídos em crianças com idade média de 4 anos e 2 meses. Foram reconstruídos 30 dentes e após 12 meses, apenas 2 dentes apresentaram insucesso, que foi atribuído à terapia endodôntica e não à técnica restauradora. Paralelamente ao estudo clínico, o autor realizou um estudo laboratorial utilizando pinos de fibra de vidro

e constatou maiores valores de resistência à fratura e módulo de elasticidade semelhante ao dente, conferindo maior longevidade à restauração[17].

Outro estudo avaliou *in vitro* a resistência de união de 3 diferentes pinos intrarradiculares utilizados em restauração de dentes decíduos anteriores. 45 dentes foram tratados endodonticamente e divididos em 3 grupos: pinos confeccionados com a resina composta (Grupo I), pinos de fio ortodôntico em forma de “gama” (Grupo II) e pinos de fibra de vidro (Grupo III). Não houve diferença estatística entre os 3 grupos considerando os valores de resistência de união obtidos. Os autores concluiram que o tipo de pino intrarradicular não interfere na resistência de união[18].

Em 2006, autores compararam a resistência de união de 3 diferentes pinos intrarradiculares utilizados para restaurar dentes decíduos anteriores: pinos confeccionados com a resina composta Z100, pinos de fio ortodôntico em forma de “alfa” e pinos confeccionados a partir da raiz de dentes naturais. Os autores concluíram que não houve diferença estatisticamente significante entre os 3 grupos[19].

Em 2008, autores verificaram a retenção e a adaptação marginal em uma amostra de 28 dentes decíduos anteriores de crianças com idades entre 3 e 4 anos. Os grupos testados foram: pinos de fibra de vidro reforçados com resina composta e pinos de aço em ômega. Resina composta do tipo “Flow” foi utilizada para a cimentação dos pinos e os dentes foram restaurados com resina composta com auxílio de matriz de celulóide. Após 12 meses de acompanhamento, os pinos de fibra de vidro reforçados com resina composta apresentaram melhor retenção e adaptação marginal quando comparados aos pinos com fio de aço em ômega[20].

Estudos de 2010 e 2011 mostram que pinos de fibra de vidro tem sido utilizados em dentes decíduos e permanentes, pois apresentam características desejáveis, como boa resistência de união à estrutura dentária, aumento da resistência à fratura do remanescente dental e da coroa, módulo de elasticidade muito próximo à dentina e estética favorável pois apresentam coloração branca ou transparente, a qual confere translucidez e naturalidade às restaurações[21,22].

Em 2015, um estudo clínico comparou a eficácia de três retentores

intrarradiculares na dentição decídua: fibra de polietileno, pino de fibra de vidro e extensão de resina composta. E concluíram que somente o pino de fibra de vidro e fibra de polietileno provaram ser eficazes[24].

Em 2018, um estudo sobre materiais compósitos reforçados com fibras relatou fortes ligações à matriz polimérica e boa resistência à fratura, e as fibras aumentaram as propriedades mecânicas e físicas dos materiais com os quais foram utilizadas, devido à sua alta durabilidade e módulo de elasticidade[25].

Diante do exposto, o objetivo deste estudo foi avaliar dois diferentes materiais utilizados como retenção intrarradicular (fibra de vidro e pino de fibra de vidro), em diferentes extensões de alívio (1/3 da raiz e ½ da raiz). A hipótese nula deste estudo foi de que os tipos de retentor e os diferentes comprimentos de cimentação não influenciam o padrão de deformação, resistência e fratura de raízes decíduas bovinas restauradas com retenção intrarradicular.

ARTIGO 1

CAMILA RAÍSSA OLIVEIRA GONTIJO[1], THAMIRES DIOGO LIMA[2], CARLOS JOSÉ SOARES[2], ALESSANDRA MAIA DE CASTRO [1]

[1]Department of Paediatric Dentistry, Faculty of Dentistry, Federal University of Uberlandia, Uberlandia, Minas Gerais, Brazil.

[2]Department of Operative Dentistry, Faculty of Dentistry, Federal University of Uberlandia, Uberlandia, Minas Gerais, Brazil.

Corresponding Author: Alessandra Maia de Castro

Av. Pará 1720, bloco 2 G, sala 02, Campus Umuarama

Uberlândia, MG, Brazil

38405-320

+55 34 32258146

email: alessandramaiacp@ufu.br

Abstract

The use of different intraradicular techniques and retainers to rehabilitate deciduous teeth with great coronary destruction is controversial, given the complexity of factors involved. The aim of this study was to evaluate, through biomechanical analyzes, two different materials used as posts system cemented in two different lengths. Forty bovine primary incisor roots were used for the study, sectioned with 12mm, treated endodontically, and randomly divided into 2 groups (n = 20): fiber post (FP) and pre-impregnated glass fiber (PGF). Subsequently, they were divided into 2 subgroups (n = 10), varying the length of the retainer: 1/2 of the root (6mm) and 1/3 of the root (4mm). All roots were restored with conventional composite resin with the aid of a polyvinyl chloride (PVC) matrix. Extensometry and fracture resistance tests were performed. The data obtained were analyzed using two-way ANOVA and Tukey, with significance level α=0.05. The results obtained were similar between groups for length ½. For 1/3, FP showed better deformation results ($p < 0.001$) than F. In the fracture pattern, F was better, with reversible fractures (type I). In conclusion, in this study, the FP

and PGF retainers showed resistance and deformation, therefore, both are indicated for intraradicular retention in the primary dentition.

KEYWORDS: Primary teeth, post and core technique, fracture resistance.

Introduction

Early loss of deciduous anterior teeth has a major functional, aesthetic, psychological and social impact as it may result in decreased chewing efficiency, malocclusion, loss of space and vertical dimension, development of parafunctional habits and psychological problems that may affect behavioral development and social life of the child[1,2,3].

Among the options of techniques used in cases of severe coronary destruction of deciduous anterior teeth are restoration and extraction[4], however, due to several factors, the availability of techniques capable of providing effective, durable and functional restorations is required, thus preventing loss dental elements[2].

The literature presents a variety of restorative techniques, where treatment options using direct and indirect techniques are included. The insufficient coronary dental structure of severely compromised teeth hinders the retention and resistance of restorations, in these cases it is necessary to endodontic treatment and the placement of posts or intraradicular retainers before restoring the crown[5,6,7].

The use of different intraradicular retention techniques in endodontically treated teeth may increase restoration survival. However, some factors are limiting such techniques and should be considered, such as the degree of rhizolysis of the deciduous teeth, the degree of rhizogenesis of the permanent successor and presence of pathological resorption[8].

Generally, only the cervical third of the canal is used to obtain retention. Authors recommend that the post inside the conduit does not exceed 4 mm so that it does not interfere with rhizolysis[9,10,11,12].

Intraradicular posts may consist of a variety of materials such as composite resin, metal, biological material, quartz fibers, posts and fibersglass[2]. Currently, more attention has been given to the use of fiber posts, which have been used as an alternative for metal posts in the restoration of endodontically treated teeth[2,13,14]. Mechanical connection to the final restorative material, reduced risk of root fracture and the absence of discoloration are some of the possible advantages of these posts[15].

Aesthetics and mechanical fracture resistance are of great importance for obtaining a lasting result in the restorations of anterior teeth, which can be obtained through fibers reinforced with resin matrix and other aesthetic retainers that emerged on the market as an alternative to high modulus materials of elasticity, such as gold and stainless steel[16,17]. In addition, the reduction of steps and the lower cost of pre-impregnated glass fiber are some advantages over the fiber post.

The objective of this study was to evaluate two differents materials used as intraradicular retention (pre-impregnated glass fiber and fiber post), in different extensions of relief (1/3 root and 1/2 root). The null hypothesis of this study was that types of retainer and the different cementing lengths do not influence the deformation, resistance and fracture pattern of restored deciduous bovine roots with intraradicular retention.

Material e Methods

Selection and section of teeth

Forty roots of bovine deciduous incisors were selected for the study. The teeth were cleaned with scalpel blade and after cleaning were sectioned with the aid of double-sided diamond disc coupled to a straight part in low rotation under constant water jet, so that remained a root remnant 12 mm long. The roots with similar size and shape were selected by measuring the buccolingual and mesio-distal in millimeters, in the cervical, middle and apical third to calculate the total volume of the root, allowing a maximum variation of 10% of the mean[18]. The roots were stored in deionized water, under refrigeration at 4 degrees celsius.

Experimental groups

The roots were randomly divided into two groups (n=20), in relation to the type of intraradicular retainer: fiber post (FP) (Whitepost DC 0.5, FG Produtos Odontológicos, SC, Brazil) and pre-impregnated glass fiber (PGF) (Interlig, Ângelus, Londrina, PR, Brazil). Subsequently, each group was divided into two subgroups (n=10), varying the extent of the intraradicular retainer: P4 – relief of 4.0 mm of the root canal (1/3 of the root) and P6 – relief of 6.0 mm of the root canal (1/2 root).

Inclusion for simulation of the periodontal ligament

Initially, the roots were measured in the mesio-distal and buccolingual direction, with the aid of a digital caliper (Mitutoyo, SP, Brasil). The external surfaces of the roots were covered with a thin layer of pink wax number 7 (Lysanda, SP, Brazil), simulating the thickness of the periodontal ligament (0.25 mm from each root face)[18]. After wax heating, the root was dipped and immediately removed. Again, the roots were measured to ensure the standardization of thickness.

The roots were coupled to a radiographic film, with central perforation and this set included using 13.0 mm tall vaseline PVC cylinders and 25.0 mm in diameter. Polystyrene resin (Aerojet, Química Industrial Ltda, RJ, Brazil) was poured inside the PVC cylinder, with exposure of the root of 2 mm high. After its polymerization, the PVC cylinder was removed[18].

Endodontic treatment

The remaining pulp was removed with file number 45 (Kendo, Munich, Germany). The root canal was instrumented by means of a sequence of Kerr Files of 21 mm (Kendo, Munich, Germany) with irrigation of sodium hypochlorite at 1%, until reaching the apical foramen, with direct view of the apex. The final irrigation of the canal was done with saline. After the instrumentation was completed, the canal obturation was done with calcium hydroxide and Iodoform

paste in a viscous vehicle (Feapex, Formula and action, Brazil). The canal was relieved according to the groups to be tested.

Cementation of intraradicular retainer

Fiber posts were submitted to surface treatment with hydrogen peroxide at 35% (Whiteness HP, FGM Produtos Odontológicos, SC, Brazil) for 1 minute, with the aid of microbrush (Brush, KG Sorensen, SP, Brazil). Then they were washed with water for 1 minute and dried with gentle air jet for 1 minute. Soon after, silane (Prosil, FGM Produtos Odontológicos, SC, Brazil) was applied for 1 minute with the aid of microbrush and dried with air jet[19].

Pre-impregnated glass fibers were not subjected to any prior treatment, following the manufacturer's recommendations.

For cementing all intraradicular retainers, Relyx U200 (3M ESPE, Germany) self-etching cement was used.

Relyx U-200 Clicker resin cement was manipulated, mixing the base pastes and catalyst over a glass plate for 10 seconds. Then, the manipulated cement was inserted into the canal, by means of a file number 35, which was removed counterclockwise. Then the post or fiber was inserted inside and performed digital pressure for 10 seconds. After 1 min, excess cement was removed with microbrush. 5 minutes were expected and cement photopolymerization was performed for 20 seconds on each face (vestibular, palatine, mesial, distal and incisal), totaling 100 seconds (Radii Plus, SDI, Australia).

The fiber posts, as well as the pre-impregnated glass fibers, were cemented and a 4mm coronary remnant was left in order to occupy the entire length of the crown. The fiber posts were cut with a cylindrical diamond tip No. 2214 (KG Sorensen, SP, Brazil) after cementation. The pre-impregnated glass fibers were cut with scissors before cementation.

Coronary restoration

After the cementation of the prefabricated retainers, the coronary reconstruction was performed with nanoparticulate composite resin color A1

(Filtek Z-350 XT, 3M-ESPE, Germany) with the aid of prefabricated polyvinyl chloride (PVC) matrix (TDV, Pomerode, SC, Brazil). Self-etching adhesive (Single Bond Universal, 3M-ESPE, Germany) was applied to the coronary remnant with the aid of microbrush and photopolymerized for 20 seconds (Radii Plus, SDI, Australia). The composite resin was inserted into the matrix with an insertion spatula and taken into position, then it was light cured for 20 seconds on all faces (buccal, palatal, mesial, distal and incisal) totaling 100 seconds. The matrix was removed with a scalpel blade No. 12 and the finishing was done with low-grain diamond tips (KG Sorensen, SP, Brazil) in high rotation.

After finishing the preparation, the samples were stored in an oven at 37 degrees celsius.

Simulation of the periodontal ligament

The wax from the roots was removed and in each cylinder a channel was made on the face where the extensometer would be positioned. After fixing the entensometers, the roots were covered with a 0.3 mm layer of Impregum F (3M ESPE, St. Paul, USA) polyether impression material to simulate the periodontal ligament[18], and embedded in a polystyrene resin (Cristal, Piracicaba, Brazil) up to 2 mm below the cervical limit to simulate the alveolar bone.

Extensometry Test

The 40 samples were submitted to the extensometry test, using extensometers with sensitivity factor 2.13 (Excel Sensores Ind. Com. Exp. Ltda, Embú, SP, Brazil) in each sample. For fixation of them, phosphoric acid at 37% (Condac 37, FGM, Joinville, SC) was applied for 30s, washing with water for 15s and drying with jets of air where the extensometers were glued. These were fixed on the palatine face of the root dentin, positioned 1.0 mm apically from the cervical end. The extensometers were adhered to the dental structure with cyanoacrylate adhesive (Super Bonder, Loctite, Brazil). The excess adhesives were removed, and the wires of the extensometers connected to the Data Acquisition System.

The samples were inserted in a metal device for support and reinforcement of the resin cylinder, being positioned in the mechanical test machine. The samples were submitted to the application of tangential compression load at an angle of 135° with the long axis of the tooth. The tangential load of compression was applied on niche in the palatine coronary portion to evaluate the deformation against continuous loading from 0 to 100 N, under a speed of 0.5 mm/min and later under continuous loading until the fracture. The data obtained through the acquisition board were captured through specific software. Horizontal deformation and cervico-apical direction was measured.

Fracture resistence test

The specimens were positioned in the mechanical test machine (EMIC, 2000DL, São José dos Pinhais, Brazil) and submitted to continuous tangential loading by cutting edge in knife form with a thickness of 0.2 mm at the active tip under a speed of 0.5 mm/min until the sample fracture. The required force (N) to cause the fracture was measured by 500N load cell linked to a software (TEST; EMIC). In each sample, a channel was made on the palatal surface, where the tip of the machine would load, to prevent the tip from slipping in the sample.

Analysis of fracture pattern

Fractured specimens were analyzed to determine the fracture pattern using the following classification model[20]:

I- Fracture with filling or retainer core involvement,

II- Root fracture in the cervical third;

III- Root fracture in the middle third;

IV- Root fracture in the apical third;

V- Longitudinal root fracture.

Statistical analysis

The data of deformation were individually submitted to two-way analysis of variance followed by Tukey's test (α =0.05), since data presented normal distribution based on the Shapiro-Wilk test ($p>0.05$).

The analysis of the failure pattern was done descriptively.

Results

The average values of deformation at 100 N of the experimental groups are shown in table 1.

There was a statistically significant difference for Fiber Post (FP) between the lengths of 1/2 and 1/3 of the retainer ($p<0.001$), and the FP group with 1/2 obtained a higher deformation value than FP with 1/3.

Among the pre-impregnated glass fiber (PGF) groups, in the lengths of 1/2 and 1/3, there was no statistically significant difference ($p=0.252$).

In the different intraradicular retainer lengths there was statistical difference only for 1/3 ($p<0.001$), and FP was better than PGF.

Table 1 - Mean and standard deviation (±) of deformation (μS) to 100 N of restored teeth with intraradicular seals (FP and PGF) in two lengths (1/2 and 1/3).

Length of retainer intraradicular	Fiber Post (FP)	Pre-impregnated glass fiber (PGF)
1/2	1.6 (0.39)Ba	2.2 (1.01)Aa
1/3	1.0 (0.44)Aa	2.7 (0.64)Ab

* Uppercase letters indicate comparison in columns and lowercase letters compared in rows, ($p < 0.001$).

The average values of fracture resistance of the experimental groups are shown in table 2, showing statistically similar values, regardless of the length ($p=0.896$) and type of intraradicular reinforcement ($p=0.309$) used.

Table 2 - Mean and standard deviation (±) of fracture resistance (N) with different intraradicular seals (FP and PGF) in two lengths (1/2 and 1/3).

Length of retainer intraradicular	Fiber Post (FP)	Pre-impregnated glass fiber (PGF)
1/2	166.76 (68.24)Aa	205.76 (73.1)Aa
1/3	184.95 (42.1)Aa	182.86 (32.43)Aa

* Uppercase letters indicate comparison in columns and lowercase letters compared in rows, ($p < 0.001$).

The average values of deformation until fracture of the experimental groups are shown in table 3.

There was a statistically significant difference between the retainers for length 1/3 ($p<0.001$), and FP was better than PGF.

There was no statistically significant difference between lengths 1/2 and 1/3 for both FP and PGF ($p=0.752$), as well as in the interaction between retainers and intraradicular retainer length ($p=0.050$).

Table 3- Mean and standard deviation (±) from deformation (μS) to fracture of restored teeth with intraradicular seals (FP and PGF) in two lengths (1/2 and 1/3).

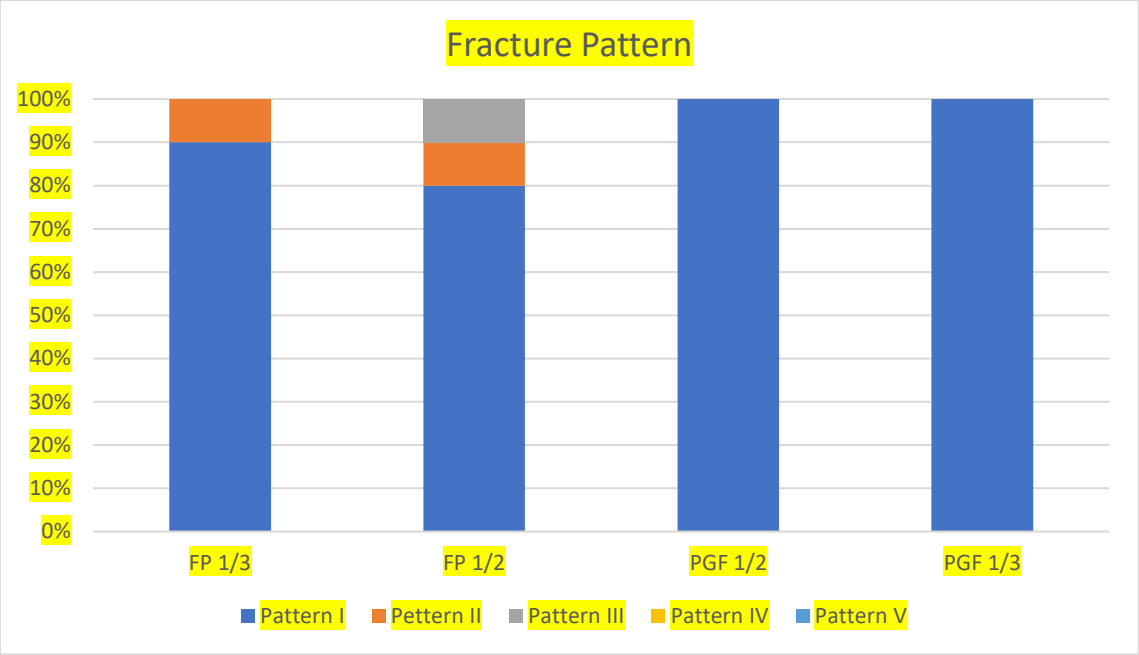
Length of retainer intraradicular	Fiber Post (FP)	Pre-impregnated glass fiber (PGF)
1/2	1.6 (0.6)Aa	2.3 (1.09)Aa
1/3	**1.2 (0.33)Aa**	**2.7 (0.71)Ab**

* Uppercase letters indicate comparison in columns and lowercase letters compared in rows, ($p < 0.001$).

Figure I shows the failure pattern of the samples. It is possible to observe that group PGF presented the best failure patterns, being 100% type I failures, that is, with involvement of the filling core or retainer.

The FP group had more catastrophic failures, 10% type II fractures, that is, root fracture in the cervical third, for both lengths and 10% type III fractures, which consists of root fracture in the middle third, for ½ length.

Figure I- Percentage of failure of groups.



Discussion

Studies on intraradicular posts in deciduous teeth are still insufficient to establish an ideal protocol to be followed, given the various difficulties encountered in these treatments, especially the degree of rhizolysis of the dental element and rhizogenesis of the permanent successor should be considered[8].

Currently there are several materials used as intraradicular seals and, authors state that in view of the correlation between restorative material and root fracture, the material that constitutes these retainers should present modulus of elasticity similar to dentin for homogeneous distribution of stresses along the retainer and root[2].

Different deformation values at 100N were found for the cementation lengths of the fiber post and also in the deformation until the fracture between FP and PGF for length 1/3, thus rejecting the null hypothesis of this study.

The literature presents studies using pre-impregnated glass fiber as periodontal, orthodontic containment, as reinforcement for extensive restorations and direct adhesive prostheses[23,24,25,26,27], but is scarce in relation to the use of this material as an intraradicular retainer.

In this study, we opted to use pre-impregnated glass fiber for comparison with fiber post, which is one of the most used materials today for intraradicular retention. FP has several advantages, among them is the similarity of its mechanical properties with dentin and greater modulus of elasticity, which makes it deform less. However, pre-impregnated glass fiber has a lower cost, greater technical ease and reduced steps when compared to the fiber post, which is important to consider because it is pediatric patients.

According to the results obtained in this study, in relation to the type of intraradicular retainer there was statistical difference only for length 1/3, and FP presented lower mean deformation value at 100N and also deformation until fracture than PGF. However, it is important to highlight that the fracture pattern found in the FP group is less favorable, because it also involves root fractures, which are considered irreversible, while the PGF group presented only fractures in the filling nucleus, being able to new restoration.

Another important factor to consider is the extent of the intraradicular retainer. In deciduous dentition, only the cervical third of the canal is usually used to obtain retention. One study stated that the minimum length of the post should be 2 to 3 mm to give more support and retention to the crown[28]. Authors recommend that the retainer inside the conduit does not exceed 4 mm so that it does not interfere with rhizolysis and physiological eruption of permanent teeth[9,10,11,12]. In this study, two different intraradicular retainer lengths, 1/2 (6mm relief) and 1/3 (4mm relief) were used. For the FP group there was statistical difference between lengths, and 1/2 presented higher mean deformation value at 100N than 1/3. For the PGF group, the length did not influence the deformation.

The present *in vitro* study produced fracture resistance values between 72.78 N and 308.78 N, which is in agreement with another study of fracture resistance in deciduous dentition[29]. In contrast, studies with permanent teeth showed greater fracture resistance ranging from 400 N to 935 N, which is related to the greater diameter of permanent teeth[30].

It is well known that clinical studies are the best way to evaluate and improve restorative systems and materials[21], but many are the difficulties that these studies present, mainly because it is deciduous dentition. In addition to

being time-consuming, expensive studies that are not always able to identify exactly failure, various stress factors of the oral cavity and childhood habits that can influence the result[2,3,22]. For these reasons, in the present study, the resistance, deformation and fracture pattern of different intraradicular retainers at different cementing lengths were evaluated *in vitro*.

It is possible to conclude that, in this study, the FP and PGF retainers present adequate strength and deformation, differing only in the fracture pattern, as F was better, with 100% reversible fractures. Therefore, both options are indicated for intra-root retention in the primary dentition. An adherence test is suggested to complement this study.

Why this paper is important to paediatric dentists:

- The study presents a new option for intraradicular retention in the primary dentition;
- Fiber post and pre-impregnated glass fiber are suitable options for intraradicular retention in the primary dentition.

Author contributions

Study design and concept: Camila RAÍSSA OLIVEIRA GONTIJO, Alessandra MAIA DE CASTRO PRADO, Carlos JOSÉ SOARES. Data collection: Camila RAÍSSA OLIVEIRA GONTIJO. Data analysis: Thamires DIOGO LIMA, Camila RAÍSSA OLIVEIRA GONTIJO. Drafting: Camila RAÍSSA OLIVEIRA GONTIJO, Alessandra MAIA DE CASTRO, Thamires DIOGO LIMA. Manuscript final design: Camila RAÍSSA OLIVEIRA GONTIJO, Alessandra MAIA DE CASTRO PRADO.

Conflict of interest

The authors declare no conflict of interests.

Financial disclosure

The authors have no financial disclosures to express and no conflict of interests to report.

Funding/support

The study was supported by CAPES.

References

1. Mendes FM, De Benedetto MS, del Conte Zardetto CG, Wanderley MT, Correa MS. Resin composite restoration in primary anterior teeth using short-post technique and strip crowns: a case report. *Quintessence Int* 2004;**35**:689-9.
2. Motisuki C, Santos-Pinto L, Giro EM. Restoration of severely decayed primary incisors using indirect composite resin restoration technique. *Int J Paediatr Dent* 2005;**15**:282-6. https://doi.org/10.1111/j.1365-263X.2005.00645.x
3. Goldenfum GM, de Almeida Rodrigues J, *et al.* Esthetic Rehabilitation in Early Childhood Caries: A Case Report. *Int J Clin Pediatr Dent* 2019;**12(2)**:157–159. https://doi.org/10.5005/jp-journals-10005-1611
4. Viera CL, Ribeiro CC. Polyethylene fiber tape used as a post and core in decayed primary anterior teeth: a treatment option. *J Clin Pediatr Dent* 2001;**26**:1-4. https://doi.org/10.17796/jcpd.26.1.p75643n238120x62
5. Aron VO. Porcelain veneers for primary incisors: a case report. *Quintessence Int* 1995;**26**:455-7.
6. Busato AL, Loguercio AD, Barbosa AN, Sanseverino Mdo C, Macedo RP, Baldissera RA. Biological restorations using tooth fragments. *Am J Dent* 1998;**11**:46-9.
7. Croll TP. Bonded composite resin crowns for primary incisors: technique update. *Quintessence Int* 1990;**21**:153-7.
8. Cavalcanti, A. L. et al. Utilização de pinos intracanal cimentados por adesão, em restaurações de dentes decíduos anteriores. *Jornal Brasileiro*

de Odontopediatria e Odontologia do Bebê, Curitiba, v. 6, n. **30**, p. 152-156, 2003.

9. Eshghi A, Esfahan RK, Khoroushi M. A simple method for reconstruction of severely damaged primary anterior teeth. *Dent Res J* (Isfahan) 2011 Oct;**8(4)**:221-225.
10. Metha D, Gulati A, Basappa N, Raju OS. Esthetic rehabilitation of severely decayed primary incisors using glass fiber reinforced composite: a case report. J *Dent Child* (Chic) 2012 Jan-Apr;**79(1)**:22-25.
11. Rachana B, Suleman A, Tapan S. Custom-made polyethylene fiber reinforced composite resin used as a short post for pediatric anterior teeth. Asian J *Oral Health Allied Sci* 2011 Jan-Mar;**1(1)**:31-35.
12. Lara, SEL; et al. Restaurações de dentes decíduos anteriores com uso de diferentes materiais para a confecção de pinos intra-radiculares: caso clínico. *Revista* Ibero-Americana de Odontopediatria e Odontologia do Bebê, Curitiba, v. 7, n. **35**, p. 14-24, 2004.
13. Qualtrough AJ, Mannocci F. Tooth-colored post systems: a review. *Oper Dent* 2003;**28**:86-91.
14. Rocha Rde O, das Neves LT, Marotti NR, Wanderley MT, Corrêa MS. Intracanal reinforcement fiber in paediatric dentistry: a case report. *Quintessence Int* 2004;**35**:263-8.
15. Chunawalla YK, Zingade SS, Ahmed BMN, Thanawalla EA. Glass fibre reinforced composite resin post and core in decayed primary anterior teeth – a case report. *Int J Clin Dent Sci* 2001 Feb;**2(1)**:55-59.
16. Fidel SR, Sassone L, Alvares GR, Guimaraes RP, Fidel RA. Use of glass fiber post and composite resin in vertical fractures tooth. *DentTraumatol* 2006;**22**:337-9. https://doi.org/10.1111/j.1600-9657.2005.00331.x
17. Boschian Pest L; Cavalli, G; Bertani, P; Gagliani, M. Adhesive post-endodontic restorations with fiber posts: pushout tests and SEM observations. *Dent Mater.*, Kidlington, v. 18, no. **8**,p. 596-602, Dec. 2002. https://doi.org/10.1016/S0109-5641(02)00003-9

18. Soares CJ, Pizi EC, Fonseca RB, Martins LR. Influence of root embedment material and periodontal ligament simulation on fracture resistance tests. *Pesqui Odontol Bras* 2005;19**(1)**:11-6. https://doi.org/10.1590/S1806-83242005000100003
19. Menezes, M. S. et al. Etching a fiber post surface with high-concentration bleaching agents. *Operative dentistry* 2014;39**(1)**:E16-E21. https://doi.org/10.2341/12-270-L
20. Zhi-Yue L, Yu-Xing Z. Effects of post-core design and ferrule on fracture resistance of endodontically treated maxillary central incisors. *J Prosthet Dent* 2003;89**(4)**:368-7. https://doi.org/10.1067/mpr.2003.73
21. Moll K, Fritzenschaft A, Haller B. In vitro comparison of dentin bonding systems: effect of testing method and operator. *Quintessence Int* 2004; **35**: 845–852.
22. Perdigao J. Dentin bonding as a function of dentin structure. *Dent Clin North Am* 2002; **46**: 277–301. https://doi.org/10.1016/S0011-8532(01)00008-8
23. Goel, D; et al. Restoring Esthetics after Anterior Tooth Loss for a Five-Year-Old Child: Natural Tooth Pontic Fiber Reinforced Prosthesis. *Case Reports in Dentistry*. 2013; Article ID 215816. https://doi.org/10.1155/2013/215816
24. Madi, L; Vieira, FT. Composite Restorations Reinforced With Fiberglass: Na Alternative For Indirect Restorations. *Cathedra Magazine*, Russian, 2014; 50.
25. Mishra, N; et al. Glass Fiber Reinforced Bridge Using Acrylic Denture Tooth Pontic – A Multidisciplinary Approach. *International Journal of Prosthetic Dentistry*. 2013;4**(2)**: 56-59.
26. Torabi K; Fattahi, F. Fracture resistance of endodontically treated teeth restored by different FRC posts: An in vitro study Year : 2009. *Indian Journal Of Dental Research* 20**(3)**:282-28. https://doi.org/10.4103/0970-9290.57359

27. Clavijo, VGR; Monsano, R; Calixto, LR; Kabbach, W; Clavijo, EMA; Andrade, M.F. Reabilitação de dentes tratados endodonticamente com pinos anatômicos indiretos de fibra de vidro. *Revista dental press de estética*, Maringá; 2008;5;**2**:31-49.
28. Pithan S, Vieira Rde S, Chain MC. Tensile bond strength of intracanal posts in primary anterior teeth: An *in vitro* study. *J Clin Pediatr Dent* 2002;**27**:35-9. https://doi.org/10.17796/jcpd.27.1.776566w222426064
29. Nilavarasan N, Hemalatha R, Vijayakumar R, Hariharan VS. Comparison of compressive strength among three diferente intracanal post materials in primary anterior teeth: An *in vitro* study. *Eur J Dent* 2016;**10**:464-8.
30. Ambica K, Mahendran K, Talwar S, Verma M, Padmini G, Periasamy R. Comparative evaluation of fracture resistance under static and fatigue loading of endodontically treated teeth restored with carbon fiber posts, glass fiber posts, and an experimental dentin post system: An *in vitro* study. *J Endod* 2013;**39**:96-100. https://doi.org/10.1016/j.joen.2012.07.003

INTERNATIONAL JOURNAL OF
PAEDIATRIC DENTISTRY

Author Guidelines

Sections

1. SUBMISSION

Authors should kindly note that submission implies that the content has not been published or submitted for publication elsewhere except as a brief abstract in the proceedings of a scientific meeting or symposium.

Once the submission materials have been prepared in accordance with the Author Guidelines, manuscripts should be submitted online at https://mc.manuscriptcentral.com/ijpd

Click here for more details on how to use ScholarOne.

Data protection

By submitting a manuscript to or reviewing for this publication, your name, email address, and affiliation, and other contact details the publication might require, will be used for the regular operations of the publication, including, when necessary, sharing with the publisher (Wiley) and partners for production and publication. The publication and the publisher recognize the importance of protecting the personal information collected from users in the operation of these services, and have practices in place to ensure that steps are taken to maintain the security, integrity, and privacy of the personal data collected and processed. You can learn more at https://authorservices.wiley.com/statements/data-protection-policy.html.

Preprint policy

Please find the Wiley preprint policy here.

This journal accepts articles previously published on preprint servers.

International Journal of Paediatric Dentistry will consider for review articles previously available as preprints. Authors may also post the submitted version of a manuscript to a preprint server at any time. Authors are requested to update any pre-publication versions with a link to the final published article.

For help with submissions, please contact: **IJPDedoffice@wiley.com**

2. AIMS AND SCOPE

International Journal of Paediatric Dentistry publishes papers on all aspects of paediatric dentistry including: growth and development, behaviour management, diagnosis, prevention, restorative treatment and issue relating to medically compromised children or those with disabilities. This peer-reviewed journal features scientific articles, reviews, case reports, short communications and abstracts of current paediatric dental research. Analytical studies with a scientific novelty value are preferred to descriptive studies. Case reports illustrating unusual conditions and clinically relevant observations are acceptable but must be of sufficiently high quality to be considered for publication; particularly the illustrative material must be of the highest quality.

3. MANUSCRIPT CATEGORIES AND REQUIREMENTS

i. Original Articles

Divided into: Summary, Introduction, Material and methods, Results, Discussion, Bullet points, Acknowledgements, References, Figure legends, Tables and Figures arranged in this order.

- **Summary** should be structured using the following subheadings: Background, Hypothesis or Aim, Design, Results, and Conclusions and should be less than 200 words.
- **Introduction** should be brief and end with a statement of the aim of the study or hypotheses tested. Describe and cite only the most relevant earlier studies. Avoid presentation of an extensive review of the field.
- **Material and methods** should be clearly described and provide enough detail so that the observations can be critically evaluated and, if necessary repeated. Use section subheadings in a logical order to title each category or method. Use this order also in the results section. Authors should have considered the ethical aspects of their research and should ensure that the project was approved by an appropriate ethical committee, which should be stated. Type of statistical analysis must be described clearly and carefully.
- **Results** should clearly and concisely report the findings, and division using subheadings is encouraged. Double documentation of data in text, tables or figures is not acceptable. Tables and figures should not include data that can be given in the text in one or two sentences.
- **Discussion** section presents the interpretation of the findings. This is the only proper section for subjective comments and reference to previous literature. Avoid repetition of results, do not use subheadings or reference to tables in the results section.
- **Bullet Points:** Authors will need to provide no more than 3 ‘key points’ that summarise the key messages of their paper to be published with their article. The key points should be written with a practitioner audience in mind under the heading: *Why this paper is important to paediatric dentists.

References: Maximum 30.

ii. Review Articles

May be invited by the Editor.

iii. Systematic reviews

We consider publishing systematic reviews if the manuscript has comprehensive and unbiased sampling of literature and covering topics related to Paediatric Dentistry.

References: Maximum 30.

Articles for the *International Journal of Paediatric Dentistry* should include: a) description of search strategy of relevant literature (search terms and databases), b) inclusion criteria (language, type of studies i.e. randomized controlled trial or other, duration of studies and chosen endpoints, c) evaluation of papers and level of evidence. For examples see:

Twetman S, Axelsson S, Dahlgren H et al. Caries-preventive effect of fluoride toothpaste: a systematic review. Acta Odontologica Scandivica 2003; 61: 347-355.

Paulsson L, Bondemark L, Söderfeldt B. A systematic review of the consequences of premature birth on palatal morphology, dental occlusion, tooth-crown dimensions, and tooth maturity and eruption. Angle Orthodontist 2004; 74: 269-279.

iv. Short Communications

Brief scientific articles or short case reports may be submitted, which should be no longer than three pages of double-spaced text and include a maximum of three illustrations. They should contain important, new, definitive information of sufficient significance to warrant publication. They should not be divided into different parts and summaries are not required.

References: Maximum 30.

v. Brief Clinical Reports/Case Reports

Short papers not exceeding 800 words, including a maximum of three illustrations and five references may be accepted for publication if they serve to promote communication between clinicians and researchers. If the paper describes a genetic disorder, the OMIM unique six-digit number should be provided for online cross reference (Online Mendelian Inheritance in Man).

A paper submitted as a Brief Clinical/Case Report should include the following:

- a short **Introduction** (avoid lengthy reviews of literature);
- the **Case report** itself (a brief description of the patient/s, presenting condition, any special investigations and outcomes);
- a **Discussion** which should highlight specific aspects of the case(s), explain/interpret the main findings and provide a scientific appraisal of any previously reported work in the field.
- **Bullet Points:** Authors will need to provide no more than 3 ‘key points’ that summarise the key messages of their paper to be published with their article. The key points should be written with a practitioner audience in mind under the heading: *Why this paper is important to paediatric dentists.

vi. Letters to the Editor

Should be sent directly to the editor for consideration in the journal.

4. PREPARING THE SUBMISSION

Cover Letters

Cover letters are not mandatory; however, they may be supplied at the author’s discretion.

Parts of the Manuscript

The manuscript should be submitted in separate files: title page; main text file; figures.

Title page

The title page should contain:
i. A short informative title that contains the major key words. The title should not contain abbreviations (see Wiley's **best practice SEO tips**);
ii. A short running title of less than 50 characters;
iii. The full names of the authors and a statement of author contributions, e.g.
Author contributions: A.S. and K.J. conceived the ideas; K.J. and R.L.M. collected the data; R.L.M. and P.A.K. analysed the data; and A.S. and K.J. led the writing;
iv. The author's institutional affiliations where the work was conducted, with a footnote for the author's present address if different from where the work was conducted;
v. Acknowledgments;
vi. Word count (excluding tables)

Authorship

Please refer to the journal's authorship policy the Editorial Policies and Ethical Considerations section for details on eligibility for author listing.

Acknowledgments

Contributions from anyone who does not meet the criteria for authorship should be listed, with permission from the contributor, in an Acknowledgments section. Financial and material support should also be mentioned. Thanks to anonymous reviewers are not appropriate.

Conflict of Interest Statement

Authors will be asked to provide a conflict of interest statement during the submission process. For details on what to include in this section, see the section 'Conflict of Interest' in the Editorial Policies and Ethical Considerations section below. Submitting authors should ensure they liaise with all co-authors to confirm agreement with the final statement.

Main Text File

As papers are double-blind peer reviewed the main text file should not include any information that might identify the authors.

The main text file should be presented in the following order:

i. Title, abstract and key words;
ii. Main text;
iii. References;
iv. Tables (each table complete with title and footnotes);
v. Figure legends;
vi. Appendices (if relevant).

Figures and supporting information should be supplied as separate files.

Abstract

Abstracts and keywords are required for some manuscript types. For details on manuscript types that require abstracts, please refer to the 'Manuscript Types and Criteria' section.

Keywords

Please provide 3-6 keywords. Keywords should be taken from the list provided at submission in ScholarOne.

Main Text

- As papers are double-blind peer reviewed, the main text file should not include any information that might identify the authors.
- The journal uses British spelling; however, authors may submit using either option, as spelling of accepted papers is converted during the production process.

References

All references should be numbered consecutively in order of appearance and should be as complete as possible. In text citations should cite references in consecutive order using Arabic superscript numerals. For more information about AMA reference style please consult the **AMA Manual of Style**

Sample references follow:

Journal article
1. King VM, Armstrong DM, Apps R, Trott JR. Numerical aspects of pontine, lateral reticular, and inferior olivary projections to two paravermal cortical zones of the cat cerebellum. J Comp Neurol 1998;390:537-551.

Book
2. Voet D, Voet JG. Biochemistry. New York: John Wiley & Sons; 1990. 1223 p.

Internet document
3. American Cancer Society. Cancer Facts & Figures 2003.
http://www.cancer.org/downloads/STT/CAFF2003PWSecured.pdf Accessed March 3, 2003

Tables

Tables should be self-contained and complement, not duplicate, information contained in the text. They should be supplied as editable files, not pasted as images. Legends should be concise but comprehensive – the table, legend, and footnotes must be understandable without reference to the text. All abbreviations must be defined in footnotes. Footnote symbols: †, ‡, §, ¶, should be used (in that order) and *, **, *** should be reserved for P-values. Statistical measures such as SD or SEM should be identified in the headings.

Figure Legends

Legends should be concise but comprehensive – the figure and its legend must be understandable without reference to the text. Include definitions of any symbols used and define/explain all abbreviations and units of measurement.

Figures

Although authors are encouraged to send the highest-quality figures possible, for peer-review purposes, a wide variety of formats, sizes, and resolutions are accepted.

Click here for the basic figure requirements for figures submitted with manuscripts for initial peer review, as well as the more detailed post-acceptance figure requirements.

In the text, please reference figures as for instance 'Figure 1', 'Figure 2' to match the tag name you choose for the individual figure files uploaded.

Colour Figures. Figures submitted in colour may be reproduced in colour online free of charge. Please note, however, that it is preferable that line figures (e.g. graphs and charts) are supplied in black and white so that they are legible if printed by a reader in black and white.

Data Citation

Please review Wiley's data citation policy here.

Additional Files

Appendices

Appendices will be published after the references. For submission they should be supplied as separate files but referred to in the text.

Supporting Information

Supporting information is information that is not essential to the article, but provides greater depth and background. It is hosted online and appears without editing or typesetting. It may include tables, figures, videos, datasets, etc.

Click here for Wiley's FAQs on supporting information.

Note: if data, scripts, or other artefacts used to generate the analyses presented in the paper are available via a publicly available data repository, authors should include a reference to the location of the material within their paper.

Submission of Revised Manuscripts

Revised manuscripts must be uploaded within 2 months of authors being notified of conditional acceptance pending satisfactory revision. Locate your manuscript under 'Manuscripts with Decisions' and click on 'Submit a Revision' to submit your revised manuscript. Please remember to delete any old files uploaded when you upload your revised manuscript. All revisions must be accompanied by a cover letter to the editor. The letter must a) detail on a point-by-point basis the author's response to each of the referee's comments, and b) a revised manuscript highlighting exactly what has been changed in the manuscript after revision.

Resource Identification Initiative

The journal supports the **Resource Identification Initiative**, which aims to promote research resource identification, discovery, and reuse. This initiative, led by the **Neuroscience Information Framework** and the **Oregon Health & Science University Library**, provides unique identifiers for antibodies, model organisms, cell lines, and tools including software and databases. These IDs, called Research Resource Identifiers (RRIDs), are machine-readable and can be used to search for all papers where a particular resource was used and to increase access to critical data to help researchers identify suitable reagents and tools.

Authors are asked to use RRIDs to cite the resources used in their research where applicable in the text, similar to a regular citation or Genbank Accession number. For antibodies, authors should include in the citation the vendor, catalogue number, and RRID both in the text upon first mention in the Methods section. For software tools and databases, please provide the name of the resource followed by the resource website, if available, and the RRID. For model organisms, the RRID alone is sufficient.

Additionally, authors must include the RRIDs in the list of keywords associated with the manuscript.

To Obtain Research Resource Identifiers (RRIDs)

1. Use the Resource Identification Portal, created by the Resource Identification Initiative Working Group.
2. Search for the research resource (please see the section titled “Search Features and Tips” for more information).
3. Click on the “Cite This” button to obtain the citation and insert the citation into the manuscript text.

If there is a resource that is not found within the **Resource Identification Portal**, authors are asked to register the resource with the appropriate resource authority. Information on how to do this is provided in the “Resource Citation Guidelines” section of the Portal.

If any difficulties in obtaining identifiers arise, please contact **rii-help@scicrunch.org** for assistance.

Example Citations

Antibodies: "Wnt3 was localized using a rabbit polyclonal antibody C64F2 against Wnt3 (Cell Signaling Technology, Cat# 2721S, RRID: AB_2215411)"

Model Organisms: "Experiments were conducted in c. elegans strain SP304 (RRID:CGC_SP304)"

Cell lines: "Experiments were conducted in PC12 CLS cells (CLS Cat# 500311/p701_PC-12, RRID:CVCL_0481)"

Tools, Software, and Databases: "Image analysis was conducted with CellProfiler Image Analysis Software, V2.0 (http://www.cellprofiler.org, RRID:nif-0000-00280)"

Wiley Author Resources

Manuscript Preparation Tips: Wiley has a range of resources for authors preparing manuscripts for submission available **here**. In particular, authors may benefit from referring to Wiley’s best practice tips on **Writing for Search Engine Optimization.**

Article Preparation Support: **Wiley Editing Services** offers expert help with English Language Editing, as well as translation, manuscript formatting, figure illustration, figure formatting, and graphical abstract design – so you can submit your manuscript with confidence.
Also, check out our resources for **Preparing Your Article** for general guidance about writing and preparing your manuscript.

Guidelines for Cover Submissions: If you would like to send suggestions for artwork related to your manuscript to be considered to appear on the cover of the journal, please follow these **general guidelines**.

5. EDITORIAL POLICIES AND ETHICAL CONSIDERATIONS

Peer Review and Acceptance

The acceptance criteria for all papers are the quality and originality of the research and its significance to journal readership. Manuscripts are double-blind peer reviewed. Papers will

only be sent to review if the Editor-in-Chief determines that the paper meets the appropriate quality and relevance requirements.

Wiley's policy on the confidentiality of the review process is **available here.**

Human Studies and Subjects

For manuscripts reporting medical studies that involve human participants, a statement identifying the ethics committee that approved the study and confirmation that the study conforms to recognized standards is required, for example: **Declaration of Helsinki**; **US Federal Policy for the Protection of Human Subjects**; or **European Medicines Agency Guidelines for Good Clinical Practice**. It should also state clearly in the text that all persons gave their informed consent prior to their inclusion in the study.

Patient anonymity should be preserved. When detailed descriptions, photographs, or videos of faces or identifiable body parts are used that may allow identification, authors should obtain the individual's free prior informed consent. Authors do not need to provide a copy of the consent form to the publisher; however, in signing the author license to publish, authors are required to confirm that consent has been obtained. Wiley has a **standard patient consent form** available for use. Where photographs are used they need to be cropped sufficiently to prevent human subjects being recognized; black eye bars should not be used as they do not sufficiently protect an individual's identity).

Animal Studies

A statement indicating that the protocol and procedures employed were ethically reviewed and approved, as well as the name of the body giving approval, must be included in the Methods section of the manuscript. Authors are encouraged to adhere to animal research reporting standards, for example the **ARRIVE guidelines** for reporting study design and statistical analysis; experimental procedures; experimental animals and housing and husbandry. Authors should also state whether experiments were performed in accordance with relevant institutional and national guidelines for the care and use of laboratory animals:

- 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 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.

Clinical Trial Registration

Clinical trials should be reported using the CONSORT guidelines available at **www.consort-statement.org**. A **CONSORT checklist** should also be included in the submission material under "Supplementary Files for Review".

If your study is a randomized clinical trial, you will need to fill in all sections of the CONSORT Checklist. If your study is not a randomized trial, not all sections of the checklist might apply to your manuscript, in which case you simply fill in N/A.

All prospective clinical trials which have a commencement date after the 31st January 2017 must be registered with a public trials registry: **www.clinicaltrials.gov**, **http://clinicaltrials.ifpma.org/clinicaltrials/**, **http://isrctn.org/**. The clinical trial registration number and name of the trial register will then be published with the paper.

Research Reporting Guidelines

Accurate and complete reporting enables readers to fully appraise research, replicate it, and use it. The guidelines listed below should be followed where appropriate and where applicable, checklists, and flow diagrams uploaded with your submission; these may be published alongside the final version of your paper.

• **Observational studies** : **STROBE**

Checklist for cohort, case-control, and cross-sectional studies (combined)
Checklist for cohort studies
Checklist for case-control studies
Checklist for cross-sectional studies

• **Systematic reviews** : **PRISMA**
• Meta-analyses of observational studies: **MOOSE**
• **Case reports** : **CARE**
• In vitro studies: **CRIS**
• **Qualitative research** : **COREQ**
• **Diagnostic / prognostic studies** : **STARD**
• **Quality improvement studies** : **SQUIRE**
• **Economic evaluations** : **CHEERS**
• **Animal pre-clinical studies** : **ARRIVE**
• **Study protocols** : **SPIRIT**
• **Clinical practice guidelines** : **AGREE**

The **Equator Network** (Enhancing the Quality and Transparency Of Health Research) provides a comprehensive list of reporting guidelines.

We also encourage authors to refer to and follow guidelines from:

• **Future of Research Communications and e-Scholarship (FORCE11)**
• **National Research Council's Institute for Laboratory Animal Research guidelines**
• **The Gold Standard Publication Checklist from Hooijmans and colleagues**
• **Minimum Information Guidelines from Diverse Bioscience Communities (MIBBI) website**
• **FAIRsharing website**

Sequence Data

Nucleotide sequence data can be submitted in electronic form to any of the three major collaborative databases: DDBJ, EMBL, or GenBank. It is only necessary to submit to one database as data are exchanged between DDBJ, EMBL, and GenBank on a daily basis. The suggested wording for referring to accession-number information is: ‘These sequence data have been submitted to the DDBJ/EMBL/GenBank databases under accession number U12345’. Addresses are as follows:

- DNA Data Bank of Japan (DDBJ): www.ddbj.nig.ac.jp
- EMBL Nucleotide Archive: ebi.ac.uk/ena
- GenBank: www.ncbi.nlm.nih.gov/genbank

Proteins sequence data should be submitted to either of the following repositories:

- Protein Information Resource (PIR): pir.georgetown.edu
- SWISS-PROT: expasy.ch/sprot/sprot-top

Structural Data

For papers describing structural data, atomic coordinates and the associated experimental data should be deposited in the appropriate databank (see below). **Please note that the data in databanks must be released, at the latest, upon publication of the article.** We trust in the cooperation of our authors to ensure that atomic coordinates and experimental data are released on time.

- Organic and organometallic compounds: Crystallographic data should not be sent as Supporting Information, but should be deposited with the *Cambridge Crystallographic Data Centre* (CCDC) at ccdc.cam.ac.uk/services/structure%5Fdeposit.
- Inorganic compounds: *Fachinformationszentrum Karlsruhe* (FIZ; fiz-karlsruhe.de).
- Proteins and nucleic acids: *Protein Data Bank* (rcsb.org/pdb).
- NMR spectroscopy data: *BioMagResBank* (bmrb.wisc.edu).

Conflict of Interest

The journal requires that all authors disclose any potential sources of conflict of interest. Any interest or relationship, financial or otherwise that might be perceived as influencing an author's objectivity is considered a potential source of conflict of interest. These must be disclosed when directly relevant or directly related to the work that the authors describe in their manuscript. Potential sources of conflict of interest include, but are not limited to: patent or stock ownership, membership of a company board of directors, membership of an advisory board or committee for a company, and consultancy for or receipt of speaker's fees from a company. The existence of a conflict of interest does not preclude publication. If the authors have no conflict of interest to declare, they must also state this at submission. It is the responsibility of the corresponding author to review this policy with all authors and collectively to disclose with the submission ALL pertinent commercial and other relationships.

It is the responsibility of the corresponding author to have all authors of a manuscript fill out a conflict of interest disclosure form, and to upload all forms together with the manuscript on submission. Please find the form below:

Conflict of Interest Disclosure Form

Funding

Authors should list all funding sources in the Acknowledgments section. Authors are responsible for the accuracy of their funder designation. If in doubt, please check the Open Funder Registry for the correct nomenclature: **https://www.crossref.org/services/funder-registry/**

Authorship

The list of authors should accurately illustrate who contributed to the work and how. All those listed as authors should qualify for authorship according to the following criteria:

1. Have made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; and
2. Been involved in drafting the manuscript or revising it critically for important intellectual content; and
3. Given final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content; and

4. Agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Contributions from anyone who does not meet the criteria for authorship should be listed, with permission from the contributor, in an Acknowledgments section (for example, to recognize contributions from people who provided technical help, collation of data, writing assistance, acquisition of funding, or a department chairperson who provided general support). Prior to submitting the article all authors should agree on the order in which their names will be listed in the manuscript.

Additional Authorship Options. Joint first or senior authorship: In the case of joint first authorship, a footnote should be added to the author listing, e.g. 'X and Y should be considered joint first author' or 'X and Y should be considered joint senior author.'

Data Sharing and Data Accessibility

Please review Wiley's policy here. This journal encourages and peer review data sharing.

The journal encourages authors to share the data and other artefacts supporting the results in the paper by archiving it in an appropriate public repository. Authors should include a data accessibility statement, including a link to the repository they have used, in order that this statement can be published alongside their paper.

All accepted manuscripts may elect to publish a data availability statement to confirm the presence or absence of shared data. If you have shared data, this statement will describe how the data can be accessed, and include a persistent identifier (e.g., a DOI for the data, or an accession number) from the repository where you shared the data. **Sample statements are available here**. If published, statements will be placed in the heading of your manuscript.

Human subject information in databases. The journal refers to the **World Health Medical Association Declaration of Taipei on Ethical Considerations Regarding Health Databases and Biobanks**.

Publication Ethics

This journal is a member of the **Committee on Publication Ethics (COPE).** Note this journal uses iThenticate's CrossCheck software to detect instances of overlapping and similar text in submitted manuscripts. Read Wiley'sTop 10 Publishing Ethics Tips for Authors **here**. Wiley's Publication Ethics Guidelines can be found **here**.

ORCID

As part of the journal's commitment to supporting authors at every step of the publishing process, the journal requires the submitting author (only) to provide an ORCID iD when submitting a manuscript. This takes around 2 minutes to complete. **Find more information here.**

6. AUTHOR LICENSING

If your paper is accepted, the author identified as the formal corresponding author will receive an email prompting them to log in to Author Services, where via the Wiley Author Licensing Service (WALS) they will be required to complete a copyright license agreement on behalf of all authors of the paper.

Authors may choose to publish under the terms of the journal's standard copyright agreement, or **OnlineOpen** under the terms of a Creative Commons License.

General information regarding licensing and copyright is available **here**. To review the Creative Commons License options offered under OnlineOpen, please **click here**. (Note that certain funders mandate that a particular type of CC license has to be used; to check this please click **here.**)

Self-Archiving definitions and policies. Note that the journal's standard copyright agreement allows for self-archiving of different versions of the article under specific conditions. Please **click here** for more detailed information about self-archiving definitions and policies.

Open Access fees: If you choose to publish using OnlineOpen you will be charged a fee. A list of Article Publication Charges for Wiley journals is available **here**.

Funder Open Access: Please click **here** for more information on Wiley's compliance with specific Funder Open Access Policies.

Reproduction of Copyright Material: If excerpts from copyrighted works owned by third parties are included, credit must be shown in the contribution. It is the author's responsibility to also obtain written permission for reproduction from the copyright owners. For more information visit Wiley's Copyright Terms & Conditions FAQ at **http://exchanges.wiley.com/authors/faqs---copyright-terms--conditions_301.html**

7. PUBLICATION PROCESS AFTER ACCEPTANCE

Accepted article received in production

When an accepted article is received by Wiley's production team, the corresponding author will receive an email asking them to login or register with **Wiley Author Services.** The author will be asked to sign a publication license at this point.

Accepted Articles

The journal offers Wiley's Accepted Articles service for all manuscripts. This service ensures that accepted 'in press' manuscripts are published online shortly after acceptance, prior to copy-editing or typesetting. Accepted Articles are published online a few days after final acceptance and appear in PDF format only. They are given a Digital Object Identifier (DOI), which allows them to be cited and tracked and are indexed by PubMed. After the final version article is published (the article of record), the DOI remains valid and can still be used to cite and access the article.

Accepted Articles will be indexed by PubMed; submitting authors should therefore carefully check the names and affiliations of all authors provided in the cover page of the manuscript so it is accurate for indexing. Subsequently, the final copyedited and proofed articles will appear in an issue on Wiley Online Library; the link to the article in PubMed will update automatically.

Proofs

Authors will receive an e-mail notification with a link and instructions for accessing HTML page proofs online. Page proofs should be carefully proofread for any copyediting or typesetting errors. Online guidelines are provided within the system. No special software is required, most common browsers are supported. Authors should also make sure that any renumbered tables, figures, or references match text citations and that figure legends

correspond with text citations and actual figures. Proofs must be returned within 48 hours of receipt of the email. Return of proofs via e-mail is possible in the event that the online system cannot be used or accessed.

Early View

The journal offers rapid speed to publication via Wiley's Early View service. **Early View** (Online Version of Record) articles are published on Wiley Online Library before inclusion in an issue. Note there may be a delay after corrections are received before the article appears online, as Editors also need to review proofs. Once the article is published on Early View, no further changes to the article are possible. The Early View article is fully citable and carries an online publication date and DOI for citations.

8. POST PUBLICATION

Access and sharing

When the article is published online:

- The author receives an email alert (if requested).
- The link to the published article can be shared through social media.
- The author will have free access to the paper (after accepting the Terms & Conditions of use, they can view the article).
- The corresponding author and co-authors can nominate up to ten colleagues to receive a publication alert and free online access to the article.

Promoting the Article

To find out how to best promote an article, **click here.**

Article Promotion Support

Wiley Editing Services offers professional video, design, and writing services to create shareable video abstracts, infographics, conference posters, lay summaries, and research news stories for your research – so you can help your research get the attention it deserves.

Measuring the Impact of an Article

Wiley also helps authors measure the impact of their research through specialist partnerships with **Kudos** and **Altmetric.**

9. EDITORIAL OFFICE CONTACT DETAILS

For queries about submissions, please contact **IJPDedoffice@wiley.com**

Author Guidelines Updated 22 November, 2019

REFERÊNCIAS

1. Drury TF, Horowitz AM, Ismail AI, Maertens MP, Rozier RG, Selwitz RH. Diagnosing and reporting early childhood caries for research purposes. A report of a workshop sponsored by the National Institute of Dental and Craniofacial Research, the Health Resources and Services Administration, and the Health Care Financing Administration. **J Public Health Dent.** 1999;59(3):192-7. https://doi.org/10.1111/j.1752-7325.1999.tb03268.x
2. Mendes FM, De Benedetto MS, del Conte Zardetto CG, Wanderley MT, Correa MS. Resin composite restoration in primary anterior teeth using short-post technique and strip crowns: a case report. **Quintessence Int** 2004;35:689-9.
3. Motisuki C, Santos-Pinto L, Giro EM. Restoration of severely decayed primary incisors using indirect composite resin restoration technique. **Int J Paediatr Dent** 2005;15:282-6. https://doi.org/10.1111/j.1365-263X.2005.00645.x
4. Viera CL, Ribeiro CC. Polyethylene fiber tape used as a post and core in decayed primary anterior teeth: a treatment option. **J Clin Pediatr Dent** 2001;26:1-4. https://doi.org/10.17796/jcpd.26.1.p75643n238120x62
5. Bayrak S, Tunc ES, Tuloglu N. Polyethylene fiber-reinforced composite resin used as a short post in severely decayed primary anterior teeth: a case report. **Oral Surg Oral Med Oral Pathol Oral Radiol Endod.** 2009;107(5):60-4. https://doi.org/10.1016/j.tripleo.2008.12.051
6. Verrastro AP, Tashima AY, Faria FP, Alves KRG, Bussadori SK, Wanderley MT. Reconstrução de dentes decíduos anteriores com pino de fibra de vidro e matriz anatômica de celulóide: relato de caso clínico. **Conscientiae Saúde**. 2007; 6(1):81-8. https://doi.org/10.5585/conssaude.v6i1.911
7. Croll TP. Bonded composite resin crowns for primary incisors: technique update. **Quintessence Int** 1990;21:153-7.

8. Aron VO. Porcelain veneers for primary incisors: a case report. **Quintessence Int** 1995;26:455-7.
9. Busato AL, Loguercio AD, Barbosa AN, Sanseverino Mdo C, Macedo RP, Baldissera RA. Biological restorations using tooth fragments. **Am J Dent** 1998;11:46-9.
10. Metha D, Gulati A, Basappa N, Raju OS. Esthetic rehabilitation of severely decayed primary incisors using glass fiber reinforced composite: a case report. J **Dent Child** (Chic) 2012 Jan-Apr;79(1):22-25.
11. Eshghi A, Esfahan RK, Khoroushi M. A simple method for reconstruction of severely damaged primary anterior teeth. **Dent Res J** (Isfahan) 2011 Oct;8(4):221-225.
12. Rachana B, Suleman A, Tapan S. Custom-made polyethylene fiber reinforced composite resin used as a short post for pediatric anterior teeth. Asian J **Oral Health Allied Sci** 2011 Jan-Mar;1(1):31-35.
13. Qualtrough AJ, Mannocci F. Tooth-colored post systems: a review. **Oper Dent** 2003;28:86-91.
14. Rocha Rde O, das Neves LT, Marotti NR, Wanderley MT, Corrêa MS. Intracanal reinforcement fiber in paediatric dentistry: a case report. **Quintessence Int** 2004;35:263-268.
15. Chunawalla YK, Zingade SS, Ahmed BMN, Thanawalla EA. Glass fibre reinforced composite resin post and core in decayed primary anterior teeth – a case report. **Int J Clin Dent Sci** 2001 Feb;2(1):55-59.
16. Casellato C, Giometti CF, Wanderley MT, Rodrigues-Filho LE, Rodrigues CRMD. Resistência à fratura de dentes decíduos restaurados com diferentes tipos de retenção intracanal. **Pesqui Odontol Bras.** 2001;15:101.
17. Sharaf AA. The application of fiber core posts in restoring badly destroyed primary incisors. **J Clin Pediatr Dent.** 2002;26(3):217-24. https://doi.org/10.17796/jcpd.26.3.y3660x50n5l0jv0p
18. Pithan S,Vieira R de S, Chain MC. Tensile bond strength of intracanal posts in primary anterior teeth: an in vitro study. **J Clin Pediatr Dent.** 2002;27(1):35-9.

https://doi.org/10.17796/jcpd.27.1.776566w222426064

19. Pinheiro SL, Bönecker MJ, Duarte DA, Imparato JC, Oda M. Bond strength analysis of intracanal posts used in anterior primary teeth: an in vitro study. **J Clin Pediatr Dent.** 2006;31(1):32-4. https://doi.org/10.17796/jcpd.31.1.547tqq6574361549
20. Subramaniam P, Babu KL, Sunny R. Glass fiber reinforced composite resin as an intracanal post-a clinical study. **J Clin Pediatr Dent.** 2008;32(3):207-10. https://doi.org/10.17796/jcpd.32.3.700t77h520473149
21. Goracci C, Ferrari M. Current perspectives on post systems: a literature review. **Aust Dent J.** 2011 Jun; 56 Suppl 1:77-83. https://doi.org/10.1111/j.1834-7819.2010.01298.x
22. Gujjar KR, Indushekar KR. Comparison of the retentive strength of 3 different posts badly broken primary maxillary incisors. **J Dent Child**. 2010 Jan-Apr; 77(1):17-24.
23. Eshghi A, Kowsari-Isfahan R, Khoroushi M. Avaliação de três técnicas restauradoras para dentes anteriores decíduos com lesões de cárie extensas: um estudo clínico de 1 ano. **J Dent Child** 2013; 80: 80-7.
24. Mehra M, Grover R, Pandit IK, Sri vastava N, Neeraj G, Gupta M. Gerenciamento de anteriores primários grosseiramente deteriorados usando vários sistemas intracanais pós: Um estudo clínico. **JISPPD**. 2015; 34: 199-203.
25. Kara NB, Kanyilmaz T, Cankaya S, Kara C. Evaluation of the effect of different post materials and adhesive systems on the bonding strength of short-post technique for primary teeth. **International Journal of Paediatric Dentistry** 2018; 28: 239-248. https://doi.org/10.1111/ipd.12347