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# AVALIAÇÃO DA DENSIDADE ÓPTICA DO CIMENTO PORTLAND ASSOCIADO A AGENTES RADIOPACIFICADORES EM DIFERENTES PROPORÇÕES

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Trabalho de conclusão de curso apresentado a Universidade Federal de Sergipe como pré-requisito para obtenção do título de Cirurgiã-dentista

**Orientador**: Prof. Dr. Wilton Mitsunari Takeshita

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## RESUMO

# AVALIAÇÃO DA DENSIDADE ÓPTICA DO CIMENTO PORTLAND ASSOCIADO A AGENTES RADIOPACIFICADORES EM DIFERENTES PROPORÇÕES

Jessika Ingrid Gomes Malta, Wilton Mitsunari Takeshita. Universidade Federal de Sergipe. 2015.

**Objetivo**: Avaliar o potencial radiopacificador de algumas substâncias associadas ao cimento Portland (CP) em diferentes concentrações quando comparados ao MTA. **Materiais e métodos:** Foram avaliados neste estudo o cimento Portland, o MTA e os seguintes radiopacificadores: iodofórmio, óxido de bismuto, óxido de chumbo, subnitrato de bismuto, sulfato de bário e óxido de zircônio. Prepararam-se as amostras de acordo com a determinação nº 57 (2000) da ANSI-ADA. Adicionou-se ao cimento Portland radiopacificadores referidos nas proporções de 15%, 20% e 30%. Cada amostra foi radiografada ao lado do *stepwedge*, utilizando um sensor de radiografia digital Instrumentarium Kavo EXPRESS®. O programa Adobe Photoshop®CS6 foi utilizado para a análise da radiopacidade dos cimentos e os dados foram submetidos à análise estatística ANOVA e teste Tukey a nível de significância de 5%. **Resultados:** O cimento Portland puro (CP) apresentou o menor valor de radiopacidade. O CP adicionado de radiopacificadores apresentou o maior valor de radiopacidade para o CP+Óxido de chumbo na proporção de 30% (4,7365 mmEq.Al) e o menor foi para o CP+sulfato de bário na proporção de 15% (1,5760 mmEq.Al). **Conclusão:** O cimento Portland apresentou densidade óptica mais próxima do MTA quando associado ao subnitrato de bismuto a 20% e iodofórmio a 20%. A adição de radiopacificadores a 15% não são ideais para melhorar a radiopacidade do cimento Portland.



**Palavras-chave:** cimentos dentários, agregado trióxido mineral, material reparador, cimento portland.

## ABSTRACT

# EVALUATION OF OPTICAL DENSITY ASSESSMENT OF PORTLAND CEMENT ASSOCIATED WITH AGENTS RADIOPACIFIERS IN DIFFERENT PROPORTIONS.

Jessika Ingrid Gomes Malta, Wilton Mitsunari Takeshita. Federal University of Sergipe. 2015.

**Objective:** Evaluate the radiopacifier potential of some substances associated with Portland cement (CP) at different concentrations when compared to MTA. **Methods:** Were evaluated in this study Portland cement, the MTA and the following radiopacifiers : iodoform , bismuth oxide , lead oxide , bismuth subnitrate , barium sulfate and zirconium oxide . Samples were prepared according to the determination No 57 (2000) ANSI -ADA. Was added to the Portland cement in the proportions of said radiopacifying 15 %, 20 % and 30 %. Each sample was imaged next to the stepwedge using a digital radiography sensor Instrumentarium Kavo EXPRESS®. Adobe Photoshop®CS6 program was used to analyze the radiopacity of the cement and the data were subjected to statistical analysis ANOVA and Tukey test at a significance level of 5 %. **Results:** The pure Portland cement (PC) had the lowest amount of radiopacity . The CP addition of radiopacifiers showed the highest amount of radiopacity for the CP + lead oxide in a proportion of 30 % (4,7365 mmEq.Al) and was lowest for the CP + barium sulfate in a ratio of 15 % (1,5760 mmEq.Al). **Conclusion :** The Portland cement showed nearest optical density of MTA when combined with bismuth subnitrate (20%) and iodoform (20%. The addition of radiopacifiers 15% are not ideal for enhancing the radiopacity of Portland cement.



**Keywords**: dental cements, mineral trioxide aggregate, root-end filling materials, portland cement.

# SUMÁRIO

## 1. INTRODUÇÃO

A radiopacidade dos materiais odontológicos é de extrema importância para o diagnóstico radiográfico. Sendo assim aceita como uma propriedade necessária em todos os materiais odontológicos. Entre eles podemos citar os materiais protéticos, cimentos endodônticos, agentes cimentantes, resinas compostas diretas e indiretas, entre outros. [1]

Desde que as primeiras pesquisas confirmaram as excelentes propriedades físicas e biológicas do agregado de trióxido mineral, [2,3] também conhecido como MTA, o seu uso tem se difundido na Odontologia. O uso do MTA, com base em evidências científicas e em estudos clínicos, é dirigido para o tratamento de acidentes e complicações endodônticas. [5,6] A biocompatibilidade[7] e composição química[8,9] do cimento Portland (CP) são semelhantes aos do MTA, exceto a presença da partícula radiopacificadora. O cimento Portland tem sido proposto como um material alternativo para reparação retrógrada do canal radicular, [10,11] em substituição ao MTA, uma vez que suas propriedades físicas são semelhantes.[11] A partir do momento em que se identificaram semelhanças na composição dessa substância e do cimento tipo Portland utilizado na construção civil[12,14], inúmeras pesquisas laboratoriais e in vivo[12,15] surgiram diante da possibilidade de estender os benefícios desse material, de custo significativamente menor, a uma parcela maior da população que necessita de tratamentos endodônticos complexos. No entanto, o cimento Portland é menos radiopaco do que o MTA,[16] limitando sua visualização radiográfica após a inserção na cavidade radicular. Essa menor radiopacidade se deve à ausência do óxido de bismuto em sua composição, que é o responsável pela radiopacidade do MTA. A fim de resolver este problema, agentes radiopacificadores que são normalmente utilizados em materiais dentários, têm sido propostos para serem agregados ao cimento Portland.

A especificação da ISO (International Organization for Standardization) número 57 certifica que a radiopacidade mínima de um material endodôntico na espessura de 1 mm deve ser igual ou maior do que a de 3 mm de densidade de um *stepwedge* de alumínio (3mmEq.Al).[17] O Conselho em Materiais Dentários e Aparelhos da American Dental Association (ADA), em concordância com a especificação nº57 publicada em 1983, sugeriram a inclusão da declaração de que a densidade óptica é um requisito necessário em todos os materiais endodonticos.[17,19]

O MTA é composto, basicamente, por cimento Portland acrescido de um radiopacificador, em uma proporção de 4:1 respectivamente. No entanto, o cimento Portland tem um inconveniente, que é a sua baixa radiopacidade, quando utilizado em condições de uso clínico, o que dificulta sua visualização e impossibilita a distinção das estruturas anatômicas adjacentes, como dentina e osso, justificando o presente trabalho de pesquisa. O resultado é de importância clínica, pois interessa não só ao radiologista, mas, especialmente, ao clínico, que poderá distinguir os cimentos entre si, dos

outros materiais, das estruturas dentárias, de lesões de cárie e outras alterações.[23] Sabendo-se que a radiopacidade obtida na análise clinico-radiográfica depende da natureza do agente radiopacificador e da proporção em que o mesmo é adicionado ao cimento, este estudo investigará o potencial radiopacificador de algumas substâncias adicionados ao cimento tipo Portland em diferentes concentrações.

O objetivo deste trabalho foi avaliar a densidade óptica do cimento Portland adicionado de agentes radiopacificadores em diferentes proporções, tendo o MTA como referência.

## 2. MATERIAIS E MÉTODOS

Os seguintes radiopacificadores foram avaliados neste estudo: iodofórmio (MAQUIRA, Maringa, Brazil), óxido de bismuto (TODINI, Monza, Italy), óxido de chumbo (SS WHITE, Rio de Janeiro, Brazil), subnitrato de bismuto (FARMAQUIMIA DO BRASIL IMPORTAÇÃO E EXPORTAÇÃO LTDA, São Paulo, Brazil), sulfato de bário (CRISTALIA, São Paulo, Brazil) e óxido de zircônio (NANUM, Minas Gerais, Brazil). Prepararam-se as amostras de acordo com a determinação nº 57 (2000) da ANSI-ADA. Mediante pesagem em balança de precisão (LANTESCALE, China), adicionou-se ao cimento Portland os diferentes radiopacificadores referidos nas proporções de 15%, 20% e 30%. Cada amostra representou uma proporção e teve sempre o MTA (ANGELUS, Londrina, Brazil), que foi utilizado na comparação, e o cimento Portland branco puro (VOTORANTIM, Sergipe, Brazil) como grupo controle. Para cada porcentagem foram confeccionadas três amostras, totalizando nove placas acrílicas.

| | | |
|---|---|---|
| Vaso 1 | MTA | - |
| Vaso 2 | Cimento Portland puro (10g) | - |
| Vaso 3 | Cimento Portland (8,5g) + iodofórmio (1,5g) | 15% |
| Vaso 4 | Cimento Portland (8,0g) + iodofórmio (2,0g) | 20% |
| Vaso 5 | Cimento Portland (7,0g) + iodofórmio (3,0g) | 30% |
| Vaso 6 | Cimento Portland (8,5g) + óxido de chumbo (1,5g) | 15% |
| Vaso 7 | Cimento Portland (8,0g) + óxido de chumbo (2,0g) | 20% |
| Vaso 8 | Cimento Portland (7,0g) + óxido de chumbo (3,0g) | 30% |
| Vaso 9 | Cimento Portland (8,5g) + óxido de zircônio (1,5g) | 15% |
| Vaso 10 | Cimento Portland (8,0g) + óxido de zircônio (2,0g) | 20% |
| Vaso 11 | Cimento Portland (7,0g) + óxido de zircônio (3,0g) | 30% |
| Vaso 12 | Cimento Portland (8,5g) + subnitrato de bismuto (1,5g) | 15% |
| Vaso 13 | Cimento Portland (8,0g) + subnitrato de bismuto (2,0g) | 20% |
| Vaso 14 | Cimento Portland (7,0g) + subnitrato de bismuto (3,0g) | 30% |
| Vaso 15 | Cimento Portland (8,5g) + sulfato de bário (1,5g) | 15% |
| Vaso 16 | Cimento Portland (8,0g) + sulfato de bário | 20% |
| Vaso 17 | Cimento Portland (7,0g) + sulfato de bário (3,0g) | 30% |
| Vaso 18 | Cimento Portland (8,5g) + óxido de bismuto (1,5g) | 15% |
| Vaso 19 | Cimento Portland (8,0g) + óxido de bismuto (2,0g) | 20% |
| Vaso 20 | Cimento Portland (7,0g) + óxido de bismuto (3,0g) | 30% |

Figura 1. Tabela referente à disposição dos radiopacificadores e suas respectivas proporções.

O MTA, o cimento Portland puro (CP) e o CP com os radiopacificadores foram espatulados com água destilada e inseridos nos orifícios de placas acrílicas (10mm x 30mm) com espessura de 1 mm, contendo cavidades de 5mm de diâmetro seguindo uma sequência ordenada alfabeticamente, por meio de marcações feitas nas placas, de acordo com a primeira letra da marca comercial, utilizando-se uma espátula Thompson nº6 (Miltex, inc., Tuttlingen, Alemanha). O material foi pressionado por uma lâmina de vidro de 5 mm de espessura intermediada por uma lâmina plástica

para transparência (Maxprint) do mesmo tamanho, cujo objetivo é limitar a espessura do material a ser inserido e nivelar a superfície prevenindo a formação de bolhas, de acordo com Rizon. As placas foram protegidas por filme de PVC (Polivinil Carbono) visando prevenir contaminações. [24]

Um *stepwedge* de alumínio (1100) de oito degraus foi utilizado para correlacionar a densidade das imagens das amostras às do alumínio, permitindo verificar concordância com os requerimentos da International Standard Organization (*Specification* 57) para materiais endodônticos (ISO 6876-2001). [18]

Cada amostra foi radiografada ao lado do *stepwedge*, utilizando um sensor de placa de fósforo baseado em um sistema de radiografia digital semi-direto Instrumentarium Kavo EXPRESS® (Joinvile, Brasil), por meio de um aparelho de raios X odontológico GNATUS® Timex 70 E (Ribeirão Preto, Brasil), utilizando um tempo de exposição de 0,32 segundos e uma distância foco-filme de 40 cm para cada placa. [25,26]

Figura 2. Sensor, placa de fósforo e amostras posicionadas para exposição radiográfica.

O programa Adobe Photoshop® foi utilizado para a análise da radiopacidade dos cimentos. Todas as imagens foram capturadas com resolução fixa de 600 dpi (*dots per inch*) e arquivadas em formato *TIFF*. As imagens foram importadas para o programa Adobe Photoshop, sendo que a leitura da radiopacidade foi realizada em quatro diferentes áreas em cada amostra do cimento reparador, e no terceiro degrau equivalente a 3 mm do *stepwedge*, calculando-se os valores médios de densidade óptica. [19]

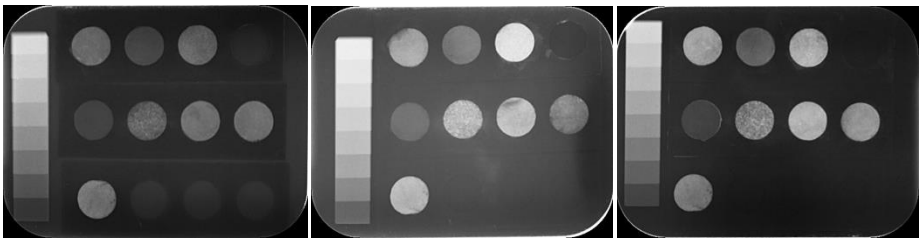

Figura 3. Radiografias dos diferentes radiopacificadores em diferentes proporções (15%, 20% e 30% respectivamente).

## 3. RESULTADOS

De acordo com metodologia do presente trabalho de pesquisa foram obtidos os seguintes resultados apresentados na sequência.

Para a proporção de 15%, o MTA não diferiu estatisticamente do CP + óxido de chumbo, CP + óxido de zircônio e do CP + subnitrato de bismuto. No entanto, a radiopacidade desses materiais foi inferior à 3,0 mmAl [Quadro 2].

Para a proporção de 20%, o MTA não diferiu estatisticamente do CP + iodofórmio, CP + óxido de chumbo, CP + óxido de zircônio, CP + subnitrato de bismuto, CP + sulfato de bário e do CP + óxido de bismuto. Destes, o CP + óxido de zircônio e o CP + sulfato de bário apresentaram suas radiopacidades inferiores à do terceiro degrau [Quadro 4].

Na proporção de 30%, o MTA não diferiu estatisticamente do CP + iodofórmio, CP + óxido de zircônio, CP + subnitrato de bismuto e do CP + sulfato de bário. Apenas o CP + sulfato de bário possui a radiopacidade inferior à 3,0 mmAl [Quadro 6].

As densidades do CP + óxido de bismuto a 20% e do CP + subnitrato de bismuto a 30% são superiores ao quarto degrau do stepwedge de alumínio.

Os materiais que apresentaram melhor radiopacidade foram o CP + subnitrato de bismuto a 20% e o CP + iodofórmio a 20%, 3.0526 mmEqAl e 3.3704 mmEqAl respectivamente.

Quadro 1 – análise de variância (ANOVA) para a proporção de 15% de radiopacificador.

**ANOVA**

| | Soma dos quadrados | Df | Média dos quadrados | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 6,750 | 7 | ,964 | 11,550 | ,000 |
| Within Groups | 1,336 | 16 | ,083 | | |
| Total | 8,085 | 23 | | | |

Quadro 2 – Estatística descritiva e teste Tukey para a proporção de 15% de radiopacificador.

| | Média | Desvio padrão | Intervalo de confiança a 95% | | Grupos homogêneos |
|---|---|---|---|---|---|
| | | | Limite inferior | Limite superior | |
| MTA | 3,2095 | ,12645 | 2,8954 | 3,5236 | A |
| Cimento Portland (CP) | 1,5438 | ,19913 | 1,0492 | 2,0385 | B |
| CP + Iodofórmio | 2,3716 | ,32371 | 1,5675 | 3,1757 | CD |
| CP + Óxido de chumbo | 2,8493 | ,23630 | 2,2623 | 3,4363 | AD |
| CP + Óxido de Zircônio | 2,4298 | ,49467 | 1,2010 | 3,6586 | AD |
| CP + Subnitrato de Bismuto | 2,4246 | ,33070 | 1,6031 | 3,2461 | AD |
| CP + Sulfato de Bário | 1,5760 | ,20830 | 1,0585 | 2,0934 | BC |
| CP + Óxido de Bismuto | 2,3149 | ,23265 | 1,7370 | 2,8928 | BCD |

*Letras diferentes indicam diferença estatística significante ($p<0,05$)

Quadro 3 – análise de variância (ANOVA) para a proporção de 20% de radiopacificador.

**ANOVA**

| | Soma dos quadrados | Df | Média dos quadrados | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 9,938 | 7 | 1,420 | 9,745 | ,000 |
| Within Groups | 2,331 | 16 | ,146 | | |
| Total | 12,268 | 23 | | | |

Quadro 4 – Estatística descritiva e teste Tukey para a proporção de 20% de radiopacificador.

| | Média | Desvio padrão | Intervalo de confiança a 95% | | Grupos homogêneos |
|---|---|---|---|---|---|
| | | | Limite inferior | Limite superior | |
| MTA | 3,2095 | ,12645 | 2,8954 | 3,5236 | ACD |
| Cimento Portland (CP) | 2,1016 | ,03596 | 2,0123 | 2,1909 | B |
| CP + Iodofórmio | 3,3704 | ,36590 | 2,4614 | 4,2793 | CD |
| CP + Óxido de chumbo | 3,5756 | ,48766 | 2,3642 | 4,7870 | CD |
| CP + Óxido de Zircônio | 2,6806 | ,49041 | 1,4623 | 3,8988 | ABC |
| CP + Subnitrato de Bismuto | 3,0526 | ,02409 | 2,9927 | 3,1124 | ABC |
| CP + Sulfato de Bário | 2,2263 | ,06754 | 2,0585 | 2,3940 | AB |
| CP + Óxido de Bismuto | 4,1427 | ,72855 | 2,3329 | 5,9525 | D |

*Letras diferentes indicam diferença estatística significante ($p<0,05$)

Quadro 5 – análise de variância (ANOVA) para a proporção de 30% de radiopacificador.

| | Soma dos quadrados | Df | Média dos quadrados | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 20,871 | 7 | 2,982 | 24,284 | ,000 |
| Within Groups | 1,964 | 16 | ,123 | | |
| Total | 22,835 | 23 | | | |

Quadro 6 – Estatística descritiva e teste Tukey para a proporção de 30% de radiopacificador.

| | Média | Desvio padrão | Intervalo de confiança a 95% | | Grupos homogêneos |
|---|---|---|---|---|---|
| | | | Limite inferior | Limite superior | |
| MTA | 3,2095 | ,12645 | 2,8954 | 3,5236 | AC |
| Cimento Portland (CP) | 1,7561 | ,18658 | 1,2926 | 2,2196 | B |
| CP + Iodofórmio | 3,6788 | ,50176 | 2,4323 | 4,9252 | CE |
| CP + Óxido de chumbo | 4,7365 | ,49263 | 3,5127 | 5,9602 | D |
| CP + Óxido de Zircônio | 3,8003 | ,19526 | 3,3153 | 4,2854 | CDE |
| CP + Subnitrato de Bismuto | 3,9619 | ,10773 | 3,6943 | 4,2295 | CDE |
| CP + Sulfato de Bário | 2,5968 | ,33562 | 1,7631 | 3,4306 | AB |
| CP + Óxido de Bismuto | 4,5789 | ,52401 | 3,2772 | 5,8806 | DE |

*Letras diferentes indicam diferença estatística significante ($p<0,05$)

Para determinação do teste foi realizado a avaliação de normalidade, utilizando o teste Shapiro-Wilk, em seguida, foi realizado a análise de variância (ANOVA) e teste de Tukey ao nível de significância de 5%.

## 4. DISCUSSÃO

O agregado trióxido mineral (MTA) foi inicialmente desenvolvido para selar comunicações entre o dente e a superfície externa periodontal. [2,3] Foram encontradas no MTA propriedades como a alta alcalinidade, baixa solubilidade, excelente selamento marginal, capacidade antimicrobiana, alta radiopacidade, estabilidade dimensional, resistência à compressão e elevada biocompatibilidade. Diante destas características, o MTA passou a ser credenciado como um material promissor para uso em procedimentos endodônticos reparadores. [2,3,5]

Estudos em análise microbiológica e química, verificaram que o MTA possui composição química e propriedades físicas semelhantes ao cimento Portland (CP), porém este possui um custo bastante inferior. Holland et al [15] verificaram, ainda, que os dois compostos possuem propriedades biológicas semelhantes, porém o cimento Portland tem um inconveniente, que é a sua baixa radiopacidade, o que dificulta sua visualização radiograficamente. [11]

Até o final da década de 80, os estudos sobre radiopacidade de materiais reparadores foram predominantemente realizados empregando o método do fotodensitômetro para leitura de radiopacidade em películas radiográficas, de acordo com as recomendações da American Dental Association (ADA). Nesse método, a radiopacidade do cimento é comparada com uma escala de alumínio com degraus de diferentes espessuras, sendo feita a equivalência da radiopacidade em milímetros de alumínio. [24]

Estudos mais recentes sobre radiopacidade de cimentos têm utilizado a radiografia digital ou imagens digitalizadas, pois este método radiográfico necessita menor tempo de exposição e elimina a etapa do processamento químico, responsável pelas variações na qualidade da imagem, além de permitir melhor observação da densidade e do contraste radiográfico. Atualmente existem inúmeros métodos de digitalização da imagem radiográfica. Antes, a capacidade de armazenar e mostrar imagens de boa qualidade era restrita a empresas do ramo, no entanto, hoje tornaram-se populares e de fácil acesso a população. [24]

No presente estudo, as imagens radiográficas foram obtidas por meio de sensores radiográficos e analisadas através do programa Adobe Photoshop para a determinação das densidades radiográficas dos materiais testados em comparação com uma escala de alumínio. Raitz et al [19] utilizaram o mesmo método de avaliação radiográfica em um estudo sobre a comparação entre a radiografia panorâmica convencional e digitalizada na análise de lesões ósseas periapicais.

Trindade et al [32] sugeriram a adição de 30% de radiopacificadores ao agregado de trióxido mineral com o intuito de facilitar sua visualização radiográfica nos tratamentos em que a espessura do material não se apresentar suficiente para destacar sua presença. Conforme os resultados deste

trabalho, os únicos materiais que apresentam radiopacidade necessária para visualização quando estão à uma proporção de 30% são CP + iodofórmio, CP + óxido de zircônio, CP + subnitrato de bismuto.

Figueiredo et al [31] demonstraram que o cimento Portland tem densidade óptica bastante inferior ao cimento MTA. À medida que proporções crescentes de subnitrato de bismuto foram incorporados ao cimento Portland, houve um aumento dos valores em pixels o que se traduz em maior radiopacidade, sendo que a última amostra (33%) chega a ultrapassar os valores do MTA. Os resultados do presente trabalho corroboram com os de Figueiredo. Nas proporções de 15 e 20%, o CP + subnitrato de bismuto são estatisticamente semelhantes ao MTA, diferindo na proporção de 30%.

Tanomaru et al [30] compararam a radiopacidade do cimento Portland quando adicionado de diferentes radiopacificadores, dentre eles, o sulfato de bário, usado no presente trabalho. Segundo ele, o cimento Portland puro e associado ao sulfato de bário não atendem à norma número 57 da ADA, que determina radiopacidade mínima de 3 mm de alumínio. Este trabalho confirma os resultados que Tanomaru, já que em nenhuma das proporções testadas, o CP associado ao sulfato de bário obteve radiopacidade superior ao terceiro degrau de alumínio.

Segundo Bodanezi et al [28], o óxido de bismuto na concentração de 20% em peso, apresentou-se como um agente capaz de conferir níveis de radiopacidade estatisticamente equivalentes ao da guta-percha e, ao mesmo tempo, superiores aos das combinações de cimento Portland com subnitrato de bismuto ou sulfato de bário. Conforme os resultados deste trabalho, a adição desses agentes radiopacificadores ao cimento Portland, na concentração de 20%, se mostrou a mais viável.

Kim et al [33] avaliaram a radiopacidade do cimento Portland contendo diferentes proporções de óxido de bismuto. Os resultados revelaram que a proporção de 20% propiciou a melhor radiopacidade, estatisticamente significante, quando comparado às outras proporções. Os resultados corroboram com o presente trabalho, já que somente a 20% ele não apresentou diferenças estatísticas em relação ao MTA.

Diante dos resultados deste estudo, a adição de agentes radiopacificadores ao cimento Portland se mostra viável nas concentrações de 20% e 30%. Contudo, antes que esses compostos possam ser recomendados ao uso clínico, novos ensaios são necessários para comprovar esses achados e verificar a interferência de maiores quantidades dessas substâncias radiopacificadoras nas propriedades físico, química e biológica dos cimentos reparadores.

## 5. REFERÊNCIAS


1. Bouschlicher MR, Cobb DS, Boyer DB. Radiopacity of compomers, flowable and conventional resin composites for posterior restarations. Oper Dent. 1999; 24(1):20-25.
2. Lee SJ, Monsef M, Torabinejad M. Sealing ability of a mineral trioxide aggregate for repair of lateral root perforations. J Endod. 1993; 19:541-4.
3. Torabinejad M, Chivian N. Clinical application of mineral trioxide aggregate. J Endod. 1999; 25:197-205.
4. Torabinejad M, Parirokh M. Mineral trioxide aggregate: A comprehensive literature review - Part II: Leakage and biocompatibility investigations. J Endod. 2010; 36:190-202.
5. Parirokh M, Torabinejad M. Mineral trioxide aggregate: A comprehensive literature review - Part III: Clinical applications, drawbacks, and mechanism of action. J Endod. 2010; 36:400-413.
6. Martínez Lalis R, Esain ML, Kokubu GA, Willis J, Chaves C, Grana DR. Rat subcutaneous tissue response to modified Portland cement, a new mineral trioxide aggregate. Braz Dent J 2009; 20:112-117.
7. Oliveira MG, Xavier CB, Demarco FF, Pinheiro ALB, Costa AT, Pozza DH. Comparative chemical study of MTA and Portland cements. Braz Dent J 2007; 18:3-7.
8. Asgary S, Eghbal MJ, Parirokh M, Ghoddsi J, Kheirieh S, Brink F. Comparison of mineral trioxide aggregate´s composition with Portland cements and a new endodontic cement. J Endod 2009; 35:243-250.
9. Bidar M, Moradi S, Jafarzadeh H, Bidad S. Comparative SEM study of the marginal adaptation of white and grey MTA and Portland cement. Aust Endod J 2007; 33:2-6.
10. Valera MC, Camargo CHR, Carvalho AS, Gama ERP. In vitro evaluation of apical microleakage using different root-end filling materials. J Appl Oral Sci 2006; 14:49-52.
11. Islam I, Chng HK, Yap AU. Comparison of the physical and mechanical properties of MTA and Portland cement. J Endod. 2006; 32:193-197.
12. Camilleri J, Montesin FE, Di Silvio L, Pitt Ford TR. The chemical constitution and biocompatibility of accelerated Portland cement for endodontic use. Int Endod. J. 2005; 38:834-42.
13. Wucherpfennig AL, Green DB. Mineral trioxide vs. Portland cement – two biocompatible filling materials. J Endod. 1999; 25:308.
14. Bodanezi A, Bortoluzzi EA, Munhoz EA, Bernardineli N, Moraes IG, Bramante CM. Radiopacity Portland cement added radiopacifying agents in different proportions .Rev Inst Ciênc Saúde. 2009; 27(2):167-70.

15. Holland R, Souza V, Nery MJ, Faraco Júnior IM, Bernabé PFE, Otoboni Filho JA. Reaction of rat connective tissue to implanted dentin tubes filled with mineral trioxide aggregate, Portland cement or calcium hydroxide. Braz Dent J. 2001; 12:3-8.
16. Council on Dental Materials and Devices of the New American Dental Association specification Nº 27 for direct filling resins. J Am Dent Assoc.1977; 94(6):1191-4.
17. Council on Dental Materials, Instruments and Equipment of the American Dental Association. The desirability of using radiopaque plastics in dentistry: a status report. J Am Dent Assoc. 1981; 102(3):347-9.
18. ANSI/ADA – American Dental Association, "Specification 57: endodontic sealing material, Chicago, ANSI/ADA, 2000.
19. Raitz R, Silva LG, Silva, CL. Comparative study between convencional and digitalized panoramic radiography in the analysis of periapical bone lesions. Rev Odontol da Universidade Cidade de São Paulo. 2008; 20(3) 261-6.
20. Gu S, Rasimick BJ, Deutsch AS, Musikant BL. Radiopacity of dental materials using a digital X-ray system. Dent Mater. 2006; 22(8):765-70.
21. Akerboom HBM, Kreulen CM, van Amerongen WE, Mol A. Radiopacity os posterior composite resins, composite resin luting cements, and glass ionomer lining cements. J Prosthet Dent. 1993; 70(4):351-5.
22. Curtis PM, von Fraunhofer JA, Farman AG. The radiographic density of composite restorative resins. Oral Surg Oral Med Oral Pathol. 1990; 70(2):226-30.
23. Ergücü Z, Türkün LS, Onem E, Güneri P. Comparative radiopacity of six flowable resin composites. Oper Dent. 2010; 35(4):436-40.
24. Takeshita WM, Castilho JCM, Medici Filho E, Sannomiya EK. An investigation of the density of composite resin using digital radiography. Braz Dental Science. 2004; 7(2):6-11.
25. Takeshita, WM, Bissoli CF, Santos LRA, Medici-Filho E, Moraes MEL. Calcium hydroxide cavity liners: a study of the optical density using a digital system. Rev Odonto Ciência 2008; 23:63-66.
26. Takeshita, WM, Iwaki LC, Da Silva MC, Iwaki Filho L, Queiroz AD, Geron LB. Comparison of the diagnostic accuracy of direct digital radiography system, filtered images, and subtraction radiography. Contemporary Clinical Dentistry 2013; 4(3):338-342.
27. Duda, JG, Losso, EM. The use of mineral trioxide aggregate ( MTA) in pediatric dentistry. Arq. Odontol 2005; 41(1):93-103.
28. Bodanezi, A, Bortoluzzi, EA, Munhoz, EA, Bernardineli, N, Moraes, IG, Bramante, CM. Radiopacity Portland cement added radiopacifying agents in different proportions .Rev Inst Ciênc Saúde 2009; 27(2):167-70.

29. Bissoli, CF, Takeshita, WM, Castilho, JCM, Medici Filho, E, Morares, MEL. Scan radiology images : a new vision of the future . Dental journal. 2007; 30:34-39.
30. Costa, BC, Campos, CN, Grizzo, LT, Tanomaru, M. Physical and chemical analysis of MTA and Portland cement associated with four different radiopacifiers . Rev Odontol UNESP. 2014; 43(4):228-235.
31. Figueiredo, JAP, Bottesello, BV, Ritter, DD, Cogo, DM, Parlow, IF, Barbisan, AO. Evaluation of Portland cement radiopacity compared to MTA cement. Robrac, 2008; 17 (43) :11-15.
32. Trindade AC, Oliveira EP, Figueiredo M, Poli JA. Comparative analysis of the tissue response to mineral trioxide aggregate (MTA), portland cement and portland cement to radiopaque substance. Journal bras endodontia. 2003; 4(15): 309-314.
33. Song JS, Mante FK, Romanow WJ, Kim S. Chemical analysis of powder and set forms of Portland cement, gray ProRoot MTA, white ProRoot MTA, and gray MTA-Angelus. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2006;102(6):809-15. PMid:17138186.

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