



RODOLFO LUIS GONÇALVES

“ANÁLISE DE CUSTO DE MATERIAIS DIRETOS E INDIRETOS
UTILIZADOS EM RESTAURAÇÕES DENTÁRIAS CLASSES III, IV E
V EM RESINA COMPOSTA”

*“COST ANALYSIS OF DIRECT AND INDIRECT MATERIALS USED
IN CLASSES III, IV, AND V COMPOSITE RESIN DENTAL
RESTORATIONS”*

PIRACICABA
2013



UNIVERSIDADE ESTADUAL DE CAMPINAS
FACULDADE DE ODONTOLOGIA DE PIRACICABA

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COMPOSTA”**

Orientador: Prof. Dr. Eduardo Hebling

***“COST ANALYSIS OF DIRECT AND INDIRECT MATERIALS USED IN CLASSES
III, IV, AND V COMPOSITE RESIN DENTAL RESTORATIONS”***

Dissertação de Mestrado Profissionalizante apresentada à Faculdade de Odontologia de Piracicaba da Universidade Estadual de Campinas para obtenção do título de Mestre em Odontologia em Saúde Coletiva

Professional Master's Dissertation presented to Dentistry Program of Piracicaba Dental School of University of Campinas to obtain the Master grade in Dentistry in Community Oral Health.

**ESTE EXEMPLAR CORRESPONDE À VERSÃO FINAL DA DISSERTAÇÃO
DEFENDIDA PELO ALUNO RODOLFO LUIS GONÇALVES, E ORIENTADA
PELO PROF. DR. EDUARDO HEBLING**

Assinatura do Orientador

PIRACICABA

2013

Ficha catalográfica
Universidade Estadual de Campinas
Biblioteca da Faculdade de Odontologia de Piracicaba
Marilene Girello - CRB 8/6159

G586a Gonçalves, Rodolfo Luis, 1984-
Análise de custo de materiais diretos e indiretos utilizados em restaurações dentárias classes III, IV e V em resina composta / Rodolfo Luis Gonçalves. – Piracicaba, SP : [s.n.], 2013.

Orientador: Eduardo Hebling.
Dissertação (mestrado profissional) – Universidade Estadual de Campinas, Faculdade de Odontologia de Piracicaba.

1. Odontologia. 2. Custos e análise de custo. 3. Materiais dentários. 4. Resinas compostas. I. Hebling, Eduardo, 1968-. II. Universidade Estadual de Campinas. Faculdade de Odontologia de Piracicaba. III. Título.

Informações para Biblioteca Digital

Título em outro idioma: Cost analysis of direct and indirect materials used in classes III, IV and V composite resin dental restorations

Palavras-chave em inglês:

Dentistry

Costs and cost analysis

Dental materials

Composite resins

Área de concentração: Odontologia em Saúde Coletiva

Titulação: Mestre em Odontologia em Saúde Coletiva

Banca examinadora:

Eduardo Hebling [Orientador]

Camila Pinelli

Antonio Carlos Pereira

Data de defesa: 31-07-2013

Programa de Pós-Graduação: Odontologia em Saúde Coletiva



UNIVERSIDADE ESTADUAL DE CAMPINAS
Faculdade de Odontologia de Piracicaba



A Comissão Julgadora dos trabalhos de Defesa de Dissertação de Mestrado Profissionalizante, em sessão pública realizada em 31 de Julho de 2013, considerou o candidato RODOLFO LUÍS GONÇALVES aprovado.

A handwritten signature in blue ink, appearing to read "Eduardo Hebling", written over a horizontal line.

Prof. Dr. EDUARDO HEBLING

A handwritten signature in blue ink, appearing to read "Camila Pinelli", written over a horizontal line.

Profa. Dra. CAMILA PINELLI

A handwritten signature in blue ink, appearing to read "Antonio Carlos Pereira", written over a horizontal line.

Prof. Dr. ANTONIO CARLOS PEREIRA

Dedico este trabalho aos meus pais **João** e **SUELI** pelo amor e apoio incondicional em todos os meus projetos. Aos meus irmãos **RENATA** e **ALMIR** pelo companheirismo e torcida mútua para vencermos na vida.

Em especial, dedico este trabalho à **MARJORIE**,
que tem sido fonte de inspiração na minha vida
e constante suporte, auxílio, apoio, força e
dedicação.

AGRADECIMENTOS

À **DEUS**, em primeiro lugar, pela dádiva da vida e pelas oportunidades que tive.

À Universidade Estadual de Campinas (UNICAMP), na pessoa de seu magnífico Reitor, Prof. Dr. **JOSÉ TADEU JORGE**, e à Faculdade de Odontologia de Piracicaba (FOP), na pessoa de seu Diretor, Prof. Dr. **JACKS JORGE JÚNIOR**, pela oportunidade de ser aluno dessa universidade.

Ao Prof. Dr. **ANTONIO CARLOS PEREIRA**, Coordenador do Curso de Mestrado Profissionalizante em Odontologia em Saúde Coletiva da FOP/UNICAMP, pela oportunidade de participar desse Programa de Pós-Graduação.

Ao Prof. Dr. **EDUARDO HEBLING**, primeiramente pela amizade, pela orientação, por compartilhar seus conhecimentos, pela paciência e pelo auxílio na elaboração deste trabalho.

Aos Prof. Dr. **MARCELO DE CASTRO MENEGHIM**, Prof. Dr. **FÁBIO LUIZ MIALHE**, Profa. Dra. **MARIA DA LUZ ROSÁRIO DE SOUSA**, Profa. Dra. **GLÁUCIA BOVI AMBROSANO** e Profa. Dra. **DAGMAR DE PAULA QUELUZ**, pelos conhecimentos compartilhados.

Ao Prof. Dr. **BENEDITO GALVÃO BENZE**, pelo auxílio com a análise estatística deste trabalho, paciência para me esclarecer esta parte do estudo e pela nova amizade que criamos.

As tutoras **FABIANA DE LIMA VAZQUEZ**, **FERNANDA GONÇALVES DUVRA SALOMÃO**, **KARINE LAURA CORTELLAZZI**, **LUCIANE MIRANDA GUERRA** pelo apoio dado tanto nas teorias quanto na prática nas Unidades de Saúde.

Aos meus amigos do Curso de Mestrado: **ALEXANDRE**, **ANDRÉIA**, **CLÁUDIA**, **CRIS**, **ELIANA**, **ELÔ**, **FÁBIO**, **FERNANDA**, **LAURA**, **LÍDIA**, **LILIAN**, **LUCAS**, **MARTHA**, **PAULA**, **PEDRO**, **RAQUEL** e **NÉIA**.

À **EQUIPE DE SAÚDE DA FAMÍLIA** dos bairros Primeiro de Maio e Tiradentes de Piracicaba pela força, aprendizado e momentos felizes de convivência.

A todos que direta ou indiretamente contribuíram para realização deste trabalho, minha gratidão e respeito.

“Com o tempo, os conceitos mudam,
os sonhos mudam...

os planos mudam...

a vida muda...

Mas não se mudam princípios e valores...

Mudei e continuo igual...

Assim é o ser humano: tão coerente em suas
contradições...”

JACKY CORREIA

RESUMO

As resinas compostas são materiais usualmente utilizados em restaurações dentárias diretas. O custo dos materiais faz parte do cálculo do valor dos honorários odontológicos. O objetivo desse trabalho foi determinar e analisar o valor total do custo dos materiais diretos e indiretos utilizados para a confecção de restaurações dentárias diretas de classes III, IV e V em resina composta. O cálculo dos custos foi baseado no método de sistema de custeio variável. A lista dos materiais foi obtida por meio de consulta a uma banca juízes e baseada nos padrões de excelência comprovados na literatura para atendimento em equipe. Os valores dos materiais foram obtidos de uma média dos valores consultados no mercado fornecedor e convertidos em dólar americano (US\$1.00=R\$2,12). As repetições foram obtidas de preparos cavitários Classes III, IV e V em dentes artificiais pré-fabricados. As cavidades foram classificadas em profundidades rasa, média e profunda. Os materiais foram quantificados para cada tipo de preparo. Sete marcas de resinas compostas avaliadas foram pesadas em balança de precisão após a sua inserção em cada tipo de preparo. Os dados foram avaliados por estatística descritiva e pelo Teste não-paramétrico de Friedman. O custo encontrado para restauração de Classe III foi de US\$7.96 (R\$16,88), para a de Classe IV de US\$8.13 (R\$17,24) e, para a de Classe V de US\$7.84 (R\$16,62). Houve diferença estatística no custo entre algumas marcas de resina, entre todos os tipos de preparos cavitários e entre todas as profundidades. Os valores encontrados podem ser utilizados no cálculo do valor final do procedimento restaurador, auxiliando na gestão de serviços odontológicos públicos ou privados.

Palavras-chave: Odontologia; Custos e análise de custos; Materiais dentários; Resinas compostas.

ABSTRACT

Composite resins are materials commonly used in direct dental restorations. The cost of the materials is part of the calculation of the value of dental fees. The aim of this study was to determine and to assess the total value of direct and indirect materials used in Classes III, IV and V composite resin direct dental restorations. The calculation of costs was based on the method of variable costing system. A list of the materials was obtained by a panel of experts and based on the excellence standards established in the literature for dental team treatment. The values of the materials were obtained from an average of the values founded in the local supplier market (US\$1.0=R\$2.12). The repetitions were obtained from Classes III, IV and V cavities in artificial pre-manufactured teeth. The materials were quantified for each type of preparation. Seven trademarks of composite resins used were weighed on a precision balance after their insertion in each type of preparation. The data were assessed by descriptive statistics and non-parametric Friedman's test. **Result:** The cost found for restoration of Class III was US\$7.96 (R\$16,88), for Class IV was US\$8.13 (R\$17,24), and for Class V was US\$7.84 (R\$16,62). There was statistically significant difference in cost between some trademark resins, between all types of cavities preparation and between all depth classifications. These values might be used in the calculation of the final value of the restorative procedure, aiding in the management of public or private dental care services.

Key words: Dentistry; Costs and cost analysis; Dental materials; Composite resins.

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INTRODUÇÃO

Os serviços de prestação de assistência odontológica em consultórios ou clínicas odontológicas, inseridos tanto no setor privado quanto no setor público, devem ser gerenciados com os mesmos princípios administrativos aplicados a uma empresa. Embora os custos fixos possam diferir de um estabelecimento para outro, alguns custos variáveis diretos relacionados à execução do serviço apresentam valores estabelecidos por alguns critérios que não dependem, exclusivamente, do operador ou do gestor do serviço, como por exemplo, o custo dos materiais odontológicos. O preço, estabelecido pelo mercado dos produtores e fornecedores de artigos odontológicos, a quantidade, estabelecida pelo tamanho do preparo cavitário, e o tipo desses materiais, estabelecido pelas evidências científicas que direcionam a correta indicação, são exemplos destes critérios (Andrade *et al.*, 1999).

Todavia, o tamanho do preparo cavitário pode ser influenciado pela extensão da lesão de cárie e pela habilidade técnica e conhecimentos do operador. A pressuposição de que este obedeça aos princípios de prevenção e conservação do tecido dentário deve ser sempre considerada. Esse fato faz com que tipos de preparos cavitários mais conservadores e com menor extensão e profundidade utilizem menor quantidade de material restaurador (Busato, 2005; Mondelli, 2006).

O desenvolvimento dos sistemas adesivos e dos compósitos resinosos tem permitido o uso comum e frequente de resinas compostas em restaurações dentárias diretas. A similaridade da coloração original dos dentes, proporcionada pelo uso das resinas compostas, permite a manutenção e restauração da estética do sorriso, aumentando a preferência de uso desse material restaurador tanto pelos profissionais quanto pelos pacientes (Conceição *et al.*, 2005).

Um sistema de custeio consiste na determinação de critérios para coleta, processamento, interpretação e análise de dados para obtenção do custo de um serviço ou produto. De acordo com o sistema adotado, determinados custos podem ou não fazer parte dos custos de produção. O sistema de custeio pode ser classificado em três tipos: 1) custeio por absorção; 2) custeio variável; e, 3) custeio baseado em atividades (Chiavenato, 2008; Bruni, 2010).

O sistema de custeio por absorção consiste na apropriação (absorção) de todos os custos de produção aos bens ou serviços realizados, sejam estes custos fixos, variáveis, diretos ou indiretos. Assim, os custos diretos são alocados diretamente, enquanto que os custos indiretos são distribuídos ao valor dos serviços ou produtos por meio de rateios previamente definidos. O grande inconveniente na adoção do custeio por absorção diz respeito aos custos fixos. Os custos fixos são necessários para que a empresa, no caso o prestador de assistência odontológica, esteja em condições de produzir. Dessa forma, são custos incorridos independentemente da quantidade de serviços que venha a ser produzida, até certo limite, já que não sofrem variações em razão do volume de

produção. Como regra, nesse tipo de sistema, os custos fixos são considerados indiretos, sendo apropriados por estimativas mais ou menos arbitrárias. Isto faz com que o custo de produção de um serviço, como é o caso do tratamento odontológico, possa variar de acordo com os critérios adotados para a apropriação dos custos fixos. Por consequência, o resultado apurado na venda de um serviço pode variar de acordo com a parcela de custos fixos que a ele se decida apropriar. Como cada estabelecimento possui custos fixos próprios e diferentes uns dos outros, a comparação entre um local e outro se torna difícil. Outro inconveniente é o fato de os custos fixos unitários variarem de acordo com as quantidades produzidas. Com o aumento do volume de produção, ocorre a redução do custo fixo unitário (Bruni, 2010).

No sistema de custeio variável são apropriados aos serviços apenas os custos variáveis de produção, sendo os custos fixos lançados diretamente ao resultado, como se fossem despesas operacionais. O sistema de custeio variável também é conhecido como sistema de custeio direto, em virtude de os custos variáveis serem, como regra, diretos. Em razão de nesse método serem apropriados à produção tanto os custos variáveis diretos quanto os variáveis indiretos, parece ser mais adequada à expressão sistema de custeio variável. O custo dos materiais é um exemplo de sistema de custeio variável (Bruni, 2010).

O sistema de custeio baseado em atividades, também conhecido como sistema de custeio ABC (*Activity Based Costing*) é baseado na premissa de que serviços ou produtos para serem produzidos usam atividades e estas, por sua vez,

utilizam recursos. Esse sistema procura identificar e custear as atividades conforme sua natureza, ou seja, as que agregam valor ao produto ou serviço produzido e as que não agregam valor, nomeando as que podem ou não serem eliminadas do processo de produção (Bruni, 2010).

O custo dos materiais faz parte do cálculo do valor dos honorários de restaurações dentárias diretas. O conhecimento do custo dos materiais utilizados pode facilitar o planejamento de ações de gerenciamento dos serviços de assistência odontológica e a determinação dos honorários de trabalho (Couttolenc & Zucchi, 1998; Andrade et al., 1999; Falk, 2001; Bruni, 2010).

A execução dos procedimentos desenvolvidos no atendimento odontológico de pacientes deve ser baseada nos padrões de excelência comprovados na literatura, com eficiência e produtividade na aplicação das técnicas restauradoras, respeitando a biossegurança do paciente e da equipe de trabalho (São Paulo, 1995; São Paulo, 1999; Brasil, 2000; Estrela, 2003), o atendimento em equipe (Barros, 1991), o uso dos materiais (Busato, 2005; Mondelli, 2006) e os princípios éticos (Brasil, 1998). Os mesmos padrões devem ser seguidos na determinação das técnicas e materiais para a realização da análise do custo desses procedimentos.

Os materiais utilizados nos procedimentos odontológicos podem ser classificados em diretos, aqueles utilizados diretamente na produção do procedimento odontológico, e indiretos, aqueles que utilizados de forma indireta na

produção do procedimento odontológico (Barros, 1991). Brocas, matrizes, cunha e resina composta são exemplos de materiais diretos utilizados em um procedimento restaurador. Soluções desinfetantes, luvas, gorro e óculos são exemplos de materiais indiretos no mesmo tipo do procedimento anterior.

As restaurações dentárias podem ser classificadas em diretas, aquelas realizadas diretamente pelo cirurgião-dentista na cavidade bucal do paciente e, indiretas, aquelas confeccionadas fora da cavidade bucal em laboratório de prótese (Mondelli, 2006).

Apesar da contínua necessidade, nos últimos anos, para mais avaliações econômicas na área de atuação da Odontologia (Donaldson, 1998) e da padronização dos procedimentos odontológicos baseados em evidências científicas (Bader *et al.*, 1999), há notavelmente pouca informação disponível sobre os custos de diferentes materiais restauradores e de sua utilização (Smales & Hawthorne, 1996). A pequena quantidade de estudos sobre o assunto disponível é em grande parte baseada em estimativas de longevidade da restauração, na realização de retratamentos a médio e longo prazo e em seus custos relativos e custos benefícios e efetividade (Mjor *et al.*, 1997). Dessa maneira, não há, até o término desse trabalho, artigos que determinem os valores de custos de materiais diretos e indiretos utilizados para a confecção de restaurações dentárias diretas.

Diante desses fatos, o objetivo principal desse trabalho foi determinar e analisar o valor do custo dos materiais diretos e indiretos utilizados em restaurações dentárias diretas de Classes III, IV e V em resina composta.

PROPOSIÇÃO

O objetivo geral deste estudo experimental laboratorial, realizado na Faculdade de Odontologia de Piracicaba/UNICAMP, foi determinar e analisar o valor total do custo dos materiais diretos e indiretos utilizados em restaurações dentárias diretas de Classes III, IV e V em resina composta.

Os objetivos específicos foram:

1. Analisar o custo médio dos materiais diretos e indiretos utilizados nas restaurações Classe III, Classe IV e Classe V em resina composta;
2. Verificar se existe diferença no custo dos materiais diretos e indiretos utilizando diferentes marcas de resina composta;
3. Verificar se existe diferença no custo dos materiais entre os diferentes tipos de preparos cavitários avaliados (Classes III, IV e V).
4. Verificar se existe diferença no custo dos materiais entre as diferentes profundidades dos preparos cavitários avaliados (rasa, média e profunda)..

Esse trabalho foi realizado no formato alternativo, conforme a deliberação da Comissão Central de Pós-graduação (CCPG) da Universidade Estadual de Campinas (UNICAMP) nº 001/98 e formatado de acordo com o Manual de Normalização de Teses e Dissertações da FOP/UNICAMP (Ceccotti & Sousa, 2006).

Para alcançar o objetivo geral proposto, o **CAPÍTULO 1** foi desenvolvido.

CAPÍTULO 1:

Cost analysis of materials used in Classes III, IV, and V composite resin dental restorations^{*}

Corresponding Author:

Eduardo Hebling; DDS, MSC, Ph.D

Faculdade de Odontologia de Piracicaba – UNICAMP

Caixa Postal 52, Piracicaba-SP, Brasil.

13414-903

Tel.: +55-19-3412.5280

Fax: +55-19-3412.5218

E-mail: hebling@fop.unicamp.br

^{*} Artigo submetido para publicação na *Brazilian Journal of Oral Science* e formatado de acordo com as normas dessa revista, em concordância com a deliberação da Comissão Central de Pós-graduação (CCPG) da Universidade Estadual de Campinas (UNICAMP) nº 001/98 para dissertações no formato alternativo.

ABSTRACT

Aim: To assess the total value of direct and indirect materials used in Classes III, IV and V composite resin direct dental restorations. **Methods:** The calculation of costs was based on the method of variable costing system. A list of the materials was obtained by a panel of experts and based on the excellence standards established in the literature for dental team treatment. The values of the materials were obtained from an average of the values founded in the regional supplier market (US\$1.0=R\$2.12). The repetitions were obtained from Classes III, IV and V cavities in artificial pre-manufactured teeth. The cavities were classified in shallow, medium and deep. The materials were quantified for each type of preparation. Seven trade mark of composite resins were weighed on a precision balance after their insertion in each type of cavity preparation. The data were assessed by descriptive statistics and non-parametric Friedman's test. **Results:** The mean cost found for restoration of Class III was US\$7.96 (R\$16.88), for Class IV was US\$8.13 (R\$17.24), and for Class V was US\$7.84 (R\$16.92). There was statistically significant difference in cost between some trade mark resins, between all types of cavities preparation and between all depth classifications. **Conclusions:** These founded values might be used in the calculation of the final value of the restorative procedure, aiding in the management of public or private dental care services.

Keywords: dentistry, costs and cost analysis, dental materials, composite resins.

INTRODUCTION

Composite resins are materials commonly used in direct dental restorations. The similarity of the original color of the teeth, afforded by the use of composite resins, allows the maintenance and restoration of the aesthetics of the smile, increasing, currently, the preference for use of this restorative material by professionals and patients ¹ (Conceição, et al., 2005).

The materials used in dental procedures can be classified into direct, those used directly in the production of the dental procedure, and indirect, those who used indirectly in the production of dental procedure ² (Barros, 1991). Drills, matrix strips, wedges and composite resin are examples of direct materials used in a restorative procedure. Disinfecting solutions, gloves, beanie and glasses are examples of indirect materials used.

Dental care services, entered in both private and public sector, should be managed with the same principles applied to a company. Although fixed costs can differ from one place to another, some direct variable costs related to the implementation of the service feature values established by some criteria that do not depend on, exclusively, the operator or manager of the service, such as for example, the cost of dental materials. The price, determined by the market of producers and suppliers of dentistry articles, the amount established by the size of the preparation cavity, and the type of these materials, established by clinical and scientific evidences, are examples of these criteria ³ (Andrade, et al., 1999).

A costing system consists in determining a criterion by which the costs are appropriate for the production. In accordance with the adopted system, certain costs may or may not be part of the production costs ^{4, 5} (Chiavenato, 2008; Bruni, 2010). In the variable costing system are appropriate to services only the variable costs of production, both direct and indirect ⁵ (Bruni, 2010).

The cost of materials is part of the calculation of the value of the fees for direct dental restorations. The knowledge of the cost of the materials used can facilitate the planning of actions to manage the dental care services and the determination of dental restorations fees ^{3, 5, 6, 7} (Andrade et al., 1999; Bruni, 2010; Couttolenc & Zucchi, 1998; Falk, 2001).

Despite the continuous need, in recent years, for more economic assessments in the field of the Dentistry ⁸ (Donaldson, 1998) and the standardization of dental procedures based on scientific evidences ⁹ (Bader et al., 1999), there is remarkably a few of available information on the costs of different restorative materials and their use ¹⁰ (Smales & Hawthorne, 1996). The small number of studies on the available subject is in large part based on estimates of longevity of the restoration, in the realization of retreatment in the medium and long term and on their relative costs and benefits costs and effectiveness ¹¹ (Mjor et al., 1997). This way, there are no publications, until the end of this paper, which determine the cost values for direct and indirect materials used for direct dental restorations. Thus, the main aim of this present study was to determine and assess the mean value of the direct and indirect materials used in classes III, IV and V

composite resin direct dental restorations. The specific aim of this study was to assess the total cost of direct and indirect materials used in different trademark resins, both types of cavity preparation and size classification. The null hypothesis was that there is no difference in mean cost values between these studied variables.

MATERIAL AND METHODS

This experimental study was developed at the Piracicaba Dental School, University of Campinas, Piracicaba, Brazil in year 2012. The calculation of costs was based on the method of variable costing system ⁵ (Bruni, 2010).

The list of materials was obtained through consultation by a panel of experts and based on the excellence standards established in the literature for dental team treatment, applying restorative techniques with efficiency and productivity ² (Barros, 1991), and respecting the biosafety of the patient and the dental team ^{12, 13, 14, 15} (Sao Paulo, 1995; Sao Paulo, 1999; Brazil, 2000; Estrela, 2003), the use of materials ^{16, 17} (Busato, 2005; Mondelli, 2006) and the ethical principles ¹⁸ (Brazil, 1998). This panel of experts was comprised of ten dental practitioners with more than 20 years of experience, being four Restorative Dentistry clinical specialists, two general practitioners, three professors of Restorative Dentistry and one professor of Dental Materials, and by two dental hygienist techniques with ten years of experience. A list of materials to be used was prepared by the authors. The judges reviewed each item through the Likert scale ¹⁹ (Likert, 1932) classified as: 1) strongly disagree; 2) disagree; 3) neither agree nor disagree; 4) agree; 5)

strongly agree. In all items of materials listed and their quantity there was still the possibility of inclusion of suggestion of the judge. The materials and quantities classified in the scores 4 and 5 by the judges were kept in the final list of materials.

The values of the materials were obtained from an average of the values found in the supplier market of the administrative region of Campinas-SP, Brazil, in three different resellers. The obtained values in local currency (Real) were converted in American dollars (US\$1.00 = R\$ 2.12). This value was adjusted in accordance with the quantity of material to be used. For the non-disposable materials, the value was adjusted considering their mean life of use.

The quantity of material was stipulated by simulation of clinical performance of the restorative procedure. This quantity was measured with the use of graduated measuring cylinder, for liquid materials, and precision digital scale (Mettler Toledo[®], Brazil, model AB-S) with power of reading of 0.1 mg to 0.01 mg, weighing ranging from 51 g to 320 g, for solid materials.

The repetitions were obtained from Classes III, IV, and V cavities preparations in artificial permanent pre-manufactured teeth. Each type of cavity preparation was classified in relation to the pre-established depth measured in: shallow, medium and deep, totaling 9 anterior artificial teeth. This depth classification was established by the authors in these artificial teeth, whose manufacturer offers with cavity preparation previously performed, following the conservative techniques currently recommended ^{16, 17} (Busato, 2005; Mondelli, 2006).

In drawing up of the list of materials was considered the dental care performed in dental team (operator and auxiliary), following the biosafety principles and the conservative restorative techniques currently recommended based on scientific evidence ^{15, 16, 17} (Estrela, 2003; Busato, 2005; Mondelli, 2006). For the dental care performed, was also standardized: the use of specific restorative diamond drills ²⁰ (Siegel & Von Fraunhofer, 1999), which would be sterilized and reused for up to 10 patients ^{21, 22} (Siegel & Von Fraunhofer, 1996; Gureckis *et al.*, 1991); do not use of dental liner; use of total isolation; use of condensation dental resin composite; use of the incremental placement technique for the use the restorative materials; and finishing and adjust the occlusion, with use of specific tips, discs and strips of sandpaper for finishing and carbon paper ^{16, 17} (Busato, 2005; Mondelli, 2006).

The materials were classified into seven distinct groups and for each one of these was established the following standardization criteria ²³ (Hebling & Trentin, 2013):

- Group 1: Materials used for the maintenance and cleaning of equipment.

- Dental operating room equipment contained: 1) two ultra-speed air handpieces, a set of slow-speed air handpiece micro-motor with contra angle and three-way syringe; 2) auxiliary unit containing one cuspidor, vacuum system with saliva and blood suction hoses, one three-way syringe and one resin curing light photo polymerization device; 3) chair with seat and back without seams or buttons, drive command in feet and support arm on both sides; 4) Spotlight mono focal with single cable; 5) Stools: one for

the operator and one for the auxiliary; 6) mobile auxiliary table, size 60 x 50 cm;

- Lubrication of high and slow-speed air handpieces: use of two sprays of lubricant oil into the drive air line; use of the lubricant oil recommended by the manufacturer for each four hours of use;
 - Disinfection: use of two gauzes and disinfectant solution. Sterilization: use of sterilization packaging following the manufacturer's guidelines ^{12, 13} (Sao Paulo, 1995; Sao Paulo, 1999);
- **Group 2:** Materials used as disposable Personal Protective Equipment (PPE) and for the biosafety of the team and the patient.
- Use of PPE and washing of hands by helping to perform the disinfection of dental equipment; use of PPE and washing of hands by the operator and the auxiliary to the clinical care; use of protective barriers for the equipment; protective barriers and eyeglass for the patient; use of pre-operatively mouthwash with antiseptic solution by the patient.
- **Group 3:** Materials used for the sterilization of instruments.
- Use of sterilization in autoclave with polypropylene thermoplastic sealing packaging;
- **Group 4:** Materials for anesthesia

- Use of regional anesthesia; topical anesthetic in the form of gel, applied with cotton ball; solution of lidocaine 2% with epinephrine 1:100,000 (two tubes per patient); long needle.

- **Group 5:** Materials for absolute isolation and cavity preparation.

- Use of sterilized and reused for up to 10 patients drills ^{21, 22} (Siegel & Von Fraunhofer, 1996; Gureckis *et al.*, 1991);
- Number of drills: two types of diamond high-speed drills; low-speed drill using a type of carbide drill ²⁰ (Siegel & Von Fraunhofer, 1999);
- Use of instrumental classified as restorative instrumental (packaged in drilled holster), metal tray, rubber dam, template, punch, clamp forceps, arc of isolation, scissors, Ivory clamps (packaged in drilled holster with separations), drills (wrapped in small drilled holster for eight drills).

- **Group 6:** Materials for tooth restoration

- Materials were sub-classified in common use materials for Classes III, IV, and V cavities, and specific materials for Classes III and IV cavities (such as anatomic wooden wedges);
- Use the Adper Single Bond 2 (3M Espe, Sumare, SP, Brazil) adhesive system for all types of resin;
- Composite resins trade mark: **Llis** (FGM, Joinville, SC, Brazil) ; **Fill Magic** (Vigodent, Rio de Janeiro, RJ, Brazil); **Charisma** (Heraeus-Kulzer, Sao

Paulo, SP, Brazil); **Prisma APH** (Dentsply, Petropolis, RJ, Brazil); **Z350** (3M Espe, Sumare, SP, Brazil); **Herculite XRV** (Kerr, Sao Paulo, SP Brazil); **Tetric N-Ceram** (Ivoclar Vivodent, Sao Paulo, SP, Brazil).

- **Group 7:** Materials for finishing and polishing of the tooth restoration:

- Assembled tips: use of materials in up to 10 patients ^{21, 22} (Siegel & Von Fraunhofer, 1996; Gureckis *et al.*, 1991);
- Carbon paper and finishing and polishing discs and trips: single use, disposable.

The main focus of this present study was to determine the cost of the materials in **Group 6**. In this group, the materials were quantified for each type of preparation and depth classification. The quantity of each material was determined the final cost individually. The simulation of use of materials was performed by professional calibrated (Kappa> 0.85). The calibration process consisted by one hour of theory discussion, four hour of practical training, including both repetitions of insertion and weighing and intra-examiner differences.

The amount of adhesive was measured in drops, predetermined by the panel of experts. The amount of resin used was determined after its insertion in the artificial tooth of each type of preparation and depths cavities, following the realization of a pre-sculpture of the anatomy of the tooth, removing the excesses and the weighing of the artificial tooth with the material, discounting the weight of the tooth. The final

value of the cost of the direct and indirect materials was calculated by the sum of the individual cost of each used material.

The mean values found for the seven groups of materials studied were considered. For each evaluated material was determined the amount of materials needed, the amount of material per package, the average price of materials per package and the adjusted price for the quantity required for the achievement of the restorative procedure.

Descriptive analysis of the mean cost of direct and indirect materials used in Classes III, IV and V composite resin restorations were performance.

The data of cost of direct and indirect materials used in Classes III, IV and V composite resin dental restorations were used to analyze comparatively all the independent studied variables. The independent variables studied in this present study were: composite resin trade mark (seven types); cavity preparation (Classes III, IV and V); and depth of the cavity preparation (shallow, medium and deep). The dependent variable was the total cost of direct and indirect materials used.

The data were assessed by Friedman's Test (non-parametric) for the dependent variable. This test was applied to two factors, being that the first factor was a fixed independent variable and the second factor were the blocks of each combination of the other two independent variables. When the Friedman's test indicate significant differences between the groups, it was applied the Test of Multiple Comparisons of Siegel and Castellan, at the 5% level of significance, to check which groups were statistically different.

RESULTS

The values of the cost of the direct and indirect materials including in groups 1, 2, 3, 4, 5 and 7 relating to materials for biosafety, for local anesthesia, for total isolation and for cavity preparation were presented in a previous study²³ (Hebling & Trentin, 2013). The mean total cost found to the materials for biosafety (groups 1 to 3) was of US\$4.18. Of this amount, the materials of the Group 2, which corresponds to those of PPE disposable materials and to the biosafety for the dental team and the patient, represented 56.72 % and, in Groups 1 and 3 corresponded to 6.89% and 36.39%, respectively. The mean total cost found to the materials used for local anesthesia (Group 4) was of US\$1.01, being that the anesthetic represented no 90.23% of that value, and the topical anesthetic and the needle corresponded to 1.4% and 8.37%, respectively.[†]

Materials used for absolute isolation and cavity preparation (Group 5) showed mean total value of US\$1.0, being that the materials used to cavity preparation represented 67.30% and the used for absolute isolation corresponded to 32.7% of this value. The distribution of costs adjusted for these materials showed that the cost of the drills of low and high-speed represents the highest value found, corresponding to 64% of the total cost for this group. The cost of the rubber dam, used in absolute isolation was responsible for 26% of the mean total value of this group, which corresponds to the mean value of US\$0.26²³ (Hebling & Trentin, 2013).

[†] Para maior detalhamento dos valores apresentados, ver os ANEXOS 1 e 2.

Materials used for dental finishing and polishing (Group 7) showed mean total value of US\$1.23. The distribution of costs adjusted for materials showed that the costs of carbon paper and assembled part of silicone for finishing corresponded to 74.23% of the mean total value of this group ²³ (Hebling & Trentin, 2013).

The calculation of the weights (in grams) of the evaluated composite resins was showed in **Table 1** mean weight founded for class III was 0.027 g ($\pm$ 0.015), for class IV was 0.052 g ($\pm$ 0.040), and for class V was 0.021 g ($\pm$ 0.007). The calculation of the adjusted value (in US\$) by gram from evaluated composite resins was showed in the **Table 2** the mean adjusted value founded was US\$6.77. The calculation of the cost (in US\$) of the evaluated composite resins according the studied cavity preparation was showed in **Table 3** mean values founded for class III was US\$0.18 ($\pm$ 0.10), for class IV was US\$0.35 ($\pm$ 0.26), and for class V was US\$0.14 ($\pm$ 0.05).

The calculation of the cost (in US\$) of the materials used for tooth restoration according the type of studied cavity preparation (Group 6) was showed in the **Table 4** adjusted cost founded for class III was US\$0.55, for class IV was US\$0.72, and for class V was US\$0.43. These founded differences are due to the higher quantity of resin used for class IV than for classes III and V, and to the use of polyester matrix and wedges for classes III and IV.

Costs (in US\$) of the direct and indirect materials used in Class III, IV and V composite resin dental restoration were showed in **Table 5** the mean total cost found for class III was US\$7.96, for class IV was US\$8.13, and for class V was

US\$7.84. There were no significant differences in total cost of restorative materials between the types of cavity preparation.

The **Figure 1** showed data used in the non-parametric statistical. The slot **A** showed the difference between the total costs of the materials to studied trade mark composite resins. Charisma, Prisma APH, Z350, and Tetric N-Ceram trade mark composite resins showed higher total mean cost than Llis, Fill Magic, and Herculite XRV trade mark composite resins. There were statistically significant differences at 5% level of significance between Llis to Charisma and Z350 composite resins; between Fill Magic to Charisma, Prisma APH, Z350 and Tetric N-Ceram composite resins; and between Herculite XRV to Charisma and Z350 composite resins[‡]. The slot **B** showed the difference between the total costs of the materials to types of cavity preparation. There were statistically significant differences at 5% level of significance between all the types of cavity preparation. The slot **C** showed the difference between the total costs of the materials to types of depth classification. There was statistically significant difference (5%) between all the types of depth classification of the cavity preparation.

[‡] Para maior detalhamento dos valores apresentados, ver o ANEXO 3.

Table 1: Calculation of weights (in grams) of the evaluated composite resins according the type of studied cavity preparation.

Class	Depth	Evaluated composite resin trade mark							Mean ($\pm$ SD)
		Llis	Fill Magic	Charisma	Prisma Aph	Z350	Herculite Xrv	Tetric N- Ceram	
CLASS III	Shallow	0.0124	0.0121	0.0136	0.0122	0.0104	0.0123	0.0111	0.0120 (0.001)
	Medium	0.0258	0.0251	0.0243	0.0255	0.0228	0.0256	0.0263	0.0251 (0.001)
	Deep	0.0453	0.0417	0.0420	0.0422	0.0379	0.0454	0.0462	0.0430 (0.003)
	Mean ($\pm$ SD)	0.0278 (0.017)	0.0263 (0.015)	0.0266 (0.014)	0.0266 (0.015)	0.0237 (0.014)	0.0278 (0.017)	0.0279 (0.018)	0.0267 (0.015)
CLASS IV	Shallow	0.0219	0.0211	0.0239	0.026	0.0200	0.0223	0.0239	0.0227 (0.002)
	Medium	0.0394	0.0362	0.0371	0.0359	0.0327	0.0333	0.0351	0.0357 (0.002)
	Deep	0.1054	0.1010	0.0926	0.0965	0.0904	0.0965	0.1004	0.0975 (0.005)
	Mean ($\pm$ SD)	0.0556 (0.044)	0.0528 (0.042)	0.0512 (0.037)	0.0528 (0.038)	0.0477 (0.038)	0.0507 (0.040)	0.0531 (0.041)	0.0520 (0.040)
CLASS V	Shallow	0.0158	0.0163	0.0166	0.0154	0.014	0.0155	0.0167	0.0158 (0.001)
	Medium	0.0195	0.0188	0.0196	0.0198	0.0174	0.018	0.0218	0.0193 (0.001)
	Deep	0.0291	0.0293	0.0286	0.031	0.0262	0.0283	0.0312	0.0291 (0.002)
	Mean ($\pm$ SD)	0.0215 (0.007)	0.0215 (0.007)	0.0216 (0.006)	0.0221 (0.008)	0.0192 (0.006)	0.0206 (0.007)	0.0232 (0.007)	0.0214 (0.007)

Table 2: Calculation of the adjusted value (in US\$) by gram from evaluated composite resins.

Evaluated composite resin trade mark (weight in grams/tube)	Supplier 1	Supplier 2	Supplier 3	Mean	Adjusted Value by gram
Llis (4 g)	10.24	10.80	10.59	10.54	2.635
Fill Magic (4g)	10.24	10.80	10.59	10.54	2.635
Charisma (4g)	37.99	38.30	38.77	38.36	9.590
Prisma Aph (4g)	33.96	34.53	35.14	34.54	8.635
Z350 (4g)	42.45	44.06	46.93	44.48	11.120
Herculite XRV (5g)	21.23	21.75	22.12	21.70	4.340
Tetric N-Ceram (3.5g)	28.58	28.89	31.21	29.56	8.450
Mean	26.38	27.02	27.91	27.10	6.772

Table 3: Calculation of the cost (in US\$) of the evaluated trademark composite resins according the type of studied cavity preparation.

Class	Depth	Evaluated composite resin trade mark							Mean ($\pm$ SD)
		Llis	Fill Magic	Charisma	Prisma Aph	Z350	Herculite Xrv	Tetric N- Ceram	
CLASS III	Shallow	0.033	0.032	0.130	0.105	0.116	0.053	0.094	0.080 (0.041)
	Medium	0.068	0.066	0.233	0.220	0.254	0.111	0.222	0.168 (0.083)
	Deep	0.119	0.110	0.403	0.364	0.421	0.197	0.390	0.286 (0.139)
	Mean ($\pm$ SD)	0.073 (0.042)	0.069 (0.039)	0.255 (0.137)	0.230 (0.129)	0.264 (0.152)	0.120 (0.073)	0.235 (0.148)	0.178 (0.103)
CLASS IV	Shallow	0.058	0.056	0.229	0.225	0.222	0.097	0.202	0.155 (0.081)
	Medium	0.104	0.095	0.356	0.310	0.364	0.145	0.296	0.239 (0.119)
	Deep	0.278	0.266	0.888	0.833	1.005	0.419	0.848	0.648 (0.315)
	Mean ($\pm$ SD)	0.146 (0.116)	0.139 (0.112)	0.491 (0.350)	0.456 (0.329)	0.530 (0.417)	0.220 (0.174)	0.449 (0.349)	0.347 (0.264)
CLASS V	Shallow	0.042	0.043	0.159	0.133	0.156	0.067	0.141	0.106 (0.053)
	Medium	0.051	0.050	0.188	0.171	0.193	0.078	0.184	0.131 (0.067)
	Deep	0.077	0.077	0.274	0.268	0.291	0.123	0.264	0.196 (0.099)
	Mean ($\pm$ SD)	0.057 (0.018)	0.057 (0.018)	0.207 (0.060)	0.191 (0.070)	0.214 (0.070)	0.089 (0.030)	0.196 (0.062)	0.144 (0.046)

Table 4: Calculation of the cost (in US\$) of the materials used for tooth restoration according the type of studied cavity preparation (Group 6).

Material	Quantity required	Quantity per pack	Mean of cost per pack	Adjusted Value
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CLASS III

Micro brush ¹	1	100u	5.93	0.06
37% phosphoric acid etching gel	0.05 g	3g	3.02	0.05
Bonding liquid	0.04 g	6g	27.20	0.18
Composite resin ²	0.027g	4g	27.10	0.18
Polyester Matrix	1	50u	1.66	0.04
Wedges	1	100u	3.69	0.04
Total (US\$)				0.55

CLASS IV

Micro brush ¹	1	100u	5.93	0.06
37% phosphoric acid etching gel	0.05 g	3g	3.02	0.05
Bonding liquid	0.04 g	6g	27.20	0.18
Composite resin ²	0.052g	4g	27.10	0.35
Polyester Matrix	1	50u	1.66	0.04
Wedges	1	100u	3.69	0.04
Total (US\$)				0.72

CLASS V

Micro brush ¹	1	100	5.93	0.06
37% phosphoric acid etching gel	0.05 g	3 g	3.02	0.05
Bonding liquid	0.04 g	6 g	27.20	0.18
Composite resin ²	0.021g	4g	27.10	0.14
Total (US\$)				0.43

1 – MicrobrushTM (FGM, KG Sorensen, Brazil).

2 – Composite resin: use of mean weight of composite resin used in classes III, IV and V (Figure 1). Mean of the founded values of the studied composite resin (Figure 3).

Table 5: Mean cost of the direct and indirect materials used in Class III, IV and V composite resin dental restoration (in US\$) and Percentage (%).

Group of Materials	Class III	%	Class IV	%	Class V	%
Maintenance and cleaning (Group 1) ¹	0,288	3,6	0,288	3,5	0,288	3,7
Biosafety (Group 2) ¹	2,371	29,8	2,371	29,2	2,371	30,2
Sterilization (Group 3) ¹	1,519	19,1	1,519	18,7	1,519	19,4
Anesthesia (Group 4) ¹	1,014	12,7	1,014	12,5	1,014	12,9
Absolute isolation and cavity preparation (Group 5) ¹	0,995	12,5	0,995	12,2	0,995	12,7
Dental restoration (Group 6)	0,550	6,9	0,720	8,8	0,430	5,5
Finishing and Polishing (Group 7) ¹	1,226	15,4	1,226	15,1	1,226	15,6
Total	7,962	100	8,132	100	7,842	100

¹ – Secondary data from Hebling & Trentin, 2013(23).

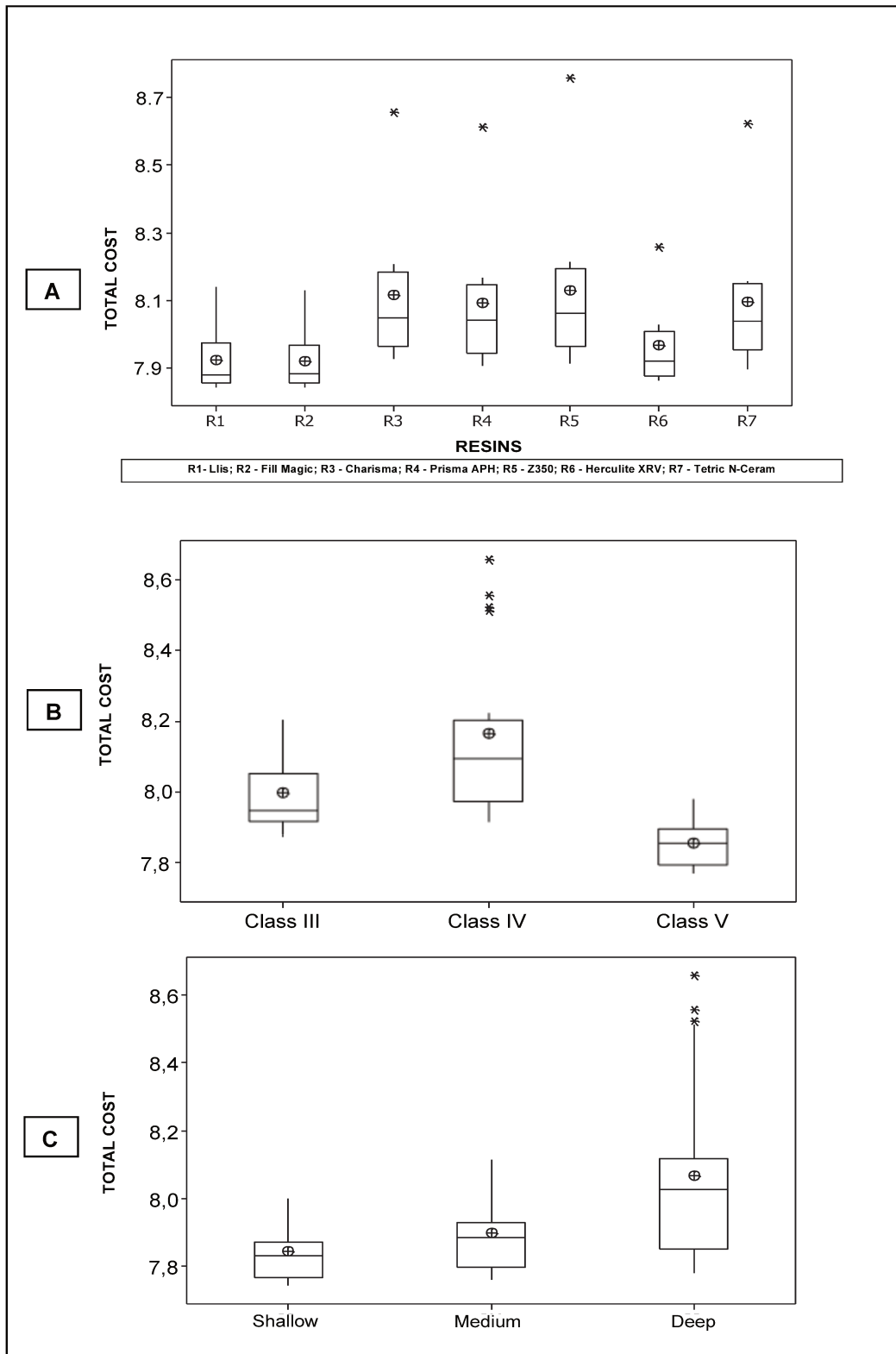


Figure 1: Slots-plots of data used in the non-parametric statistical data: **A-** Difference between the total costs of the materials to types of studied composite resin; **B-** Difference

between the total costs of the materials to types of cavity preparation; **C-** Difference between the total costs of the materials to types of depth classification.

DISCUSSION

This is the first study in which the cost analysis of materials used in Classes III, IV, and V composite resin dental restorations has been analyzed in Brazil. Indeed to our knowledge no cost analysis has been published on any aspect in Brazil and around the world. This fact makes it impossible to compare the founded results in this present study.

The list drawn up by researchers and assessed by the banks of judges represents an ideal pattern of care, covering requirements for excellence in productivity and quality of restorative procedures. All the metrics of biosafety were included, while respecting the ethical and legal precepts ^{12, 13, 14, 15} (Sao Paulo, 1995; Sao Paulo, 1999; Brazil, 2000; Estrela, 2003).

This standard of excellence of care should be observed in all types of dental care services, be they public or private, when the completion of direct composite resin dental restorations. The reduction of metrics of excellence of care may result in reduction of the cost of biosafety. However, the risks to health, both the patient and, mainly, the care team does not compensate for this reduction. Direct dental restorations represent low-risk procedures of contamination. Even so the precepts of biosafety must be respected ^{12, 13, 14, 15} (Sao Paulo, 1995; Sao Paulo, 1999; Brazil, 2000; Estrela, 2003). The use of barriers of protection reduces the risk of cross-contamination in both the treated patients as the dental team ¹⁵ (Estrela, 2003).

The low total value presented to the biosafety in this type of procedure (\$4.18) is still much lower than the values to be worn to minimize the possible effects of a contamination of the team or the patient by any type of infectious disease. The risks of inability to work and death of the dental team should also be considered, which may occur in low-risk procedures, as is the case of dental restorations. The lack of other national or international articles on the same subject made it difficult to compare these results.

The economic stability of the Brazil, which gave the control of inflation and the reduction in the rate of increase in prices of materials, can be found in the present study. There were no statistically significant differences between the total values of the materials studied among the three evaluated suppliers.

The present study showed that the mean cost of materials for restoration of class III was US\$7.96, for Class IV was US\$8.13, and for Class V was US\$7.84. There was a statistical difference in cost between Classes III, Class IV and V restoration. The value in the cost of the materials for Class IV is higher than for Classes III and V due to the high involvement of the tooth surfaces in the cavity preparation, requiring more quantity of restorative material than the other two types. Although showed low cost, the use of polyester matrix and wedge made that the material costs of Classes III and IV showed higher than of Class V.

This value does not represent the value of dental care feels to be charged to the patient. The cost of the material is a part of the variable costs to be considered in the calculation of the value of dental care feels. For the calculation of this must be considered both the fixed costs and the variable costs associated

with the dental care service.^{3, 4, 5} (Andrade *et al.*, 1999; Chiavenato, 2008; Bruni, 2010

Differences in the properties of composite resins have been demonstrated in other studies^{16, 17} (Busato, 2005; Mondelli, 2006). However, the ultimate goal of achieving a direct restorative procedure that is to obtain esthetic and functional results of the tooth, with longevity of acceptable procedure, can be obtained with the use of all types of commercial brands of resin available on the market. Thus, the observation of a small difference in the cost of the different resins evaluated causes that there is no significant difference in the final total cost of the materials used. This fact permits that composite resins with better physical and aesthetic characteristics can be elected as primary choice.

National Commission of Covenants and Accreditations²⁴ (Brazil, 2012) established, in 2012, the reference values for dental procedures. These provide minimum values of dental fees to be complied with in the private sector. The values suggested by this for restoration in composite resin type Class III was US\$43.20 (US\$1.0=R\$2.12), for Class IV was US\$61.31 and for the class V was US\$40.98. The values of the cost of the materials presented in this present study, which represent only one of the items to be considered in the calculation of the fees⁵ (Bruni, 2010), corresponded to 18.43% of the value of the fees for Class III, 13.26% for Class IV, and 19.13% for Class V. This fact reinforces the need for constant review of this fee values.

In the public sphere, the deployment of oral health funding policy for the municipalities with full management modified the lending forms intended to health

financial. The financial resources are no longer intended for production, according to the type of procedure to be carried out, but according to the types of programs of oral health to which the municipality joins, with on lending operations per inhabitant and program ²⁵ (Brazil, 2006). This fact makes the results of this study cannot be compared with the resources transferred to the municipality. However, managers of dental services, both public and private may use data founded in this study as parameters in strategic decision-making since the selection of the type of composite resin on the operability of the use of absolute isolation.

The continuity or the playback of this methodology for other groups of researchers in different scenarios and countries must be stimulated, thus allowing comparisons of the estimation of costs presented in this study.

Based on the obtained results, it may be concluded that there was statistically significant difference in cost of materials of some trade mark resins evaluated. Furthermore, there was statistically significant difference between the types of cavities and between the depths of cavities.

This present study showed values of direct and indirect materials to be used. These values can be used as parameters for the calculation of the dental care feels. Again, the lack of other studies on the same subject made it difficult to compare these results. This fact can be considered as one of the limitations of this type of study. In addition, other factors to be considered are possible regional differences in the values of the cost of the materials presented.

However, the methodology described in this present study, as well as the values of weight of composite resins evaluated can be easily reproduced in other studies, allowing the comparison of the results of the present study.

Future studies should be conducted to evaluate the cost-benefit ratio from the studied resins, as well as to compare the costs founded in this present paper with other costs in different regions and countries.

REFERENCES

1. Conceição JA, Masotti A, Hirata, R. *Reproduzindo função e estética com compósitos diretos e indiretos em dentes posteriores. Restaurações estéticas: compósitos, cerâmicas e implantes*. Porto Alegre: Artmed; 2005.
2. Barros OB. *Ergonomia 1: a eficiência ou rendimento e a filosofia correta de trabalho em Odontologia*. São Paulo: Pancast; 1991.
3. Andrade C, Farah EE, Mendonça FLP, Tatiyuwa N, Paes Júnior U. *Cálculo de custos para consultórios: guia prático para dentistas, médicos e profissionais de saúde*. São Paulo: Quest; 1999.
4. Chiavenato I. *Administração para não administradores: a gestão de negócios ao alcance de todos*. São Paulo: Saraiva, 2008.
5. Bruni AL. *A administração de custos, preços e lucros*. 4^a ed. São Paulo: Atlas; 2010.

6. Couttolenc BF, Zucchi P. *Gestão de Recursos Financeiros*. 2ª ed. São Paulo: Faculdade de Saúde Pública da USP; 1998.
7. Falk JA. *Gestão de custos para hospitais: conceitos, metodologias e aplicações*. São Paulo: Atlas; 2001.
8. Donaldson C. Economic evaluation in dentistry: an ethical imperative? *Dent Update*. 1998; 25(6): 260-264.
9. Bader J, A Ismaili *et al*. Evidence-based dentistry and the dental research community. *J Dent Res*. 1999; 78(9): 1480-1483.
10. Smales RJ, Hawthorne WS. Long-term survival and cost-effectiveness of five dental restorative materials used in various classes of cavity preparations. *Int Dent J*. 1996; 46(3): 126-130.
11. Mjor IA, Burke FJ *et al*. The relative cost of different restorations in the UK. *Br Dent J*. 1997; 182(8): 286-289.
12. São Paulo. Secretaria de Estado da Saúde. Centro de Vigilância Sanitária. Portaria CVS-11, de 04 de Julho de 1995, que dispõe sobre condições ideais de trabalho relacionadas ao controle de doenças transmissíveis em estabelecimentos de assistência odontológica. São Paulo: Secretaria de Estado da Saúde; 1995.
13. São Paulo. Secretaria de Estado da Saúde. Centro de Vigilância Sanitária.

Resolução SS-15, de 18 de Janeiro de 1999, que dispõe sobre norma técnica que estabelece condições para instalação e funcionamento de estabelecimentos de assistência odontológica, e dá providências correlatas. São Paulo: Secretaria de Estado da Saúde; 1999.

14. Brasil. Ministério da Saúde. Coordenação Nacional de DST e AIDS. Controle de infecções e a prática odontológica em tempos de AIDS: manual de condutas. Brasília: Ministério da Saúde; 2000.

15. Estrela C. Controle de infecção em odontologia. São Paulo: Artes Médicas; 2003.

16. Busato ALS. *Dentística: filosofia, conceitos e prática clínica*. Grupo Brasileiro dos Professores de Dentística. São Paulo: Artes Médicas; 2005.

17. Mondelli J. *Dentística: fundamentos de Dentística Operatória*. São Paulo: Santos; 2006.

18. Brazil. Brazilian Dentistry Council. Código de ética odontológica. Resolução CFO 179/91. Brasília: Conselho Federal de Odontologia; 1998.

19. Likert R. A Technique for the measurement of attitudes. Arch Psychol. 1932; 140: 1-55.

20. Siegel SC, Von Fraunhofer JA. Dental burs: what bur for which application? A survey of dental schools. J Prostodont. 1999; 8: 258-63.

21. Siegel SC, Von Fraunhofer JA. Assessing the cutting efficiency of dental diamond burs. J Am Dent Assoc. 1996; 127:763-72.
22. Gureckis KM, Burgess JO, Schwartz RS. Cutting effectiveness of diamond instruments subjected to cyclic sterilization methods. J Prosthet Dent. 1991; 66: 721-6.
23. Hebling E., Trentin EF. Análise de custos de materiais utilizados em restaurações dentárias em resina composta. Rev Odontol UNESP 2013; 42:144-151.
24. Brazil. Brazilian Dentistry Council. Valores referenciais para procedimentos odontológicos. Brasília: Conselho Federal de Odontologia, 2012.
25. Brazil. Health Ministry. Diretrizes operacionais: pactos pela vida, em defesa do SUS e de gestão. 2nd Ed. Brasilia: Ministério da Saúde; 2006.

CONCLUSÃO

Baseado nas limitações desse trabalho e nas premissas dos objetivos propostos, podemos concluir que:

- 1) O custo encontrado para restauração de Classe III foi de US\$7.97 (R\$16.90), para a de Classe IV de US\$8.13 (R\$17.24) e, para a de Classe V de US\$7.84 (R\$16.62);
- 2) Houve diferença estatística no custo entre os tipos de preparos e profundidades;
- 3) Os valores encontrados podem ser utilizados no cálculo do valor final do procedimento restaurador, auxiliando na gestão de serviços odontológicos públicos ou privados;
- 4) A metodologia desenvolvida para a obtenção dos dados do presente estudo pode ser empregada em outras regiões e países para a determinação de valores locais de materiais diretos e indiretos a serem utilizados em restaurações dentárias diretas de Classes III, IV e IV;
- 5) Futuros estudos devem ser realizados em outras regiões e países para permitir a comparação dos resultados encontrados no presente estudo.

REFERÊNCIAS[§]

Andrade C, Farah EE, Mendonça FLP, Tatiyuwa N, Paes Júnior U. *Cálculo de custos para consultórios: guia prático para dentistas, médicos e profissionais de saúde*. São Paulo: Quest; 1999.

Bader J, A Ismaili *et al*. Evidence-based dentistry and the dental research community. J Dent Res. 1999; 78(9): 1480-1483.

Barros OB. *Ergonomia 1: a eficiência ou rendimento e a filosofia correta de trabalho em Odontologia*. São Paulo: Pancast; 1991.

Bruni AL. *A administração de custos, preços e lucros*. 4^a ed. São Paulo: Atlas; 2010.

Busato ALS. *Dentística: filosofia, conceitos e prática clínica*. Grupo Brasileiro dos Professores de Dentística. São Paulo: Artes Médicas; 2005.

Ceccotti HM, Sousa DD. Manual de Teses e Dissertações da FOP/Unicamp. Piracicaba: UNICAMP/FOP; 2003.

Chiavenato I. *Administração para não administradores: a gestão de negócios ao alcance de todos*. São Paulo: Saraiva, 2008.

Conceição JA, Masotti A, Hirata, R. *Reproduzindo função e estética com compósitos diretos e indiretos em dentes posteriores. Restaurações estéticas:*

[§] De acordo com a Norma da FOP/UNICAMP, baseada no modelo Vancouver; abreviatura dos periódicos em conformidade com o Medline.

compósitos, cerâmicas e implantes. Porto Alegre: Artmed; 2005.

Donaldson C. Economic evaluation in dentistry: an ethical imperative? *Dent Update*. 1998; 25(6): 260-264.

Mjor IA, Burke FJ et al. The relative cost of different restorations in the UK. *Br Dent J*. 1997; 182(8): 286-289.

Mondelli J. *Dentística: fundamentos de Dentística Operatória*. São Paulo: Santos; 2006.

Smales RJ, Hawthorne WS. Long-term survival and cost-effectiveness of five dental restorative materials used in various classes of cavity preparations. *Int Dent J*. 1996; 46(3): 126-130.

APÊNDICE 1: Dados secundários do custo dos materiais dos Grupos 1, 2, 3 e 4**

TABELA 1: Descrição de valores absolutos e ajustados para os materiais do Grupo 1 (utilizados para manutenção e limpeza do equipamento).

Qt. ¹	Material	Unidade	Preços (R\$)				
			Dental 1	Dental 2	Dental 3	Valor médio	Valor Ajustado
01	Par de luvas de borracha grossa ²	1 Unid.	4,80	4,50	4,95	4,75 (±0,23)	0,01
06	Óleo lubrificante ³	200 ml	27,72	27,05	28,30	27,69 (±0,63)	0,09
03	Guardanapo de papel ⁴	Cx. 100	6,10	5,60	7,80	6,5 (±1,15)	0,05
01	Pano de limpeza (tipo Perfex) para limpeza do estofamento da cadeira e mochos, e proteção do refletor (úmido) ⁵	Pct. c/ 5	5,70	5,50	6,20	5,8 (±0,36)	0,01
01	10 ml de solução de álcool a 70% e digluconato de clorexidina a 4% para desinfecção das superfícies	1000 ml	4,10	4,90	5,15	4,72 (±0,55)	0,05
10	Gaze ⁶	Pct. 500	16,25	18,00	17,00	17,08 (±0,88)	0,35
01	2ml de sabão líquido para lavagens das mãos após a desinfecção	1000 ml	5,54	5,90	6,50	5,98 (±0,48)	0,01
03	Toalhas de papel para lavagens das mãos do auxiliar	Pct. 1000	13,00	12,00	13,45	12,82 (±0,74)	0,04
Valor Total do Grupo 1			83,21	83,45	89,35	85,34 (±3,48)	0,61

1 – Quantidade ajustada em unidades para realização do procedimento.

2 – Luva de borracha grossa: valor ajustado para vida média do produto de 3 meses, com taxa de depreciação de 33,32% ao mês e utilização mensal em até 160 pacientes. Valor Ajustado = $4,75 \times 33,32\% = 1,58 \div 160 = 0,01$

3 – Borrifadas de óleo (após um período de 4 horas de uso = 1 mL): para caneta de alta rotação, contra ângulo de baixa rotação e micro-motor de baixa rotação. Valor ajustado para uso em quatro pacientes. Valor Ajustado = $27,69 \div 200 \text{ mL} = 0,14 \div 4 = 0,03$

4 – Guardanapo de papel para proteção da lubrificação das canetas: valor ajustado para uso em quatro pacientes. Valor Ajustado = $0,07 \times 3 = 0,21 \div 4 = 0,05$

5 – Pano de Limpeza: valor ajustado para vida média do produto de 1 mês e utilização mensal em até 160 pacientes. Valor Ajustado = $1,16 \div 160 = 0,01$

6 – Gaze para fricção do desinfetante: nas canetas e seringa tríplice, mesa auxiliar, mangueiras de sucção, alça do equipo, alça e interruptor do refletor e bordas da cuspeira. Duas gazes por local.

** Dados secundários apresentados com autorização dos autores e publicados em TRENTIN EF. Análise de custo de materiais utilizados em restaurações dentárias em resina composta. Tese de Mestrado. Faculdade de Odontologia de Piracicaba, Universidade Estadual de Campinas. 2011.

TABELA 2: Descrição de valores absolutos e ajustados para os materiais do Grupo 2 (Proteção Individual descartável e para a biossegurança da equipe e do paciente).

Qt	Material	Unidade	Preços (R\$)				Valor Ajustado
			Dental 1	Dental 2	Dental 3	Valor Médio	
Barreiras de Proteção do Equipamento							
01	2 ml de sabão líquido para lavagens das mãos	1000 ml	5,54	5,90	6,50	5,98 (±0,48)	0,01
03	Toalhas de papel para lavagens das mãos	Pct.1000	13,00	12,00	13,45	12,82 (±0,74)	0,04
01	Filme de plástico PVC ¹	15 m	7,20	6,90	7,50	7,2 (±0,3)	0,81
01	Filme de plástico PVC ²	30 m	14,40	13,80	15,00	14,4 (±0,6)	0,84
01	Protetor plástico ³	Pct.100	8,40	7,95	8,90	8,42 (±0,48)	0,16
01	Par de luvas de procedimentos descartáveis para uso na colocação das barreiras	Cx. 50 pares	14,50	15,50	18,50	16,17 (±2,08)	0,32
Biossegurança do paciente							
01	Copo plástico de café de 5ml	Pct.100	4,00	3,00	4,50	3,83 (±0,76)	0,04
01	5ml de digluconato de clorexidina a 0,2 % para bochecho pré-operatório	1000 mL	13,54	13,60	14,25	13,8 (±0,39)	0,07
01	Guardanapo de papel	Cx.100	4,00	4,50	4,65	4,38 (±0,34)	0,04
EPI descartável para o Paciente							
01	Babadouro tipo avental de papel descartável	Cx.100	16,90	15,40	17,50	16,6 (±1,08)	0,17
01	Óculos para o paciente ⁴	1unid.	11,80	13,50	15,20	13,5 (±1,7)	0,11
01	Saco plástico ⁵	Cx. 1000	9,36	10,40	11,60	10,45 (±1,12)	0,01
EPI descartável para o Operador							
01	Gorro descartável	Pct.100	7,55	7,95	8,20	7,9 (±0,33)	0,08
01	Máscara descartável	Pct.50	9,31	9,50	9,80	9,54 (±0,25)	0,19
01	Óculos para o operador ⁶	1unid.	11,80	13,50	15,20	13,5 (±1,7)	0,03
02	Saco plástico ⁵	Cx. 1000	9,36	10,40	11,60	10,45 (±1,12)	0,01
01	Par de luvas de procedimentos	Cx. 50 pares	14,50	15,50	18,50	16,17 (±2,08)	0,32
01	Avental em TNT descartável ⁷	Pct. 10	19,34	20,50	22,30	20,71 (±1,49)	0,52
03	Toalhas de papel para lavagens das mãos	Pct.1000	13,00	12,00	13,45	12,82 (±0,74)	0,04
01	2ml de sabão líquido para lavagens das mãos	1000 ml	5,54	5,90	6,50	5,98 (±0,48)	0,01
EPI descartável para o auxiliar							
01	Gorro descartável	Pct.100	7,55	7,95	8,20	9,54 (±0,25)	0,08
01	Máscara descartável	Pct. 50	9,31	9,50	9,80	13,5 (±1,7)	0,19
01	Óculos para o auxiliar ⁶	1 unid.	11,80	13,50	15,20	10,45 (±1,12)	0,03
01	Saco plástico ⁵	Cx. 1000	9,36	10,40	11,60	16,17 (±2,08)	0,01
01	Par de luvas de procedimentos	Cx. 50 pares	14,50	15,50	18,50	20,71 (±1,49)	0,32
01	Avental em TNT descartável ⁷	Pct.10	19,34	20,50	22,30	12,82 (±0,74)	0,52
03	Toalhas de papel para lavagens das mãos	Pct. 1000	13,00	12,00	13,45	5,98 (±0,48)	0,04
01	2mL de sabão líquido para lavagens das mãos	1000 ml	5,54	5,90	6,50	7,9 (±0,33)	0,01
Total Geral para o Grupo 2			419,84	424,4	470,05	438,1±31,43	5,02

1 – Filme de plástico PVC (Tipo Magipac®): tamanho 14 X 15 cm para proteção da caneta de alta rotação, da segunda caneta de alta rotação, do micro motor, do contra ângulo de baixa rotação, do cabo da seringa triplice do equipo, da alça do equipo, da alça do refletor, 14 X 25 cm para proteção do cabo da seringa triplice da unidade auxiliar, 14 X 35 cm para proteção da alça e ponteira do fotopolimerizador.

2 – Filme de plástico PVC (Tipo Magipac®): tamanho 28 X 40 cm para proteção do encosto de cabeça da cadeira do paciente, 28 X 70 cm para proteção do encosto dorsal e botões de comando da cadeira do paciente, 28 X 15 cm para proteção do encosto de braços da cadeira do paciente, 28 X 25 cm para proteção da mangueira do sugador de saliva e para proteção da mangueira do sugador de sangue e dejetos

3 – Protetor plástico: para a ponta da seringa triplice do equipo e da unidade auxiliar

4–Óculos de proteção com escudo lateral: valor ajustado para vida média do produto de 6 meses, com taxa de depreciação de 16,66% ao mês e utilização mensal em até 20 pacientes (uso uma vez ao dia, após o processo de desinfecção e acondicionamento). Valor Ajustado = $13,50 \times 16,66\% = 2,25 \div 20 = 0,11$

5 – Saco plástico: para selamento térmico para acondicionar os óculos de proteção do paciente ou da equipe de atendimento após a desinfecção química, tamanho 12 X 20 cm

6 – Óculos de proteção com escudo lateral: valor ajustado para vida média do produto de 3 meses, com taxa de depreciação de 33,32% ao mês e utilização mensal em até 160 pacientes (uso o dia todo). Valor Ajustado = $13,50 \times 33,32\% = 4,50 \div 160 = 0,03$

7 – Avental descartável: valor ajustado para vida média do produto de 4 horas (procedimentos de baixo risco), com utilização diária em até 4 pacientes. Valor Ajustado = $2,07 \text{ (unidade)} \div 4 = 0,52$.

TABELA 3: Descrição de valores absolutos e ajustados para os materiais do Grupo 3 (esterilização do instrumental).

Qt	Material	Unidade	Preços (R\$)				
			Dental 1	Dental 2	Dental 3	Valor Médio	Valor Ajustado
Materiais para Esterilização do Instrumental em Autoclave							
01	Invólucro de polipropileno ¹	Emb. 100	33,86	33,00	35,20	34,02±1,11	2,72
Materiais para Desinfecção dos Óculos de Proteção do Paciente e Equipe (por imersão)							
03	200 ml de hipoclorito de sódio a 1% para desinfecção dos óculos de proteção do operador	1000 ml	2,66	3,80	4,60	3,69±0,97	0,34
Outros Materiais para Esterilização							
01	Par de luvas de borracha grossa ²	1 Unid.	4,80	4,50	4,95	4,75±0,23	0,01
03	Toalhas de papel ³	Pct.c/1000	13,00	12,00	13,50	12,83±0,76	0,12
01	6ml de sabão líquido ⁴	1000 ml	5,54	5,90	6,50	5,98±0,48	0,03
Total Geral para o Grupo 3			59,86	59,20	64,75	61,27±3,03	3,22

1 - Invólucro de polipropileno para esterilização: tamanhos de 15 X 30 cm (para todo Instrumental restaurador em estojo perfurado), 15 X 30 cm (bandeja metálica 13x23x10 cm), 16 X 14 cm (arco de isolamento absoluto), 12 X 18 cm (perfurador de lençol de borracha), 12 X 20 cm (pinça porta grampos), 8 X 14 cm (tesoura), 12 X 15 cm (15 grampos de isolamento nº 1, 1A, 2A, 14, 14A, 22, 26, 200, 205, 206, 208, 209, 210, 212 e W8A) e 8 X 7 cm (broqueiro pequeno - 8 brocas)

2 - Luva de borracha grossa (exclusiva para lavagem do instrumental): valor ajustado para vida média do produto de 3 meses, com taxa de depreciação de 33,32% ao mês e utilização mensal em até 160 pacientes. Valor Ajustado = $4,75 \times 33,32\% = 1,58 \div 160 = 0,01$.

3 - Toalhas de papel: para lavagens das mãos e para secagem do instrumental

4 - Sabão líquido - 4 ml para lavagem do instrumental e 2 mL para lavagens das mãos

TABELA 4: Distribuição dos valores totais dos três grupos de materiais analisados para a biossegurança.

Grupo	Valor	%
Grupo 1: Materiais utilizados para a manutenção e limpeza do equipamento	0,61	6,89
Grupo 2: Materiais utilizados como Equipamentos de Proteção Individual (EPI) descartáveis e para a biossegurança da equipe e do paciente	5,02	56,72
Grupo 3: Materiais utilizados para a esterilização do instrumental	3,22	36,39
TOTAL	8,85	100

TABELA 5: Descrição de valores absolutos e ajustados para os materiais do Grupo 4 (anestesia local).

Qt	Material	Unidade	Preços (R\$)				
			Dental 1	Dental 2	Dental 3	Valor Médio	Valor Ajustado
Pré-anestésicos							
01	Bola pequena de algodão (menos de 1 g)	Pct 500g	12,99	13,00	13,50	13,16± 0,29	0,00
03	0,05g anestésico tópico (gel)	PT.12 g	6,47	6,80	7,50	6,92 ± 0,53	0,03
01	Agulha longa descartável	Cx 100	17,90	18,30	18,90	18,37± 0,50	0,18
Anestésicos locais							
02	Tubetes de anestésico lidocaína 2% com epinefrina 1:100.000 (Alphacaine®)	Cx 50	47,90	48,45	48,90	48,42±0,50	1,94
Total Geral para o Grupo 4			85,26	86,55	88,8	86,87±1,79	2,15

APÊNDICE 2: Dados secundários do custo dos materiais dos Grupos 5 e 7.^{††}

TABELA 1: Descrição de valores absolutos e ajustados para os materiais utilizados para isolamento absoluto e preparo cavitário (Grupo 5).

Qt.	Material	Unidade	Custos (R\$)					
			Dental 1	Dental 2	Dental 3	Valor Médio (DP) ¹	Valor Ajustado	%
Isolamento absoluto								
01	Guardanapo de papel	Pct. 50	5,00	4,50	5,20	4.9 (±0.36)	0,10	4,74
01	Lençol de borracha, cortado, cor escura, tamanho 12,5 x 12,5 cm	cx. 26	14,17	14,00	14,90	14.36 (±0.48)	0,55	26,06
01	60 cm de fio dental	Rolo125m	4,50	4,90	5,45	4.95 (±0.48)	0,02	0,95
01	0,2 g. de vaselina sólida ou gel de barbear	Tubo 65g	6,90	8,70	7,20	7.6 (±0.96)	0,02	0,95
Preparo cavitário								
01	Sugador de saliva descartável	Pct. 40	2,50	2,90	3,10	2.83 (±0.31)	0,07	3,32
01	Broca em aço carbide, para baixa rotação ²	1unid	4,54	5,20	4,95	4.9 (±0.33)	0,49	23,22
02	Brocas diamantadas para alta rotação ¹	1unid	3,80	4,50	4,90	4.4 (±0.56)	0,86	40,76
Total Geral do Grupo 5			41,41	44,70	45,70	41,41 (±3.87)	2,11	100

1 - DP = Desvio-padrão; 2 - Valor ajustado das brocas: alta rotação: R\$ 4,30 ÷ 10 = R\$ 0,43 X 2 = R\$ 0,86; baixa rotação: R\$ 4,90 ÷ 10 = R\$ 0,49.

^{††} Dados secundários apresentados com autorização dos autores e publicados em HEBLING E., TRENTIN EF. Análise de custo de materiais utilizados em restaurações dentárias em resina composta. Rev. Odontol UNESP 2013; 42(3): 144-151.

TABELA 2: Descrição de valores absolutos e ajustados para os materiais utilizados para acabamento, ajuste e polimento do dente (Grupo 7)

Qt.	Material	Unidade ²	Custos (R\$)					
			Dental 1	Dental 2	Dental 3	Valor Médio (DP) ³	Valor Ajustado	%
1	Tira de lixa para polimento e acabamento dental de resina composta (3M)	Cx. 150	50,40	51,40	52,10	51,3 (±0,85)	0,34	13,08
1	0,01 g de pasta para acabamento para resina composta de granulação extrafina – Diamond Excel – FGM (em seringa)	Ser. 2g	26,30	28,00	32,00	28,77 (±2,93)	0,14	5,38
1	Discos de feltro flexíveis (marcas: Diamond Flex, FGM e TDV) (em caixa)	24 un.	40,51	42,15	46,20	42,95 (±2,93)	0,18	6,92
1	15 cm de fio dental para teste do ponto de contato proximal	Rolo 100 m	5,00	4,50	6,20	5,23 (±0,87)	0,01	0,39
1	Carbono para articulação fino (Detecto)	12 fl.	11,60	13,65	12,59	12,61 (±1,03)	1,05	40,38
1	Peça montada de silicone na forma de cone para acabamento de resina composta ¹	Cx. 7un	59,00	61,20	63,45	61,22 (±2,23)	0,88	33,85
Total Geral para o Grupo 7			192,81	200,9	212,54	202,08 (±9,92)	2,60	100

1 - Valor ajustável para uso em até 10 pacientes, após processo de desinfecção; 2 – Cx= Caixa; Ser.= Seringa; Un.= Unidade; fl.= Folha; m=metros; g= gramas; 3 – DP= Desvio-padrão.

APÊNDICE 3: Dados da análise estatística do presente trabalho.

TABELA 1: Cálculo da média e desvio padrão (dp) do Custo Total dos Materiais Diretos e Indiretos (em US\$) utilizados em cada dente artificial.

Classe	Média	Marcas de Resinas Compostas							Média ($\pm$ dp)
		Llis	Fill Magic	Charisma	Prisma APH	Z350	Herculite XRV	Tetric N- Ceram	
CLASSE III	Rasa	7,816	7,815	7,913	7,888	7,899	7,836	7,877	7,863 ($\pm$0,041)
	Média	7,851	7,849	8,016	8,003	8,037	7,894	8,005	7,951 ($\pm$0,082)
	Profunda	7,902	7,893	8,186	8,147	8,204	7,980	8,173	8,069 ($\pm$0,139)
	Média (dp)	7,856 ($\pm$0,044)	7,852 ($\pm$0,039)	8,038 ($\pm$0,138)	8,013 ($\pm$0,130)	8,047 ($\pm$0,153)	7,904 ($\pm$0,072)	8,018 ($\pm$0,149)	7,961 ($\pm$0,050)
CLASSE IV	Rasa	7,841	7,839	8,012	8,008	8,005	7,880	7,985	7,938 ($\pm$0,081)
	Média	7,887	7,878	8,139	8,093	8,147	7,928	8,079	8,022 ($\pm$0,119)
	Profunda	8,061	8,049	8,671	8,616	8,788	8,202	8,631	8,431 ($\pm$0,315)
	Média ($\pm$ dp)	7,929 ($\pm$0,116)	7,922 ($\pm$0,112)	8,274 ($\pm$0,350)	8,239 ($\pm$0,330)	8,313 ($\pm$0,417)	8,003 ($\pm$0,174)	8,232 ($\pm$0,349)	8,130 ($\pm$0,126)
CLASSE V	Rasa	7,744	7,746	7,862	7,836	7,859	7,770	7,844	7,809 ($\pm$0,053)
	Média	7,754	7,752	7,891	7,874	7,896	7,781	7,887	7,834 ($\pm$0,067)
	Profunda	7,780	7,780	7,977	7,971	7,994	7,826	7,966	7,899 ($\pm$0,099)
	Média (dp)	7,759 ($\pm$0,018)	7,759 ($\pm$0,018)	7,910 ($\pm$0,060)	7,893 ($\pm$0,069)	7,916 ($\pm$0,070)	7,792 ($\pm$0,029)	7,899 ($\pm$0,062)	7,847 ($\pm$0,024)

TABELA 2. Estatística Descritiva da variável Custo Total dos Materiais Diretos e Indiretos, conforme os níveis dos fatores Marcas de Resina, Classificação das Restaurações e Tamanho das Cavidades.

Custo Total dos Materiais	N	Média	D.P.	Mínimo	Mediana	Máximo
Fator Marcas de Resinas						
Custo Total dos Materiais (R1)	9	7,848	0,097	7,744	7,841	8,061
Custo Total dos Materiais (R2)	9	7,845	0,093	7,746	7,839	8,049
Custo Total dos Materiais (R3)	9	8,074	0,248	7,862	8,012	8,671
Custo Total dos Materiais (R4)	9	8,048	0,236	7,836	8,003	8,616
Custo Total dos Materiais (R5)	9	8,092	0,285	7,859	8,005	8,788
Custo Total dos Materiais (R6)	9	7,900	0,132	7,770	7,880	8,202
Custo Total dos Materiais (R7)	9	8,050	0,241	7,844	7,985	8,631
Fator Classificação das Restaurações						
Custo Total dos Materiais (Classe III)	21	7,961	0,126	7,815	7,902	8,204
Custo Total dos Materiais (Classe IV)	21	8,130	0,291	7,839	8,049	8,788
Custo Total dos Materiais (Classe V)	21	7,847	0,082	7,744	7,844	7,994
Fator Tamanho das Cavidades						
Custo Total dos Materiais (Rasa)	21	7,870	0,079	7,744	7,859	8,012
Custo Total dos Materiais (Média)	21	7,935	0,118	7,752	7,894	8,147
Custo Total dos Materiais (Profunda)	21	8,133	0,300	7,780	8,049	8,788

TABELA 3. Análise do Custo Total de Materiais Diretos e Indiretos com fixação do fator Marcas de Resina

VARIÁVEL	Teste de Friedman p-valor	Teste de Siegel & Castellan (Teste de comparações múltiplas)							
		Marcas Comerciais de Resinas Composta	Llis	Fill Magic	Charisma	Prisma APH	Z350	Herculite XRV	Tetric N-Ceram
CUSTO TOTAL DE MATERIAIS DIRETOS E INDIRETOS	< 0,001	Llis		a	b	a	b	a	a
		Fill Magic			b	b	b	a	b
		Charisma				a	a	b	a
		Prisma APH					a	a	a
		Z350						b	a
		Herculite XRV							a
		Tetric N-Ceram							

a: não-significância; b: significância

TABELA 4. Análise do Custo Total de Materiais Diretos e Indiretos com fixação do fator Classificação da Restauração

VARIÁVEL	Teste de Friedman p-valor	Teste de Siegel & Castellan (Teste de comparações múltiplas)			
		Classificação da Restauração	Classe III	Classe IV	Classe V
CUSTO TOTAL DE MATERIAIS DIRETOS E INDIRETOS	< 0,001	Classe III		b	b
		Classe IV			b
		Classe V			

a: não-significância; b: significância

TABELA 5. Análise do Custo Total de Materiais Diretos e Indiretos com fixação do fator Tamanho da Cavidade

VARIÁVEL	Teste de Friedman p-valor	Teste de Siegel & Castellan (Teste de comparações múltiplas)			
		Tamanho da Cavidade	Rasa	Média	Profunda
CUSTO TOTAL DE MATERIAIS DIRETOS E INDIRETOS	< 0,001	Rasa		b	b
		Média			b
		Profunda			

a: não-significância; b: significância

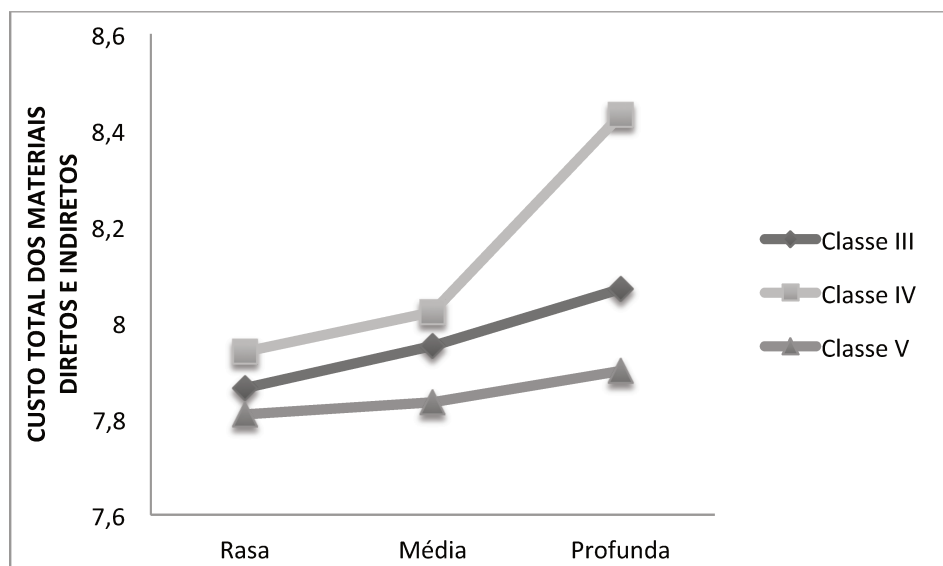


Figura. 1. Representação das médias dos grupos formados pelas combinações da Classificação da Restauração e Tamanho da Cavidade quando a resposta é o Custo Total dos Materiais Diretos e Indiretos.

ANEXO: Normas de publicação da revista *Brazilian Journal of Oral Science*

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Acknowledgements

Financial support by government agencies should be acknowledged as well as technical assistance or assistance from colleagues.

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Manuscript published in journals

Blomlof JP, Blomlof LB, Lindskog SF. Smear removal and collagen exposure after non-surgical root planning followed by etching with an EDTA gel preparation. J Periodontol. 1996;67:841-5.

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Davidson CL. Advances in glass-ionomer cements. J Appl Oral Sci. 2006;14 (sp. Issue):3-9.

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Dental Update. Guildford 1991;18(1).

Thesis

Hyde DG. Physical properties of root canal sealers containing calcium hydroxide. [Master's thesis]. Michigan: University of Michigan; 1986. 80p.

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