

**UNIVERSIDADE FEDERAL DE GOIÁS  
PÓS-GRADUAÇÃO EM CIÊNCIAS DA SAÚDE**

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**Prevalência de Dentes Tratados Endodonticamente em  
uma População de Adultos Brasileiros**

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**Augusto César Braz Hollanda**

**Tese de Doutorado**

**Goiânia  
2008**

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PÓS-GRADUAÇÃO EM CIÊNCIAS DA SAÚDE**

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uma População de Adultos Brasileiros**

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Tese de Doutorado apresentada ao Programa de Pós-Graduação em Ciências da Saúde da Universidade Federal de Goiás para obtenção do Título de Doutor em Ciências da Saúde.

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# **Siglas e abreviaturas**

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CI – confidence intervals ; IC – intervalo de confiança

DMF-T - decay/missing/filled – teeth; CPO-D – índice de dentes cariados, perdidos e obturados

OR – odds ratio

P – qui-quadrado

AP – apical periodontitis; PA - periodontite apical;

# Resumo

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## **Prevalência de dentes tratados endodonticamente em uma população de adultos brasileiros**

O objetivo do estudo transversal foi avaliar a prevalência de dentes tratados endodonticamente em uma população de brasileiros adultos. Um total de 1.401 radiografias panorâmicas, oriundas do banco de imagens do Centro de Radiologia e Imagens Orofacial de Cuiabá (CRIOF, Cuiabá, MT, Brazil), entre agosto de 2002 e setembro de 2007 foi analisado. Três examinadores avaliaram todas as imagens, considerando-se a presença de tratamento endodôntico, indiferente à qualidade do tratamento (presença ou ausência de retentor intra-radicular ou periodontite apical). Os dados foram estatisticamente avaliados empregando-se razão de chances (odds ratio), regressão logística e teste Qui-quadrado. A partir de 29.467 dentes avaliados, 6.313 (21,4%) eram endodonticamente tratados. Os pré-molares e molares superiores foram os dentes com maior prevalência de tratamento, enquanto os incisivos inferiores representaram o grupo de menor prevalência. Indivíduos do gênero feminino (61.9%), e com idade entre 46 a 60 anos apresentaram maior prevalência de tratamento endodôntico. O presente estudo encontrou elevada prevalência de dentes tratados endodonticamente em adultos Brasileiros comparada com outros estudos epidemiológicos.

**Palavras chave:** periodontite apical, tratamento endodôntico, obturação do canal radicular, epidemiologia.

# Abstract

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## **Prevalence of endodontically treated teeth in a Brazilian adult population**

This cross-sectional study examined the prevalence of endodontically treated teeth in 1,401 Brazilian adults. Panoramic radiographs were selected at the Radiological Center of Orofacial Images (CRIOF, Cuiabá, MT, Brazil) between August 2002 and September 2007. Three independent endodontists discussed interpretation criteria and classified specimens according to the following data: presence of root canal treatment, which was defined as partially or completely filled canal space, regardless of whether filling ended at the radiographic apex or not; presence of intracanal post; and associated apical periodontitis. Odds ratio, logistic regression and a chi-square test were used for statistical analyses. Significance level was set at  $p < 0.05$ . Of 29,467 teeth evaluated, 6,313 (21.4%) were treated endodontically. Endodontic treatment was most frequent in maxillary premolars and molars, whereas mandibular incisors showed the lowest prevalence. Most endodontically treated teeth were found in people aged 46 to 60 years (47.6%,  $p < 0.001$ ) and the prevalence increased with age in this age range. Females (61.9%,  $p < 0.001$ ) showed a higher prevalence of teeth with root fillings than males. The present study found a higher prevalence of endodontically treated teeth in a Brazilian adult population compared to the prevalence reported in epidemiological studies conducted in other countries.

**Key Words:** apical periodontitis, endodontic therapy, root canal filling, epidemiology.

# 1. Introdução

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Vários são os fatores de risco podem injuriar a polpa dentária. Um dos mais importantes agentes danosos à polpa dentária é a cárie dentária, causada por microrganismos bucais. Uma importante seqüela da cárie dentária é a infecção pulpar. O tratamento endodôntico deveria ser planejado de acordo com a distribuição, prevalência e severidade da doença. O estudo da epidemiologia endodôntica pode contribuir para este conhecimento.

Estudos recentes têm investigado os mecanismos de agressão microbiana à polpa dentária, o desenvolvimento da periodontite apical, e as opções de tratamentos para as lesões pulpares (Holland *et al.*, 1998; Estrela *et al.*, 2004). No entanto, alguns fatores podem afetar a sobrevivência dentária, tais como cárie dentária, doença periodontal e o tratamento endodôntico. A cárie dentária provoca graves injúrias à polpa dentária. Um relatório sobre a saúde bucal da população Brasileira realizado pelo Ministério da Saúde (2004) mostrou que 70% dos adolescentes de 12 anos e 90% de indivíduos entre 15 e 19 anos apresentaram pelo menos um dente com experiência de cárie dentária. Indivíduos na faixa etária entre 35 a 44 anos e entre 65 a 74 anos apresentaram um aumento substancial do número de seqüelas de cárie dentária.

A prevalência de dentes tratados endodonticamente associados ou não a periodontite apical foi estudada em diferentes populações (De Cleen *et al.*, 1993; Marques *et al.*, 1998; DeMoor *et al.*, 2000; Eriksen *et al.*, 2002; Kirkevang *et al.*, 2001; Lupi-Pegurier *et al.*, 2002; Tsuneishi *et al.*, 2005; Bołtacz-Rzepkowska & Laszkiewicz, 2005; Estrela *et al.*, 2008a,b). Nestes estudos epidemiológicos alguns avaliaram o número total de dentes tratados; outros analisaram o número de indivíduos com tratamento endodôntico e outros a associação do tratamento endodôntico com a periodontite apical (Dugas *et al.*, 2003; Kirkevang & Wenzel, 2003; Jiménez-Pinzón *et al.*, 2004; Tsuneishi *et al.*, 2005). A frequência de tratamentos endodônticos encontradas nestes trabalhos variou de 1,2% a 23%. Tsuneishi *et al.* (2005) determinaram a prevalência de tratamentos endodônticos e radiolucências periapicais em uma população de adultos Japoneses. A condição periapical e o comprimento de raízes obturadas de 672 indivíduos atendidos no Hospital Universitário de Odontologia de Okayama foram avaliados por meio de radiografias periapicais de toda boca. O número total de dentes examinados foi 16.232, sendo que destes 3.320 (20,5%) haviam sido tratados endodonticamente. A prevalência de dentes com raízes obturadas foi mais elevada nesta população japonesa do que na Europa ou na América (Buckley & Spångberg, 1995; Marques *et al.*, 1998, DeMoor *et al.*, 2000; Dugas *et al.*, 2003; Jiménez-Pinzón *et al.*, 2004; Bołtacz-Rzepkowska & Laszkiewicz, 2005); no entanto, a relação dos dentes com periodontite apical

tratados endodonticamente estava dentro da média relatada para outros países. Bueno & Estrela (2008) examinaram a prevalência de tratamento endodôntico e periodontite apical em diferentes populações do mundo, utilizando-se de uma revisão sistemática. Em 262 estudos avaliados, 63 contemplaram os critérios de inclusão. A prevalência de periodontite apical associada com o tratamento endodôntico foi elevada. Houve uma discrepância entre as taxas de prevalência mínima e máxima de tratamento endodôntico. Estes índices são importantes instrumentos e indicam a necessidade de obedecer a um rigoroso protocolo terapêutico e permanente atualização científica. Eriksen *et al.* (2002) constataram poucos estudos epidemiológicos foram publicados na última década na área de Endodontia, o que viabiliza o ajuste de procedimentos preventivos e clínicos do tratamento endodôntico.

Os índices de prevalência da cárie dentária no Brasil e a escassez de estudos epidemiológicos, segundo o Ministério da Saúde (2004) indicam e justificam a necessidade de estudos epidemiológicos nas diferentes especialidades odontológicas. Portanto, o objetivo deste estudo foi investigar a prevalência de dentes tratados endodonticamente em uma população de adultos Brasileiros.

## 2. Objetivo

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O objetivo deste estudo foi:

1. Avaliar a prevalência de dentes tratados endodonticamente em uma população de adultos Brasileiros.

## 3. Publicação

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**Artigo** – Hollanda ACB, Alencar AHG, Estrela CRA, Bueno MR, Estrela C.  
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## **Prevalence of endodontically treated teeth in a Brazilian adult population**

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## Prevalence of endodontically treated teeth in a Brazilian adult population

### ABSTRACT

This cross-sectional study examined the prevalence of endodontically treated teeth in 1,401 Brazilian adults. Panoramic radiographs were selected at the Radiological Center of Orofacial Images (CRIOF, Cuiabá, MT, Brazil) between August 2002 and September 2007. Three independent endodontists discussed interpretation criteria and classified specimens according to the following data: presence of root canal treatment, which was defined as partially or completely filled canal space, regardless of whether filling ended at the radiographic apex or not; presence of intracanal post; and associated apical periodontitis. Odds ratio, logistic regression and a chi-square test were used for statistical analyses. Significance level was set at  $p < 0.05$ . Of 29,467 teeth evaluated, 6,313 (21.4%) were treated endodontically. Endodontic treatment was most frequent in maxillary premolars and molars, whereas mandibular incisors showed the lowest prevalence. Most endodontically treated teeth were found in people aged 46 to 60 years (47.6%,  $p < 0.001$ ) and the prevalence increased with age in this age range. Females (61.9%,  $p < 0.001$ ) showed a higher prevalence of teeth with root fillings than males. The present study found a higher prevalence of endodontically treated teeth in a Brazilian adult population compared to the prevalence reported in epidemiological studies conducted in other countries.

**Key Words:** apical periodontitis, root canal therapy, endodontic treatment, root canal filling, epidemiology.

## INTRODUCTION

Several risk factors may affect the dental pulp. One of the most important injurious agents of the dental pulp is caries disease, caused by oral microorganisms. Pulp infection is an important caries sequel and the endodontic treatment should be planned according to disease distribution, prevalence and severity. The study of endodontic epidemiology may contribute to increase this knowledge.

Previous studies have investigated the mechanisms of microbial aggression to the dental pulp, the development of apical periodontitis (AP), and treatments for pulp injuries (1,2). However, some factors may affect tooth survival, such as dental caries, periodontal disease and endodontic treatment. Dental caries causes some of the most severe injuries to the dental pulp. A report on the oral health of the Brazilian population between 2002-2003, issued by the Brazilian Ministry of Health (3), showed that 70% of the 12-year-old and 90% of the 15-19-year-old adolescents had at least one decayed tooth. Individuals aged 35 to 44 and 65 to 74 years show a substantial increase in the number of dental caries sequelae.

The prevalence of endodontically treated teeth associated with AP or not has been examined in several populations (4-14). Some epidemiological studies evaluated the total number of treated teeth, while others evaluated the number of individuals with endodontic treatment and the association of endodontic treatment with AP (7-15). Data of these studies showed that 1.2% to 23% of all teeth had endodontic treatment.

Tsuneishi et al. (7) evaluated the prevalence of endodontic treatment and periapical radiolucencies in a Japanese adult population. Periapical status and

length of root fillings of 672 adult patients seen at the Okayama University Hospital of Dentistry were evaluated using full-mouth intraoral radiographs. The total number of examined teeth was 16,232, and 3,320 teeth (20.5%) had been treated endodontically. The prevalence of root-filled teeth was higher in this Japanese population than in Europe or America (9-11,15,16,18). However, the ratio of teeth with apical radiolucency in root-filled teeth was within the range reported for other countries. Bueno and Estrela (19) examined the prevalence of endodontic treatment and AP in different populations using a systematic review. Their search yielded 262 studies and 63 met their inclusion criteria. The prevalence of AP in association with endodontic treatment was high. There was a discrepancy between minimum and maximum prevalence rates. These indexes are important evaluation tools and show that continuous scientific updating is necessary.

Eriksen et al. (4) have pointed that the purposes of the few epidemiological studies in Endodontics published in the last decade were the adjustment of preventive and clinical procedures and the determination of endodontic treatment status.

According to the Brazilian Ministry of Health (3), data on the prevalence of dental caries in Brazil and the scarcity of epidemiological studies indicate that the prevalence of endodontic treatment should be investigated. Therefore, the purpose of this study was to examine the prevalence of endodontically treated teeth in a Brazilian adult population.

## **MATERIAL AND METHODS**

This cross-sectional study examined the prevalence of endodontically treated teeth in 1,401 males and females with a mean age of 48 years. Panoramic radiographs were retrieved from randomly selected charts of patients seen at the Radiological Center of Orofacial Images (CRIOF, Cuiabá, MT, Brazil) between August 2002 and September 2007. The sample consisted of 1,401 panoramic images captured with an Orthoralix 9200 AEC panoramic system (Gendex Dental Systems, Des Plaines, IL, USA) using 0.5-mm focal spot and Kodak dental film (T-MAT, 15X30, Manaus, AM, Brazil). The study protocol was independently reviewed and approved by the institutional Research Ethics Committee.

Three independent endodontists with over 5 years of clinical experience discussed interpretation criteria and then examined the radiographs. About 10% of all samples were initially examined by the observers for calibration and standardization of evaluation criteria. When a consensus was not reached after two observers examined the radiographs, the third observer made the final decision. The images were examined using an image-analysis software in a PC workstation running Microsoft Windows XP professional SP-1 (Microsoft Corp., Redmond, WA, USA).

The criteria for radiographic detection of endodontic treatment of all teeth seen on the radiographs, except for third molars, were the presence of radiopaque material in the pulp chamber, in one or more root canals, or in a combination of these sites. The following conditions were recorded: poor or complete root canal filling, ending or not at the radiographic apex or not, presence of intracanal post and associated AP.

## **Statistical analysis**

Odds ratio, logistic regression and a chi-square test were used for statistical analyses. Significance level was set at  $p < 0.05$ . Interobserver agreement was assessed using kappa ( $k$ ) values.

## **RESULTS**

Of 29,467 evaluated teeth, 6,313 (21.4%) had been endodontically treated. Table 1 shows the distribution of endodontically treated teeth according to age and gender. Table 2 shows the prevalence and distribution of root canal treatment according to the tooth type.

Maxillary premolars and molars were the teeth in which endodontic treatment was most frequent, whereas mandibular incisors showed the lowest prevalence. The largest number of endodontic treatments was found among individuals aged 46 to 60 years (47.6%,  $p < 0.001$ ). Females (61.9%,  $p < 0.001$ ) showed the greatest prevalence (Table 1). Interobserver agreement was excellent, and kappa values were greater than 0.91.

Table 1. Prevalence of endodontic treatment according to gender and age

Factor		Endodontic Treatment										
		Absent			Present							
		n	n=23,154 %	n=29,467 %	n	n = 6,313 %	n= 29,467 %	P1	P2	OR	OR (95% CI) Min Max	
Gender	Female	13,440	58.0%	45.6%	3,906	61.9%	13.3%					
	Male	9,714	42.0%	33.0%	2,407	38.1%	8.2%	<0.001	<0.001	0.853	0.805	0.903
Total		23,154	100.0	78.6%	6,313	100.0	21.4%					
Age	Years	n	n=23,154 %	n=29,467 %	n	n = 6,313 %	n=29,467 %	P1	P2	OR	OR (95% CI) Min Max	
	< 30	3,536	15.3%	12.0%	214	3.4%	0.7%					
	31 - 45	8,478	36.6%	28.8%	1,793	28.4%	6.1%					
	46 - 60	8,460	36.5%	28.7%	3,005	47.6%	10.2%	<0.001	<0.001	1.743	1.685	1.802
	> 60	2,680	11.6%	9.1%	1,301	20.6%	4.4%					
Total		23,154	100.0	78.6%	6,313	100.0	21.4%					

P1 -  $\chi^2$ ; P2 – logistic regression; OR - odds ratio; Min - minimum; Max – maximum

Table 2. Prevalence of endodontic treatment according to dental group.

Factor	Endodontic Treatment							P1	P2	OR	OR (95% CI)	
	Absent			Present							Min	Max
	n	n = 23,154 %	n = 29,467 %	n	n = 6,313 %	n = 29,467 %						
Tooth	11	736	3.2	2.5	266	4.2	0.9					
	12	737	3.2	2.5	271	4.3	0.9					
	13	884	3.8	3.0	294	4.7	1.0					
	14	641	2.8	2.2	311	4.9	1.1					
	15	620	2.7	2.1	329	5.2	1.1					
	16	688	3.0	2.3	287	4.5	1.0					
	17	839	3.6	2.8	201	3.2	0.7					
	21	760	3.3	2.6	268	4.2	0.9					
	22	710	3.1	2.4	278	4.4	0.9					
	23	886	3.8	3.0	291	4.6	1.0					
	24	660	2.9	2.2	308	4.9	1.0	<0.001	<0.001	0.976	0.974	0.979
	25	570	2.5	1.9	334	5.3	1.1					
	26	637	2.8	2.2	304	4.8	1.0					
	27	829	3.6	2.8	226	3.6	0.8					
	31	1,273	5.5	4.3	53	0.8	0.2					
	32	1,271	5.5	4.3	62	1.0	0.2					
	33	1,243	5.4	4.2	105	1.7	0.4					
	34	957	4.1	3.2	231	3.7	0.8					
	35	701	3.0	2.4	284	4.5	1.0					
	36	386	1.7	1.3	199	3.2	0.7					
	37	638	2.8	2.2	217	3.4	0.7					
	41	1,269	5.5	4.3	52	0.8	0.2					
	42	1,269	5.5	4.3	56	0.9	0.2					
	43	1,236	5.3	4.2	104	1.6	0.4					
	44	943	4.1	3.2	231	3.7	0.8					
	45	697	3.0	2.4	289	4.6	1.0					
	46	424	1.8	1.4	222	3.5	0.8					
	47	650	2.8	2.2	240	3.8	0.8					
Total		23,154	100.0	78.6%	6,313	100.0	21.4%					

P1 -  $\chi^2$ ; P2 – logistic regression; OR - odds ratio; Min - minimum; Max - maximum

## DISCUSSION

The results of this cross-sectional evaluation are similar to those of previous studies (5,6,16), in which males had significantly fewer remaining natural teeth than females. The average number of root-filled teeth was also lower among males.

The most prevalent teeth were maxillary premolars followed by maxillary molars and mandibular premolars and molars (Table 1). This result is in accordance with those of Lupi-Pegurier et al. (6). Kirkevang et al. (5) found that significantly more molars had been endodontically treated (8.1%) than premolars (5.4%) or anterior teeth (2.5%). This difference may be explained by the number of root-filled teeth in each sample.

The analysis of prevalence of root canal treatment according to age revealed a higher prevalence in the 46-60-year-old range (n=8,460; 47.6%) and a decrease in subjects older than 60 years (n=2,680; 20.6%). These values should be analyzed according to sample size and risk of caries disease, which were based on a Brazilian government's study of the oral health of the Brazilian population (3). A substantial increase in the number of dental caries sequelae and lost teeth were found in the groups of individuals aged 35 to 44 and 65 to 74 years.

This cross-sectional study was designed according to the methodologies of previous studies (5, 14). Images of a random sample from a database were examined to calculate the number of endodontically treated teeth. Panoramic radiographs are often used for such purpose in epidemiological studies (6,8-10). Lupi-Pegurier et al. (6) reported that the fact that all teeth can be seen using only one radiograph, the relatively low patient radiation dose, and the

convenience and speed with which panoramic radiographs can be obtained are advantages over full-mouth periapical radiographs. Estrela et al. (13) evaluated the periapical status and quality of root canal fillings, suggesting that epidemiological studies to assess the quality of periapical conditions using panoramic or periapical radiographs should be reviewed. Those authors found that CBCT images were more accurate than conventional methods.

In the present study, calibration was good and kappa was greater than 0.91, which indicates a high interobserver agreement. Studies that used similar methods also found high kappa values (6,13,16).

The high rate of endodontic treatment, a critical sequela of dental caries, points to the negative impact of this important risk factor. The clinical impact of this study reinforces the need for permanent educational programs. The prevalence of endodontically treated teeth in the Brazilian adult population evaluated in the present study was higher than that observed in epidemiological studies conducted in other countries. Females had more endodontically treated teeth than males. Endodontic treatment was most frequent in maxillary premolars and molars. Most endodontically treated teeth were found in 46-60-year-olds (47.6%) and the prevalence increased with age in this age range.

## RESUMO

O objetivo do estudo transversal foi avaliar a prevalência de dentes tratados endodonticamente em uma população de adultos Brasileiros. Um total de 1.401 radiografias panorâmicas, procedentes do banco de imagens do Centro de Radiologia e Imagens Orofacial de Cuiabá (CRIOF, Cuiabá, MT, Brazil), obtidas entre agosto de 2002 e setembro de 2007 foram analisadas. Três examinadores avaliaram todas as imagens, considerando-se a presença de tratamento endodôntico, indiferente à qualidade do tratamento (presença ou ausência de retentor intra-radicular ou periodontite apical). Os dados foram estatisticamente avaliados empregando-se *odds ratio*, regressão logística e teste qui-quadrado. A partir de amostra de 29.467 dentes avaliados, 6.313 (21,4%) eram endodonticamente tratados. Os pré-molares e molares superiores foram os dentes com maior prevalência de tratamento, enquanto os incisivos inferiores representaram o grupo de menor prevalência. Indivíduos do gênero feminino (61,9%,  $p < 0,001$ ), e com idade entre 46 a 60 anos apresentaram maior prevalência de tratamento endodôntico (47,6%,  $p < 0,001$ ). A prevalência de dentes tratados endodonticamente em adultos brasileiros mostrou-se elevada.

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## 4. Considerações finais

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A prevalência de dentes tratados endodonticamente, considerando 29.467 dentes avaliados radiograficamente, foi de 21,4% (6.313 dentes). Os pré-molares e molares superiores foram os dentes com maior prevalência de tratamento, enquanto os incisivos inferiores representaram o grupo de menor prevalência. Indivíduos do gênero feminino (61,9%), e com idade entre 46 a 60 anos apresentaram maior prevalência de tratamento endodôntico.

A maior prevalência de dentes tratados endodonticamente entre as mulheres pode estar associada aos maiores cuidados com a saúde bucal, e também devido as diferenças entre as amostras (mulheres = 13.440; homens = 9.714). A média do número de dentes com canais radiculares obturados também foi menor entre os homens. Este fato pode ter ocorrido em função de uma maior quantidade de dentes ausentes.

A análise da prevalência de canais radiculares tratados revelou um maior número com a idade (46 - 60 anos, n = 3.005; 47,6%) e uma redução em indivíduos com idade superior a 60 anos (n = 1.301; 20,6%). Estes valores devem ser analisados de acordo com tamanho da amostra e risco de cárie dentária.

O presente estudo mostrou elevada prevalência de dentes tratados endodonticamente em adultos Brasileiros.

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## 6. Anexos

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### **Anexo 1 – Artigo publicado:**

Estrela C, Leles CR, Hollanda ACB, Moura MS, Pecora JD. Prevalence and risk factors of periapical periodontitis in endodontically treated teeth in a selected population of Brazilian adults. Braz Dent J 2008; 19:34-39.













## **Anexo 2 – Norma de publicação**

Periódico: Brazilian Dental Journal

# BRAZILIAN DENTAL JOURNAL

## INSTRUCTIONS FOR AUTHORS

Original papers will be considered for publication with the understanding that they are contributed solely to the BRAZILIAN DENTAL JOURNAL. In submitting an article, the author(s) should state in the cover letter that the material has not been published previously and is not under consideration by another journal.

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The Journal publishes Full-Length Papers, Short Communications and Case Reports, dealing with dentistry or related disciplines. Manuscripts must be submitted in English and must be accompanied by a diskette.

Authors whose primary language is not English must have their article reviewed by a native English speaker. The decision of acceptance for publication lies with the Editors and is based on the recommendation of the Editorial Board and/or *ad hoc* reviewers.

**The following guidelines must be followed carefully. Correction of technical presentation and English revision, if necessary, will be charged to the author at the time of acceptance.**

### GENERAL

- Three complete sets of the manuscript, illustrations and tables must be submitted.

- The authors' names, institutions and address for correspondence should appear on only ONE copy. The other two copies will be sent to the referees for scientific evaluation.

- The complete address, including e-mail, of one author must be indicated for correspondence.

- The manuscript must be accompanied by a diskette with the file in Word.

- The manuscript must be printed double-spaced, on good quality paper, with ample margins (3-4 cm) at the top, bottom and both sides.

- Pages should be numbered consecutively, starting with the title page.

- Full-length papers are assembled in the following sections:

- 1) Title Page

- 2) Summary and Key Words

- 3) Introduction, Material and Methods, Results, and Discussion

4) Title, Summary and Key Words in Portuguese (these 3 items are necessary for Latin American Indexing Services and will be provided for non-Brazilian authors by the Journal)

5) References

6) Tables (each on a separate page)

7) Figure legends

8) Figures

- Results and Discussion may be joined, if desired. Short Communications and Case Reports should be divided into appropriate sections.
- The trade name of material used must be followed by the manufacturer, city, state and country, within parentheses upon first mention.
- All abbreviations must be explained at first mention.

## **TITLE PAGE**

- On the first page should be typed the title, author(s) name(s) (no more than 6) and their institution(s), and the name and address of the author for correspondence.
- On 2 copies only the title should be typed. These copies are for the referees.
- A short title (no more than 40 spaces) should be provided for use as a running head.

## **SUMMARY**

- On a separate page, a summary of no more than 200 words should state the aims, methods, results, and any conclusions drawn from the study.
- A list of key words or terms (no more than 5) should be included below the summary.

## **INTRODUCTION**

- Summarize the purpose of the study, giving only pertinent references. Do not review existing literature extensively. State clearly the working hypothesis.

## **MATERIAL AND METHODS**

- Material and methods should be presented in sufficient detail to allow confirmation of the observations. Indicate the statistical methods used, if applicable.

## **RESULTS**

- Present the results in a logical sequence in the text, tables and figures.
- Do not repeat the same data in both tables and figures.
- Do not repeat in the text all data in the tables and illustrations.

- The important observations should be emphasized.
- Report statistical data here.

## **DISCUSSION**

- Summarize the findings without repeating in detail the data given in the Results section.
- Present your conclusions within the Discussion.
- Relate your observations to other relevant studies and point out the implications of the findings and their limitations.

## **REFERENCES**

- References must follow the Journal's style.
- References must be numbered consecutively in the text in order of citation.
- The reference list must be typed double-spaced at the end of the article in numeric sequence.
- No more than 20 references may be cited.
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  1. Blomlof JP, Blomlof LB, Lindskog SF. Smear removal and collagen exposure after non-surgical root planing followed by etching with an EDTA gel preparation. *J Periodontol* 1996;67:841-845.
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  4. Hyde DG. Physical properties of root canal sealers containing calcium hydroxide. [Master's thesis]. Michigan: University of Michigan; 1986. 80 p.

## **TABLES**

- Each table with its legend must be typed double-spaced on a separate page at the end of the manuscript.
- Tables should be numbered with Arabic numerals.
- Each table must contain all necessary information so that it may stand alone, independent of the text.
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- All figure legends should be typed on a separate page.
- Three sets of figures should be submitted, either unmounted black India ink drawings of professional quality or unmounted glossy photographs. Computer-generated artwork must be laser-printed on high-quality paper.

- Lettering and identifying marks must be clear and sharp, and the critical areas of X-rays and photomicrographs are isolated.
- Separate parts of composite figures must be labeled with letters A, B, C, etc.
- Single figures may not exceed 8 cm in width or groups of figures may not exceed 16 cm in width.
- Figures should be labeled on the back with the title of the article.
- Only black and white figures can be used. No color figures can be accepted. Do not send slides.
- Only files in Excel, Word or Photoshop (saved with extension TIF or JPG - 300 dpi resolution) can be accepted. Figures in Power Point are not accepted.

## **ACKNOWLEDGMENTS**

- Financial support by government agencies should be acknowledged. If appropriate, technical assistance or assistance from colleagues may be acknowledged.

## **CHECKLIST FOR AUTHORS**

1. Submission letter.
2. Original and two (2) copies of the article, figures and tables.
3. Names of authors, institutions and address for correspondence only on the original. The other two copies will be sent to referees without identification.
4. Article double-spaced, Times New Roman, size 12.
5. References (double-spaced).
6. Tables with their respective legends each on a separate page (double-spaced) at the end of the article.
7. Figure legends on a separate page (double-spaced).
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