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Beyond the discourse of amalgam vs composite resin restorations

Além do discurso de restaurações de amálgama x resina composta

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ABSTRACT

Objective
To diagnose the prevalence of amalgam and resin composite restorations performed by professionals in public service and university students in a municipality in the Northeast of the State of Paraná.

Methods
Ten basic health units were randomly selected, at which 500 clinical record charts of patients of both sexes aged from 18 to 50 years were consulted. To analyze the prevalence of restorations performed by students, a questionnaire was applied to 4th and 5th year students, containing questions relative to the number of restorations and type of material using in intramural clinical activities.

Results
In the basic health units, 66% of restorations were performed with amalgam, and 34% with resin composite. At the dental school, 4th year students responded that when they were in the 3rd year, out of a total of 367 restorations, 21.5% were performed with amalgam and 78.5% with resin composite. For the 5th year group of students, the percentage of teeth restored with amalgam was 14.3%, 12.0% and10.2%, when they were in the 3rd, 4the and 5th years of the course, respectively. The results obtained revealed that the indication of the restoration material differed in the two scenarios.

Conclusion
In the basic health units, the majority of restorations were performed with amalgam, whereas at the dental school there was higher prevalence of resin composite restorations. One must reflect whether professional education has adequately developed the necessary competencies for decision making and meeting the needs of this population.

Indexing terms: *Dental amalgam. Prevalence. Resin composites. Unified Health System.*

RESUMO

Objetivo
Diagnosticar a prevalência de restaurações de amálgama e resina composta realizadas por profissionais no serviço público e estudantes universitários de um município do noroeste do estado do Paraná.

Métodos
Foram selecionadas aleatoriamente dez unidades básicas de saúde, das quais foram consultados 500 prontuários de pacientes com 18 a 50 anos, de ambos os sexos. Para analisar a prevalência das restaurações realizadas pelos estudantes, aplicou-se um questionário aos estudantes do quarto e quinto ano contendo perguntas relativas ao número de restaurações e tipo de material utilizado nas atividades clínicas intramuros.

Resultados
Nas unidades básicas de saúde, 66% das restaurações foram feitas com amálgama e 34% com resina composta. Na escola, os estudantes do quarto ano responderam que quando estavam no terceiro ano, de um total de 367 restaurações, 21,5% foram feitas com amálgama e 78,5% com resina. Para o grupo de estudantes do quinto ano, a porcentagem de dentes restaurados com amálgama foi de 14,3%, 12,0% e 10,2%, respectivamente, para quando estavam no 3º, 4º e 5º ano do curso. Os resultados obtidos revelaram que a indicação do material restaurador nos dois cenários é divergente.

Conclusão
Nas unidades básicas de saúde a maioria das restaurações realizadas foi de amálgama enquanto na escola, a maior prevalência foi de resina composta. Deve-se refletir se a formação profissional tem desenvolvido adequadamente as competências necessárias para a tomada de decisão e o atendimento às necessidades da população.

Termos de indexação: Amálgama dentário. Prevalência. Resinas compostas. Sistema Único de Saúde.

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INTRODUCTION

In Restorative Dentistry it has been endeavored to study techniques and materials that minimize and restore lost dental structure, with the object of maintaining the tooth for the functions of mastication, esthetics and phonetics throughout a lifetime. At present there are direct restorative materials available for use in restorations, which must be used in accordance with their indication. The clinical behavior of direct restorations of posterior teeth is influenced by diverse factors, such as the restorative material used[1-4], professional's experience[2], position of the tooth in the dental arch, anatomy and size of the reconstruction performed, patient's age[5], among others.

Up to the beginning of the 1990s, amalgam was the first option of restorative material, and over the course of time it has gradually been replaced by resin composites[5]. Although there are still variations, and amalgam continues to be the material most used all over the world[2], some studies have related that at present over half of the direct restorations performed in posterior teeth in private dental offices have been performed with resin composite[4,6-7].

To decide the best restorative material to use is a task demanding competences for evaluating not only the factors directly related to the restorative material itself, but also to organization of the world as regards local demands and resources available. In this case, decision making about the choice of material is a task that demands a vision that goes beyond the need of the particular tooth in question. For the undergraduate courses in the area of Dentistry, and for the other areas of health care, the National Curricular Guidelines[8] point out the need to educate professionals who will be equipped to carry out general competences and skills related to health care and decision-making. Furthermore, the object of the National Curricular Directives emphasizes the necessity to construct an academic and professional profile to work, with quality and resoluteness in the country's national health service (Sistema Único de Saude)[8], which comprises services provided in both the public and private network. Therefore, it is important to study how the choice of restorative materials has occurred, both in public health services and during the education of the future professional, that is to say at under-graduate level. However, few studies with this purpose have been reported.

In this context, the aim of the present study was to diagnose the prevalence of teeth restored with amalgam and resin composite, performed by professionals in public service and by students at a public teaching institution in a municipality in the Northeast of the State of Parana.

METHODS

It was endeavored to conduct this study in conformity with the ethical principles established by Resolution No. 196/96 of the National Health Council, and its complements, and the project was previously submitted to analysis by an Ethics Committee on Research Involving Human Beings (CAAE No. 0004.0.093.000-09).

The municipality chosen for the study is divided into five health care areas and comprises 26 Basic Health Units (BHUs). For data collection, the BHUs that offer dental treatment were randomly drawn, so that for each area, two were visited, totaling ten BHUs.

At each BHU a survey was conducted of the record charts of patient who received restorative dental treatment in the year 2008. In total, 50 patients per BHU were included. In order to establish criteria for standardization of the sample, record charts were selected only of individuals aged between 18 and 50 years, born in the period from January 1, 1958 to December 31, 1990, of both sexes, who among other procedures, received Class I and/or Class II restorations.

To analyze the prevalence of restorations performed by students, a questionnaire was applied to 4th and 5th year students at a public teaching institution, containing questions relative to the number of restorations and type of material using in intramural clinical activities.

Statistical analysis of the data was performed using the Mann-Whitney test for comparison the means of the groups consisting of teeth in which the same restorative material was used.

RESULTS

At the BHUs, out of a total of 1187 posterior tooth restorations analyzed, 784 (66%) were performed with amalgam and 403 (34%) with resin composite (Figure 1). There was wide variation among the BHUs, and in BHU4, only 4.5% of the restorations were performed with resin composite against 71.7% at BHU3;

When comparing the indication of restorative material according to type of tooth (Table 1), it was verified that amalgam was particularly indicated for molars;

At the dental school, 4th year students (Table 2) responded that when they were in the 3rd year, out of a total of 367 restorations, 21.5% were performed with amalgam and 78.5% with resin composite. For the 5th year group of students (25) (Table 3), the percentage of teeth restored with amalgam was 14.3%, 12.0% and10.2%,

when they were in the 3rd, 4the and 5th years of the course, respectively. Some students did not perform any amalgam restorations in the respective year.

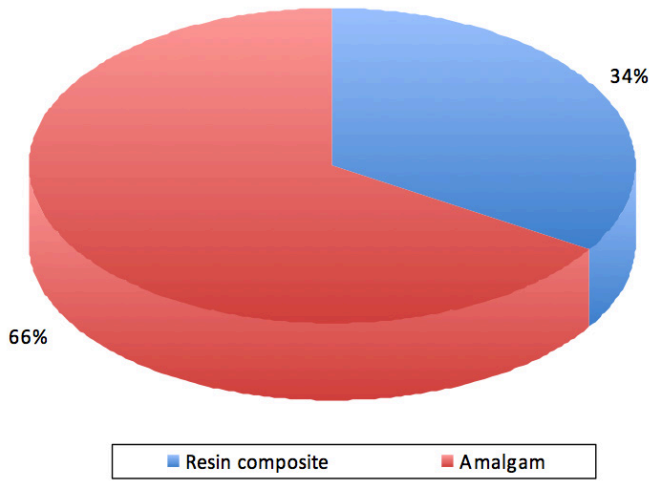

Figure 1. Prevalence of teeth restored with amalgam (Ag) and resin composite (RC) at basic health units.

Table 1. Prevalence of premolars and molars restored with amalgam and resin composite in basic health units

Amalgam			Resin composite		
Premolars	Molars	Total	Premolars	Molars	Total
242 (30.9%)	542 (69.1%)	784 (100.0%)	209 (51.9%)	194 (48.5)	403 (100.0%)

Table 2. Prevalence of teeth restored with amalgam and resin composite, by 4th year students (n=27) at a public teaching institution

	Amalgam	Resin composite	Total
3rd year of course	79 (21.5%)	288 (78.5%)	367
4th year of course	57 (17.4%)	270 (82.6%)	327

Table 3. Prevalence of teeth restored with amalgam and resin composite, by 5th year students (n=25) at a public teaching institution.

	Amalgam	Resin composite	Total
3rd Year of course	45 (14.3%)	269 (85.6%)	314
4th year of course	45 (12.0%)	328 (88.0%)	373
5th year of course	35 (10.2%)	308 (89.8%)	343

DISCUSSION

The results obtained in the present study revealed that the indication of the restorative material in the two scenarios is divergent; that is, in the public service, amalgam was the restorative material most indicated by the professional for the restoration of posterior teeth. Whereas at the dental school, resin composite was the material of choice of the students.

The findings at the BHUs are in agreement with the data found in Australia, because in the public network the indication of amalgam was two times higher than it was for resin composite[4]. In spite of amalgam being considered the material most used worldwide, and although the percentage of dentists in the United States, who do not use it, has grown[2], this is not the reality in some countries. In Australia, in private practice resin composite has being indicated double the number of times in comparison with amalgam[4]. In Finland it was verified that in 1997, 59.1% of the restorations performed in permanent teeth were made with resin composite, 0.6% with amalgam, 20.1% with resin modified glass ionomer and 20.1% with glass ionomer[6]. In Brazil, in a research conducted in the municipality of Maringa, Parana[7], a comparison was made of the proportion of resin composite restorations in posterior teeth with those of amalgam performed in a day's work. It was observed that 47% of the dentists who worked in private dental office in the year 2000 performed a ratio of 8 resin composite to 2 amalgam restorations. Furthermore, 32% of the professionals performed a proportion of 5 resin to 5 amalgam restorations. In 2006, 50% performed 8 resin to 2 amalgam restorations, however, approximately 19% no longer used amalgam.

The main factor that has contributed to the change in the condition of direct restorative material indications for posterior teeth is esthetics. However, some other factors should be considered as regards the choice of restorative material, because the clinical behavior is influenced not only by the restorative material used, but also by the professional's experience, position of the tooth in the dental arch, anatomy and size of the reconstruction performed, age of the patient, among others. In order to make the decision about the choice of material it is necessary to consider the local reality, demand for service, in addition to knowing the clinical characteristics of the materials, manipulation technique and advantages and disadvantages of each material. Some aspects, such as longevity, need for replacement, technique sensitivity, costs and causes of failures in restorations must also be considered.

The longevity of amalgam restorations of mean size, performed in the mesio-occlusal-distal regions, by a professional with median skill, is at least 10 years[2]. The longevity of resin composite resins is shorter than that of amalgam restorations in similar conditions[1]. In a controlled, randomized clinical study, with 7 years of follow-up, it was

verified that 94.4% of the amalgam restorations remained intact, while 85.5% of resin composite restorations presented the same characteristics. Amalgam restorations have a behavior superior to that of resin composite restorations, irrespective of the type of tooth, number of surfaces restored and size of restorations: the mean longevity of restorations ranges from 3 to 8 years for resin composite restorations and from 5 to 15 years for amalgam restorations. Tyas[4], on determining the age of restorations when these needed to be replaced, verified that the mean age of amalgam, resin composite and glass ionomer cement was 13.6; 7.1 and 5.7 years, respectively. Leinfelder[3] related that the longevity of the majority of amalgam restoration is from 10 to 12 years and of resin composites, half the time.

With respect to the need for replacing restorations, in a randomized clinical study, the replacement of restorations performed in permanent teeth has been more frequent when resin composite was used as restorative material rather than amalgam. In a clinical study, after five years of follow-up, 21.9% of resin composite restorations and 15.9% of amalgam restorations need to be replaced[9].

Although the longevity of resin restorations may be similar to that of amalgam[10]; that is, approximately 10 years[2], many professionals agree that performing a Class II resin composite restoration requires more care and is technically more sensitive than performing an amalgam restoration of the same dimensions[2,7]. The similar results obtained by Opdam et al.[10] were attributed possibly to the use of absolute isolation of the operative field and training of the operators. It should also be considered that the longevity of restorations is a clinical behavior of extreme relevance, particularly in public health services, as 65% of the time of clinical attendance is spent performing replacements or repairs of restorations[11].

An advantage of amalgam restorations, apart from durability and less technical sensitivity, would be the cost. When compared with any other restorative material for use in posterior teeth, the cost is much lower[2,7]. As related by Tobi et al.,[12], in a research conducted with the object of evaluating cost/benefit, amalgam restorations presented a better cost/benefit ratio than resin composite restorations. In this study, the mean treatment time (minimum and maximum) for performing Class II mesio-occlusal-distal restorations in premolars, using resin composite and amalgam was 42 (34 and 72) and 26 (24 and 32) minutes, respectively. For composite restorations in molars, the mean time (minimum and maximum) was 52 (33 and 69) and 25 (18 and 30) minutes, respectively, for resin composite and amalgam restorations.

The main causes of restoration failures is the presence of secondary caries and fracture[1,4-5,10,14]. There are authors who have related that there is no difference in the risk of fracture between amalgam and resin composite. On the other hand, Tyas[4] has related that the chance of a tooth restored with amalgam fracturing is twice as high as the chance of a tooth restored with resin. It appears that the number of surfaces of the tooth involved and the patient1s age also predispose to a higher risk of fracture. The larger the number of surfaces, the higher the chance of fracture; and individuals from 55 to 96 years of age present a higher number of fractured teeth than individuals from 18 to 54 years of age, irrespective of the restoration being of amalgam or resin composite[4].

The risk of failure due to the presence of secondary caries is 3.5 times higher in resin composite restorations compared with amalgam[1]. The reasons that explain this behavior is the presence of TEGMA and TEGDMA in the organic matrix of the majority of resin composites, which favor the growth of microorganism. Whereas amalgam presents a composition that of itself is bacteriostatic[3].

With regard to the biologic aspects of materials, particularly where the toxicity of the mercury present in the amalgam alloys is concerned, there is no scientific evidence that this characteristic may cause any harm to patients[15].

Considering the differences in clinical behavior between resin composite and amalgam restorations, and the lack of adequate training for the use of adhesive procedures, lack of equipment and working conditions necessary for performing a resin composite restoration of excellence, bearing in mind its high technique sensitivity - which is the reality in many countries and regions in the world - amalgam has continued to be the material of choice for the restoration of posterior teeth. This is particularly so when there is extensive tooth destruction[2]. In the public network, the indication of amalgam is two times higher than that of resin composite, whereas in the private network, the opposite is observed[4].

For the above-mentioned reasons, the majority of dentists would certainly still not exchange their conventional metal restorations for more esthetic alternatives. This was presented in a study conducted by Rosentiel et al.[13], with the aim of determining the choice of professionals themselves to have their molars restored and estimate the longevity of the restorations. In this study, 757 valid responses were collected, including 6034 teeth.

Schools of dentistry should be alert to opportunities to provide their students with the possibility of working with excellence in the different situations. Excluding the

content and practices of application of amalgam from their curricula, as the experiences of some schools has related[16], would not be the best pathway. This would lead to the education of a professional without competencies to use it when necessary. From this aspect, when analyzing the result of BHU3, where 71.7% of posterior tooth restorations were performed with resin composite, it is possible that this practice is related to the professionals' education. More recently graduated professionals, or those who went through training, would have more chances of presenting this conduct as a result of the development of restoratives for posterior teeth that has occurred more recently. This may be proved by the data related by undergraduate students, since the large majority use resin composite, and some did not even perform any amalgam restoration throughout the entire year.

The BHSs present different realities; however, access to treatment is a common problem. Therefore, the time each user spends in the chair for attendance, is of importance in collective work. In this sense, in the choice of adequate material there must be emphasis on the time it takes to perform the technique and the longevity of the material.

Considering the aspects mentioned and the results obtained in the present study, the material of choice in the BHUs selected was amalgam. On the other hand, one of the competencies to be developed in undergraduate teaching[8] is decision making. Are students are being prepared for the choice of the best restorative material taking into consideration the demand on the public service networks in Brazil, where approximately 30 million people have never been to the dentist for lack of, or difficulty of access? Are students being adequately prepared to work with amalgam as a restorative material?

It is known that in spite of being less sensitive to technique, the time of work with amalgam is an obstacle to the student. This leads to the false impression that resin composite would be easier to work with than this material. Therefore, in order to command the technique and perform restorations of excellence, good training is needed.

How restorations have been performed must be reviewed, both in the health services and schools; that is, evaluate whether the attendance protocols have taken into consideration the demand for service, the most adequate technique for each type of restoration, users' complaints, and advantages and disadvantages of the two types of materials. This does not mean to say that the best direct restorative material for posterior teeth to be indicated in the public health network is amalgam, or vice-versa. Or to say that schools should prepare professionals only to work in private dental offices, which mainly work with resin composite, but rather that in order to attain operative success, there are various factors to be considered. The main among these are health promotion, prevention and service of excellence. Beyond the discourse on amalgam *versus* resin composite restorations, there is a large portion of the population that has never had the opportunity of access to dental services. This is a country with different social, economic and cultural characteristics that needs to revert the logic of curativist care and invest in health promotion to reach more acceptable epidemiologic levels.

CONCLUSION

In the BHUs, the majority of restorations were performed with amalgam, whereas at the dental school there was higher prevalence of the use of resin composite. One must reflect whether professional education has adequately developed the necessary competencies for decision making and meeting the needs of this population. In the indication of restorative materials, in addition to the working time, esthetics and durability, among other factors, the local reality and demand on the service to the benefit of the user must to be taken into consideration.

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Collaborators

R MAIOLINO, MD BARBANA, MCM COSTA, M FUJIMAKI E RSS TERADA participated in the data collection stage. SMRP DAMASCENO, M FUJIMAKI E RSS TERADA participated in the elaboration of the project, review of the literature, analysis and discussion of the results, and writing the article.

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