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Caries diagnosis under the focus of the evidence-based dentistry

Diagnóstico de cárie sob o enfoque da Odontologia baseada em evidências

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Abstract

Any dental clinician, specially the pediatric dentist, needs to have know-how about the available diagnostic procedures for dental caries detection and understand the effectiveness of these procedures in order to give appropriate weight to the result in clinical decision taking. The purpose of the present paper is to verify the status of the literature about the procedures available in dental caries diagnosis, in pediatric dentistry, using the evidence-based dentistry methodology. This study was carried out in two phases. The first one consisted in a search for texts related to the theme, in English language and indexed in the MEDLINE database, as well as a review of some Epidemiology books. After that, all abstracts of the papers obtained through the key words provided by the Medical Subject Headings (MeSH), were read and classified according to their relevance and pertinence. The journal and the countries that most published relevant and pertinent papers were Caries Research and the United Kingdom (UK) and United States of America (USA), respectively. No pertinent meta-analysis has been made until the present moment.

Palavras-chave:
Odontologia baseada em evidências; cariologia; pesquisa odontológica.

Resumo

Todo cirurgião-dentista, principalmente o odontopediatra, necessita ter conhecimento suficiente quanto aos métodos de diagnóstico disponíveis para a detecção de cárie dentária, além de entender a efetividade desses métodos para dar apropriado peso ao resultado nos momentos de decisão clínica. O objetivo deste trabalho é verificar o que diz a literatura sobre os procedimentos utilizados no diagnóstico da cárie dentária, em odontopediatria, por meio da metodologia proposta pela Odontologia baseada em evidências (OBE). Este estudo foi dividido em duas etapas. Na primeira, foi realizada uma busca na base de dados MEDLINE de textos relacionados ao assunto, em língua inglesa, e revisão de alguns livros de epidemiologia. Em seguida, todos os resumos dos trabalhos apresentados pela base de dados, a partir das palavras-chave indicadas pelo Medical Subject Headings (MeSH), foram lidos e classificados quanto à relevância e pertinência ao tema. O periódico que mais publicou artigos relevantes foi o *Caries Research*, e os países que mais pesquisaram com a metodologia da OBE foram o Reino Unido e os Estados Unidos. Nenhuma metanálise pertinente ao tema foi realizada até o presente momento.

Introduction

The appropriate dental treatment for children depends on accurate and early diagnosis. These measures try to meet the demand for a more cost-effective treatment with resource-conscious oral health care [12]. Any dental clinician, specially the pediatric dentist, needs to have know-how about the available diagnostic procedures for dental caries detection and understand the effectiveness of these procedures, so that there can be given appropriate weight to the result in clinical decision taking [15]. In order to be successful, it is necessary to know how to find and integrate valuable research evidence into pediatric dentistry clinical practice. The first step to achieve this goal is to be presented to some important terms used in evidence-based practice.

The purpose of the present paper is to verify the status of the literature about the procedures used in dental caries diagnosis, in pediatric dentistry, based on the evidence-based dentistry methodology.

What is evidence-based dentistry?

The concept of evidence-based medicine is an integration of best available research evidence with clinical expertise and patient values [13]. Based on this original definition, the American Dental Association [1] defined evidence-based dentistry (EBD) as " an approach to oral health care that requires the judicious integration of systematic assessments of clinically relevant scientific evidence, relating to patient's oral and medical condition and history, with the dentists' clinical expertise and patient's treatment needs and preferences". The principal objective of EBD is to make the most judicious selection of the best procedure possible for a given patient [3].

What is the difference between systematic and narrative review?

Narrative reviews comprise a collection of studies about a certain subject, which are made without following any specific pattern. In 1994, the Potsdam conference in Germany defined systematic review as a review of studies performed by means of an identification strategy, inclusion and exclusion criteria and clear definition of the considered variables. The aim of a systematic review is to enable any researcher to obtain the same conclusions whenever the described methodology is followed [5].

The use of systematic reviews allows, among other advantages, the acquisition of more accurate conclusions and the reduction of the time between the surveys' conclusions and their clinical implementation [2, 9]. Therefore, it can be concluded that EBD is based on the systematic reviews of the literature [2].

What is meta-analysis?

The meta-analysis (MA) or quantitative systematic review was also defined in the Potsdam conference as

a statistical analysis applied to a systematic review in order to combine and summarize the results of two or more studies about the same subject [4, 5]. This method integrates results of primary investigations, which make generalizations possible. If the results of the studies cannot be statistically combined but if a scientific and strict methodology to reduce tendentiousness has been followed, it is called qualitative systematic review [2, 14]. The MA improves the estimate precision and increases the statistic value to the detection of the true effects of the research into the clinical practice [2, 9, 14].

What is a randomized controlled clinical trial?

The randomized controlled clinical trial (RCT) is defined as a prospective study, which aims to compare the effect as well as the value of a prophylactic or therapeutic intervention between test and control groups. The selection process of these groups ought to be randomized and the research should preferentially be performed under the double-blind condition, in which the patients are unaware of the treatment they are undergoing and so are the researchers [6, 11].

What are the main databases?

The main databases are MEDLINE, LILACS, EMBASE, BBO, among others. MEDLINE was selected because it is a widely recognized database produced by the U.S. National Library of Medicine. It is also the premier source of bibliographic and abstract coverage of biomedical literature, and the most important for us: MEDLINE has information from Index to Dental Literature [7, 10]. Besides, it is available in English language.

What is PubMed?

It is a search tool for accessing literature citations developed by the National Center for Biotechnology Information (NCBI) together with publishers of biomedical literature [7].

What is the definition of "relevant" and "pertinent"?

Relevant: "bearing upon or properly applying to the matter at hand: affording evidence tending to prove or disprove the matters at issue or under discussion" [8].

Pertinent: "that has connection or relation with something (as a matter under discussion)" [8]. Example: Our research resulted in some papers about prevalence of caries. Although we agree that these papers were relevant as the diagnosis of caries had to be performed in these studies, they were not considered pertinent, as the aim of the research was to obtain studies that assessed specific diagnostic methods.

Methods

Search strategy

The strategy consisted of a search for papers related to the theme, in English language, indexed in MEDLINE database, as well as some Epidemiology book reviews.

Studies selection

Initially, the Medical Subject Headings (MeSH), a controlled vocabulary of the MEDLINE concepts' descriptors, was accessed. In this phase, the terms used in the research were selected.

Selected keywords: "Dental caries diagnosis children clinical examination", "dental caries diagnosis children visual examination", "dental caries diagnosis children fiber optic", "dental caries diagnosis children diagnodent", "dental caries diagnosis children tooth separation", "dental caries diagnosis children radiography".

Researched period: The research comprised studies indexed in MEDLINE database from January 1998 until November 2005.

Study design: Controlled clinical trial, randomized clinical trial, systematic review or meta-analysis.

Population: Children.

Intervention: Methods for dental caries diagnosis used in pediatric dentistry.

In the second phase, all abstracts of the papers presented by MEDLINE after the selection of the key words were read and classified according to their relevance and pertinence.

Results

When we utilized the keywords "dental caries diagnosis children clinical examination" in our search in PubMed, we found 3 clinical trials (CT), 1 randomized clinical trial (RCT) and 1 meta-analysis (MA), which was not pertinent to the subject (table I). Following, we used "dental caries diagnosis children visual examination" as the keywords, and the results were: 7 CT, 5 RCT and 0 MA (table II).

Table I – Studies found at MEDLINE referring to the keywords "dental caries diagnosis children clinical examination"

Periodic	Year	Origin country	Type of publication		
			CT	RCT	MA
J Clin Pediatr Dent	2003	Brazil	1		
Caries Res	2002	Brazil	1		
Caries Res	2001	UK	1	1*	
Br Dent J	2003	UK			1**

* the papers are repeated
** not pertinent

Table II – Studies found at MEDLINE referring to the keywords "dental caries diagnosis children visual examination"

Periodic	Year	Origin country	Type of publication		
			CT	RCT	MA
Caries Res	2004	USA	1	1*	
Am J Dent	2003	USA	1	1*	
J Clin Pediatr Dent	2003	Brazil	1		
Caries Res	2003	Finland	1		
Caries Res	2002	UK	1	1*	
Caries Res	2001	UK	1	1*	
Br Dent J	2001	UK	1	1*	
Caries Res	2000	UK	1	1*	

* the papers are repeated

In our third search, we entered the keywords "dental caries diagnosis fiber optic children" and we found 4 CT, 3 RCT and 0 MA (table III). Utilizing the keywords "dental caries diagnosis children diagnodent" we found 5 CT, 2 RCT and 0 MA (table IV). We found 2 CT, 1 RCT and 0 MA when we used the keywords "dental caries diagnosis children tooth separation" (table V).

Table III – Studies found at MEDLINE referring to the keywords "dental caries diagnosis children fiber optic"

Periodic	Year	Origin country	Type of publication		
			CT	RCT	MA
J Dent Res	2004	USA	1	1*	
J Clin Pediatr Dent	2003	Brazil	1		
J Dent Res	2002	UK	1	1*	
Caries Res	2000	UK	2	2**	

* the papers are repeated
** not pertinent

Table IV – Studies found at MEDLINE referring to the keywords "dental caries diagnosis children diagnodent"

Periodic	Year	Origin country	Type of publication		
			CT	RCT	MA
Acta Odontol Scand	2004	Sweden	1	1*	
Caries Res	2003	Finland	1		
Caries Res	2002	Brazil	1		
Caries Res	2001	UK	1	1*	
Br Dent J	2001	UK	1	1*	
Eur J Oral Sci	2001	Switzerland	1		

* the papers are repeated

Table V – Studies found at MEDLINE referring to the keywords "dental caries diagnosis children tooth separation"

Periodic	Year	Origin country	Type of publication		
			CT	RCT	MA
J Clin Pediatr Dent	2003	Brazil	1		
Caries Res	2000	UK	1	1 *	

* the papers are repeated

To conclude our search, we entered the keywords "dental caries diagnosis children radiography" and the result was a total of 16 articles – 16 CT, 9 RCT and 0 MA (table VI).

Table VI – Studies found at MEDLINE referring to the keywords "dental caries diagnosis children radiography"

Periodic	Year	Origin country	Type of publication		
			CT	RCT	MA
Eur J Paediatr Dent	2004	Greece	1	1*	
J Dent Res	2004	USA	1	1*	
Pediatr Dent	2004	Greece	1		
Am J Dent	2003	USA	1	1*	
J Clin Pediatr Dent	2003	Brazil	1		
Aust Dent J	2002	Indonesia	1		
Caries Res	2003	Finland	1		
Br Dent J	2002	UK	1	1*	
J Dent Res	2002	UK	1	1*	
J Am Dent Assoc	2002	USA	1		
ASDC J Dent Child	2001	Brazil	1	1*	
Community Dent Oral Epidemiol	2001	Lithuania	1	1*	
Clin Oral Investig	2001	Sweden	1		
J Am Dent Assoc	2001	USA	1	1*	
Br Dent J	2001	UK	1	1*	
Eur J Oral Sci	2001	Switzerland	1		
Acta Odontol Scand	1999	Sweden	1		
Caries Res	1999	USA	1	1*	
J Am Dent Assoc	1998	USA	1	1*	

* the papers are repeated

In our search we could notice that all the articles classified as RCT have also been classified as CT. Nevertheless, at the end of our search, we could verify that some articles were repeated and that the real total of papers pertinent with the subject was 21 articles, that is, 21 CT, of which 13 were also classified as RCT (table VII). Unfortunately, we did not find any MA about dental caries diagnosis in pediatric dentistry.

Table VII – Synthesis of relevant and pertinent studies found at MEDLINE

Periodic	Year	Origin country	Type of publication
Caries Res	2004	USA	RCT
J Dent Res	2004	USA	RCT
Acta Odontol Scand	2004	Sweden	RCT
Eur J Paediatr Dent	2004	Greece	RCT
Pediatr Dent	2004	Greece	CT
J Clin Pediatr Dent	2003	Brazil	CT
Am J Dent	2003	USA	RCT
Caries Res	2003	Finland	CT
Caries Res	2002	Brazil	CT
Caries Res	2002	UK	RCT
Aust Dent J	2002	Indonesia	CT
J Am Dent Assoc	2002	USA	CT
Br Dent J	2002	UK	RCT
J Dent Res	2002	UK	RCT
Br Dent J	2001	UK	RCT
Eur J Oral Sci	2001	Switzerland	CT
Caries Res	2001	UK	RCT
ASDC J Dent Child	2001	Brazil	RCT
Community Dent Oral Epidemiol	2001	Lithuania	RCT
Clin Oral Investig	2001	Sweden	CT
J Am Dent Assoc	2001	USA	RCT
Caries Res	2000	UK	RCT
Caries Res	2000	UK	RCT
Acta Odontol Scand	1999	Sweden	CT
Caries Res	1999	USA	RCT
J Am Dent Assoc	1998	USA	RCT

Discussion/Conclusion

Starting from the advent of the electronic sources, all professionals, in spite of the area, can have wide, quick and easy access to information of all types, with comfort and safety.

The use of EBD in clinical dental practice depends on a process where the first thing to do is to define the patient or population problem. After that, it is necessary to decide what we plan to do to solve this problem, which, in most cases, includes the use of diagnostic tests, establishment of prognosis, choice of adequate treatment kind and teaching of prevention procedures [1, 3, 13].

In this study, we proposed a specific problem of our work area: how to diagnose dental caries in pediatric dentistry. Thus, to reach such answer, we should think about the procedures or methods we have available to do this diagnosis [12, 15]. We decided to search about the most well known dental caries diagnosis procedures, like visual clinical exam, radiographic exam, tooth separation, fiber optic and the use of Diagnodent.

As electronic source, we selected MEDLINE for being the known database, totally indexed in English language and easily accessible. We chose to access starting from PubMed for the easiness of the use of the limits and filters for the research procedure [7, 10].

First of all, we tried to find out the best way of looking for the information in the database. We evaluated if it was possible to do the search casually, without using the filters and using the key words we thought that it would be adequate but the results were nonsensical (a lot of references absolutely irrelevant and without any pertinence). Since then, we decided to use the MeSH assistance, making associations and substitutions with the suggested describers. We just researched works starting from 1998, for it being the year of the incorporation of EBD. Our methodology only included studies like clinical trials, randomized controlled clinical trials and meta-analysis because they are the most complete types of study. The highest level of the evidence, based on the notion of causation and the need to control bias, is the systematic review and meta-analysis, followed by randomized controlled studies and well conducted clinical trials studies [2, 4, 5, 6, 9, 11, 14].

With the results of this work it was possible to know that: the journal that most published relevant and pertinent papers about dental caries diagnosis procedures used in pediatric dentistry was Caries Research and the majority of the studies about this theme, using evidence-based dentistry methodology, was from countries of The United Kingdom. Finally, concerning the type of study, no pertinent meta-analysis has been made until the present moment.

According to our work, it seems reasonable to conclude that it is necessary to conduct more studies based on EBD concerning dental caries diagnosis procedures used in pediatric dentistry, especially systematic reviews and meta-analysis.

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