Dental trauma: an evidence-based approach to care

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Abstract – *Background*: One of the key aspects of improving the dental care we offer to our patients is in basing our practice on the best available evidence. *Aim*: The main purpose of this paper is to present some basic ways of searching reliable papers on Internet and to introduce some techniques to facilitate the development of strategic search skill to improve the quality of dental care, using dental trauma as an example. *Materials and methods*: After formulation of a clinical question on a dental trauma issue, a comparison was made between: data collected in PubMed using a given term; data collected in PubMed using the Medical Subject Headings vocabulary (Mesh) and data collected using the principles of evidence-based research, all by an independent researcher. A number of papers searched about a clinical question on dental trauma and a brief commentary about each Internet research database is presented. The authors reported that the best sites available to perform the sample search were those produced by academic centers, professional organizations and government-sponsored. To get evidence-based clinical papers we did internet search on PubMed, Cochrane, Center of Evidence-Based Dentistry and Knowledge Finder using the clinical question "Emergency Treatment for Avulsed Tooth". *Results*: All searched databases were efficient for scientific journals, but when we used the PI strategy, the search seemed to be more relevant and specific. The Cochrane, Center of Evidence-Based Dentistry and Knowledge Finder presented more reliable papers to answer our clinical question about dental trauma treatment. *Conclusions*: It is imperative that dentists understand the advantages of searching the Internet and learning to use it effectively to guide practice and assist their patients in their pursuit for better oral health.

One of the key aspects of improving dental care of patients is in basing our practice on the best available evidence. But with the overwhelming choices of journal publications, how one can rapidly sift quality research from low quality to produce high evidence. The reader may wish to search for the best evidence to deliver treatment to a patient or the patient/parent may be looking for the best available treatment. Thus, the study has to provide the reader with the valid methodological and important results that will provide enough information to select a treatment (1).

Evidence-based practice (EBD) has been defined as the practice of dentistry that integrates the best available evidences with clinical experience and patient's values and circumstances for making clinical decisions (2, 3).

Good and sound dental practice relies not upon bits and pieces of conveniently selected evidence (dentistry based on evidence), but rather upon the collection of the best available research evidence (evidence-based dentistry). The key phrase, 'best available research evidence', implies a most important and fundamental nature of this approach to dentistry: It seeks to identify what is the 'best' research evidence presently at the disposal of the dentist for any given patient, and it recognizes that dental research evidence is continuously evolving. Evidence-based methodology reflects the vitality that is inherent in the research process itself – questioning, testing, discovering, and questioning anew – and in so doing seeks to generate novel and improved treatments (4). Obtaining the best evidence is a matter of steps; articulating a clear question; searching for the best evidence; stratifying; distilling the evidence.

The EBD research process entails a systematic and comprehensive search of all of the available published literature, a critical evaluation of report, and an overarching synthesis of the findings for the determination of the best available evidence. Accessing the literature requires acquiring the skills to conduct on-line literature searches in an efficient manner. Evaluating the quality of evidence requires an understanding of research design, epidemiology, and statistical analysis. The clinician also needs to master the new methodologies, such as meta-analysis, for determining the quality of the literature and for synthesizing the results of studies (4, 5). There are, however, problems with that, the least of which being the fact that these reports are usually voluminous – hence, dentists may or may not have the time to read and absorb them (4). These communications are generally quite sophisticated, so are their research methodologies.

In 1997 Gagliardi and Jadad (6) identified 47 instruments for measuring healthcare quality on the Internet. Four years later, they found another 51 – all of them
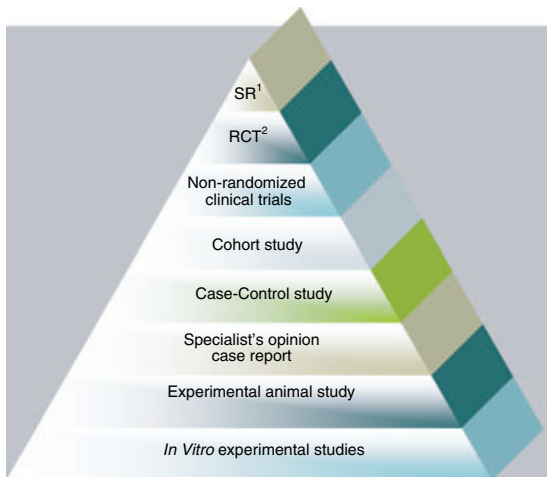
[1]Systematic Review with or without Metanalysis; [2]Randomized Controlled Trial.

Fig. 1. Pyramid of clinical evidence hierarchy.

unvalidated. Generating yet more unproved instruments is another reason to make clinicians stop looking for evidence and continue to do what they have always done. However, the proliferation of tools for assessing quality continues unabated, fueled by anxieties about possibly causing harm to patients (6).

One way to access the quality of a research is to verify the design of the study. The goal is to increase validity and reduce bias. It is generally accepted that systematic reviews and randomized controlled trials and well-designed non-randomized control studies represent the best levels of evidence for treatment decision. Regarding diagnosis, prognosis, or causation, cohort studies or case–control studies are surely more appropriate (Fig. 1).

The main purpose of this paper was to present some basics ways of reliably searching papers and to introduce some techniques to facilitate the development of strategic search skills to improve the quality of dental care, using dental trauma as an example.

Materials and methods

A comparison was made between: (i) data collected in PubMed using a given term, (ii) data collected in PubMed using the Medical Subject Headings vocabulary (MeSH), and (iii) data collected using the principles of evidence-based research, all by an independent researcher. A brief commentary about each database and its reliability will be presented.

The first step in the quest for answers to clinical questions was the formulation of a clear and focused question. The first step consists of narrowing the question by deciding which elements are the most important to answer with a 'hit and run search.' We can look for answers to the less important elements at our own choice, or more likely, when we really need them in the future (7). In our example, these elements form the question, *Which is the best emergency treatment for an avulsed tooth*? – a question of therapy. It is important to highlight at this point that the question cannot directly address other related questions, such as *What are the*

sequelae of a non-root treatment before the reimplantation? – a question of causation.

To retrieve relevant information we combined concepts/keywords together, using *Boolean operators* (And, Or, Not), keeping search statements and combining later. To avoid missing references we used the technique of *truncation*. We also used, in some database, *Limit search* results by publication type (randomized controlled trials, language, and human studies). This reduced the number of references, focused the search and increased the precision/reliability. On the other hand, we *Explode* a thesaurus term, to retrieve articles labeled with either that thesaurus term OR the more specific associated term/s, thereby widening the search to retrieve more references.

The following sites were searched.

Medline

This database produced by the National Library of Medicine in America is the major database used to trace periodical articles in the biomedical literature from 1966 onward, covering the disciplines of medicine, dentistry, nursing, veterinary medicine, healthcare services, and the preclinical sciences and, by far, is the most relevant and readily available site. A free version of MEDLINE called PubMed can be accessed at http://www.pubmed.gov.

Cochrane

The Cochrane Collaboration is an international organization whose overall aim is to build and maintain a database of up-to-date systematic reviews of randomized controlled trials of health care and to make these readily accessible electronically (http://www.cochrane.org). The main product of the Cochrane Collaboration is the Cochrane Library, an electronic library, issued quarterly, which contains databases of controlled trials and systematic reviews. The core work of the collaboration is done by the Collaborative Review Groups, which are formed by individuals who have a common interest in a healthcare problem and who work together through electronic means to prepare a systematic review on their chosen topic.

Evidence-based dentistry

This web site (http://www.cebd.org) gives access to a wide range of resources, which support evidence-based dentistry. Nowadays, this site can be accessed in Portuguese, English, or Spanish at Evidentista (http://www.evidentista.org). Evidentista is a brand new site developed by the University of Pernambuco, Brazil, and Forsyth Institute, USA. Through those sites, we can access a helpful search engine that can identify the best current oral health clinical evidence. This search engine uses the PICO strategy to find evidence-based research. The first step in developing a well-built question is to identify the patient problem or population [P] by describing the patient's chief complaint (*tooth avulsion*). Identifying the Intervention [I] is the second step in the PI process (*emergency treatment*). The third phase of the well-built question is the Comparison [C]. The

Comparison is the only optional component in the PICO question as often there may not be an alternative, as was in our case. The final aspect of the PI question is the outcome [O]. This specifies the result(s) of what you plan to accomplish, improve, or affect, and it should be measurable (*tooth maintenance*).

Knowledge Finder

Knowledge Finder analyzes your search request and retrieves the most relevant articles based on proprietary Knowledge Finder algorithms and probabilistic analysis including the following elements: Concept mapping, Spelling Equivalents, Word forms, Weighting, Term frequency and normalization, and Automatic pre-explode. Knowledge Finder conveniently packages all of these enabling technologies into a single search button (http://www.kfinder.com). The continuous enhancement of the technology for more than 14 years ensures that you retrieve excellent search results as quickly as possible. A great advantage of this search engine is that the retrieved documents are presented in order of likely relevance (in percentages).

Results

The best sites that we used to perform our example research are those produced by academic centers, government-sponsored, and professional organization sites.

Medline

On PubMed site we entered the term *Emergency Treatment for Avulsed Teeth* and pressing search, then 26 items was found. The feature 'told' us that the term *Avulsed Teeth* was a poor choice, because MEDLINE does not recognize this term as a MeSH vocabulary. MeSH is a special vocabulary developed by the NLM to index each reference. Its terminology provides a consistent way to retrieve information and bypasses the problem of medical jargon and multiple synonyms for the same idea. Substituting this term for *Tooth Avulsion [Mesh] AND Emergency Treatment [Mesh]* we found 34 articles.

Cochrane

Looking for our clinical question *Emergency Treatment for Avulsed Tooth* on the site of Cochrane Library we got only one systematic review about Interventions for treating traumatized (luxated) permanent front teeth.

Evidence-based dentistry

Based on these four parts, the final PI question was stated as: *For a patient with tooth avulsion, emergency treatment is a better choice of tooth maintenance*? Using the PICO strategy we found one article that fits the clinical question.

Knowledge Finder

To do our research we used the follow expression: *which is the evidence-based emergency treatment for tooth avulsion/PT: GUIDELINE/PT: PRACTICE GUIDELINE/English only*. In this way we retrieve more than 20 papers, but from a moderate to low relevance (up to 76%).

Discussion

The well-being of our patients depends upon the successful integration of the 'best available' evidence into novel and improved treatment modalities. The question is not 'why' but 'how.' How can we actualize this union? How can we identify the 'best available' research evidence? How can we most effectively integrate it into the common day-to-day exercise of dental practice? These are fundamental and timely questions for dentistry in the 21st century (4).

Computerized health databases, such as the above mentioned, have made easier both the distribution and the access to information. Today, other strategies available to help the dentist keep abreast with the current information are: Professional journals (many also available on-line); Web-based continuing education programs; Books, audio and video tapes (which often do not suggest the most recent information and may suffer from the personal point of view of the author); Professional and university continuing education meetings and study clubs composed by colleagues (2).

Knowing what constitutes the highest levels of evidence and how to apply evidence-based filters and limits will let us search the literature with maximum efficiency. It is important to highlight that a single research study does not constitute 'the evidence' but rather contributes to a body of knowledge that has been derived from multiple studies investigating the same area (8).

Searchers who want retrieval with little non-relevant material can choose strategies with high specificity. For those interested in comprehensive retrievals or in searching for clinical topics with few citations, strategies with higher sensitivity may be more appropriate. The strategies that optimized the balance of sensitivity and specificity helped separate eligible studies from others but did so without regard for whether sensitivity or specificity was affected (9). We did not have enough data to do an independent validation of our treatment search and thus risked overestimating the search performance.

It can be difficult to decide which terms to enter when starting a new search. A useful strategy is to enter the best term you can think of, scan a few of the abstracts from retrieved articles that seem relevant. MeSH is a special vocabulary developed to index each reference. The vocabulary contains main headings or index terms, each of which represents a single concept in the biomedical literature. New terms are continuously added and outdated ones removed by subject specialists as new concepts emerge in the scientific literature. Besides searching by subject, searching can be done by 'text words,' which are words or phrases in the title or abstract of the article (10).

Another useful operation, called truncation, can be employed when doing text word searches. A truncated

term (or wild card, in search jargon) is the first part of a word followed by an asterisk. This feature allows all terms beginning with that part of the word to be searched (10). For example, 'trauma*' will find all terms that begin with the letters *t-r-a-u-m-a*, including 'trauma,' 'traumatic,' 'traumatism,' and so on.

At the Evidentista website a professional can ask for help. The site staff will perform searches at no charge or will assist you by analyzing your clinical question, offering advice ranging from how to get started to more advanced search methods.

All those steps to get the best evidence lead us to achieve Clinical Practice Guidelines that are 'systematically developed statements to assist practitioners and patients in arriving at decisions on appropriate health care for specific clinical circumstances.' The overriding purpose of guidelines is to enhance, not dictate, clinical decision making and to provide practical recommendations to help practitioners improve the care they offer to their patients (11).

Clinical practice guidelines have evolved during the past 20 years from recommendations based largely on expert judgment to recommendations grounded primarily in evidence. Expert consensus comes into play in guideline development only when evidence is lacking (12). There are few published evidence-based guidelines available in dental trauma, although there is strong interest and some significant efforts are underway. One of the most extensive collections of guidelines can be found in the National Guideline Clearinghouse. This database can be accessed through the web site of the Agency for Healthcare Research and Quality (http://www.ahcpr.gov/clinic/cpgsix.htm) of the U.S. Department of Health and Human Services (13).

Through the EBD process we can provide valuable information to our patients and staff and stay informed about procedures, policies, and materials in our field. Our credibility may increase when current best evidence is effectively communicated in such a way that patients are able to make better-informed decisions.

References

1. Needleman I. Is this good research? Look for CONSORT and QUORUM. Evid Based Dent 2000;2:61–2.
2. Balline A, Capodiferro S, Toia M, Cantore S, Favia G, Frenza G et al. Evidence-Based Dentistry: what's new? Int J Med Sci 2007;4:174–8.
3. Seidel-Bittke D. Evidence-Based Dentistry: how to use it. Dent Today 2003;22:50–5.
4. Chiappelli F, Prolo P, Newman M, Cruz M, Sunga E, Concepcion E et al. Evidence-based practice in dentistry: benefit or hindrance. J Dent Res 2003;82:6–7.
5. Coulter ID. Evidence-based dentistry and health services research: is one possible without the other? J Dent Educ 2001;65:714–24.
6. Gagliardi A, Jadad AR. Examination of instruments used to rate quality of health information on the Internet: chronicle of a voyage with an unclear destination. BMJ 2002;324:569–73.
7. Sutherland SE. Evidence-based dentistry: Part I. Getting started. J Can Dent Assoc 2001;67:204–6.
8. Forrest JL, Miller SA. Evidence-based decision making in action: Part 1 – finding the best clinical evidence. J Contemp Dent Pract 2002;3:10–26.
9. Haynes RB, McKibbon KA, Wilczynski NL, Walter SD, Werre SR, for the Hedges Team. Optimal search strategies for retrieving scientifically strong studies of treatment from MEDLINE: analytical survey. BMJ 2005;330:1179–84.
10. Sutherland SE. Evidence-based dentistry: Part II. Searching for answers to clinical questions: how to use MEDLINE. J Can Dent Assoc 2001;67:277–80.
11. Sutherland SE. The building blocks of evidence-based dentistry. J Can Dent Assoc 2000;66:241–4.
12. Clancy CM, Cronin K. Evidence-based decision making: global evidence, local decisions. Health Aff 2005;24:151–62.
13. Sutherland SE, Walker S. Evidence-based dentistry: Part III. Searching for answers to clinical questions: finding evidence on the Internet. J Can Dent Assoc 2001;67:320–3.