Periodontal Research and its Importance

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Abstract

As is common with all areas of medicine, periodontal research also increases at an exponential rate with each passing year. Huge numbers of papers are published each year which aim to address different aspects of periodontology, and it is a difficult task to keep up with these new research developments as and when they are published, especially for the clinical practitioners. In the next four to five decades, periodontists of the future may wonder at the treatment protocols which we at present may consider as state of the art. Thus, it is empirical that researchers, clinicians, teachers and students alike, look into updating themselves with the latest developments in periodontal research.

Keywords: Periodontal Research; Dentistry

Introduction
The importance and basics of evidence based dentistry

Periodontists need to make decisions on a daily basis regarding patient care. The decision process is based on many factors but it should essentially be scientifically sound. The evidence-based approach was first introduced in medicine [1-3]. Evidence based medicine can be defined as the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients [2]. Moreover, the definition of evidence based dentistry is an approach to oral health-care decision-making that requires the judicious integration of systematic assessments of clinically relevant scientific evidence relating to the patients oral and medical condition and history, together with the dentists clinical expertise and the patients treatment needs and preferences [4]. In the 1980s, the application of an evidence-based approach to clinical education was pioneered in medicine at McMaster University, Ontario, Canada. Evidence based practice in dentistry was soon adopted [1,3].

The advantages of evidence based dentistry:

- It can improve the quality of patient management. By performing a systematic search, the most updated treatment modality and rationale can be identified and applied to patient care as appropriate.

- It can create a higher standard of practice. The practice of dentistry and periodontics is rapidly changing. In order to maintain a high standard of practice, it is important to be familiar with the pros and cons of new technologies.

- There is a need for dentistry to be more compatible with medicine that has embraced the evidence-based philosophy [1-3].

The literature search in research must be valid, specific and repeatable. Also, if the review is not comprehensive, the conclusion may be biased. Therefore, a standardized search protocol, known as the systematic review, was developed. It is a vigorous and repeatable process of literature review that is formulated specifi-

cally to answer a preset question. It can be used academically in a commissioned review or just simply to answer a query in a clinical practice. The process begins with a query encountered in practice. After the query is identified, a standardized question must be created which forms the basis of the systematic review.

The PICO question

There are four components in the question: Population (P), Intervention (I), Comparison (C), and Outcome (O), the term PICO question (Table 1). After the question is formulated, a systematic search can be performed. The results generated are then considered and analyzed carefully based on their relevance and on the strength of the evidence. Finally, the original query is reviewed and a conclusion can be drawn based on the search evidence. Most importantly, the conclusions can be applied to clinical practice [1,5].

Population (P)	Patients with calcium channel blockers induced gingival overgrowth
Intervention (I)	Scaling and root planing and periodontal resective surgery
Comparison (C)	With or without cessation of calcium channel blockers
Outcome (O)	Probing depth, Gingival size and recurrence of overgrowth

Table 1: The PICO Question design to check the effectiveness of scaling and root planning and periodontal respective surgery on calcium channel blockers induced gingival overgrowth: In patients with calcium channel blockers induced gingival overgrowth, what is the effect of scaling and root planing and periodontal respective surgery, with or without cessation of calcium channel blockers, on probing depth, gingival size and recurrence of overgrowth.

After the PICO question is formulated, a search protocol can be initiated. The inclusion criteria should be broad enough to include the necessary information but narrow enough so that the screening process will not be too complicated. The levels of evidence needs to be set when formulating the search protocol, but it may need to be amended depending on what the search actually yields. The search should be started by searching pre-appraised literature before performing database searches for primary literature. The selection of the electronic database will depend on the subject of interest [6].

The search terms should be related to all four parts of the PICO question. A more elaborate search can also include a hand search, which can compensate for the studies excluded because of the limitations in electronic database indexing or the inclusion and exclusion criteria. Ongoing trials or unpublished data may be available in clinical trial registries on the Internet, or simply published on the websites of pharmaceutical companies. Although the information may be unreliable, a search on a major Internet search engine may also provide information that has been published informally. However, the search must be performed structurally and the results considered sceptically [5].

The types of evidence

Before the results can be analyzed, the quality of the studies must be considered. The types of evidence can range from meta-analyses and systematic reviews (strongest evidence) to *in-vitro* research (weakest evidence) (Table 2). Meta-analysis is a form of systematic review in which results are pooled together mathematically [7]. Systematic reviews are considered as the most reliable method for summarizing large volumes of research evidence [8]. Epidemiological studies can be classified as either experimental studies or observational studies. The studies can be further classified as shown in the figure 1.

1.	Meta-analyses and systematic reviews (review of completed studies)
2.	Randomized controlled trials (experimental with randomization)
3.	Quasi-experimental (experimental without randomization)
4.	Cohort studies (Observational)
5.	Case-control studies (Observational)
6.	Case Series (Observational)
7.	Case Reports (Observational)
8.	Ideas, Editorials, Opinions
9.	Animal Research
10.	*In vitro* (test tube) Research

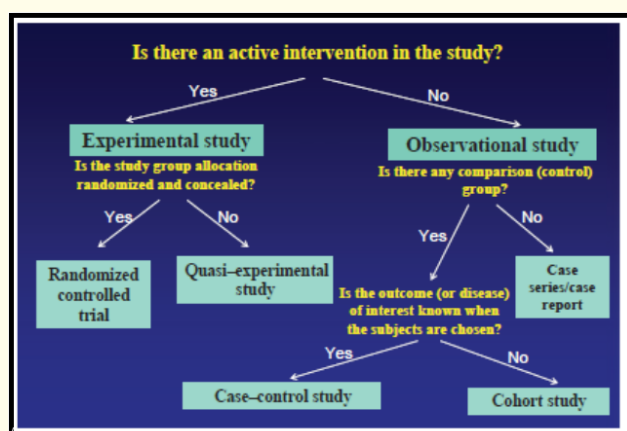**Table 2:** Hierarchy of study designs based on the evidence levels.

Figure 1: Classification of epidemiological studies.

Experimental studies are considered as the highest level of clinical study design. They involve an active attempt to change a disease determinant or the progress of a disease through treatment. The randomized controlled trial design incorporates the application of an experimental treatment and comparison with another treatment.

Observational studies are further divided into cohort studies, case-control studies, case series and case reports, in descending order of evidence level.

The disadvantages of observational studies include:

• There is no active attempt to intervene in the study population.

• The subjects selected for the study are not randomly assigned, and this can lead to bias in the study.

The advantages of observational studies include:

• They cost considerably less to conduct because there is no intervention involved.

• They can be conducted without time constraints because of lower cost and flexibility in the study design.

• They can be conducted in a timely manner because they do not rely on subject recruitment.

• The range of subjects can be broadened because the subjects are selected instead of recruited voluntarily.

Cohort studies are considered to have the highest evidence among observational studies because they are planned in advance and followed longitudinally. A group of subjects are followed to observe the effects of their exposure to either different treatments or risk factors.

Case-control studies are considered as the next level of evidence in observational studies. This type of study involves matching subjects with the disease or effect of interest (case) to subjects of similar demographics but who do not express the disease or effect of interest (control). The groups are usually selected at different times and then compared to determine the cause of the disease or the effect of the treatment; thus, it is still longitudinal.

Case series and case reports are considered to be the lowest level of evidence among observational studies. The next level of evidence is expert opinion that is based on pathophysiology, bench research or consensus.

After ranking the studies, the relevant studies are screened according to the pre-set evidence. The essence of evidence-based research is to find quality information from the first top five tiers of evidence.

A better understanding of the evidence-based method facilitates incorporation of this new information into practical clinical algorithms. After considering the search results and evaluating their validity and usefulness, a conclusion can be drawn related to the original PICO question.

Finally, the conclusion can be applied back to clinical practice, along with consideration of patient preferences and values, clinical circumstances and the clinician's experience and judgment. The scientific evidence has to be considered, along with patient preferences or values, clinical patient circumstances and the practitioner's experience and judgment [3] (Figure 2).

What the future holds for periodontal research

Clinicians and periodontists need to continually update on treatment options, modalities and rationale as new research emerges. By following a systematic approach, evidence can be considered
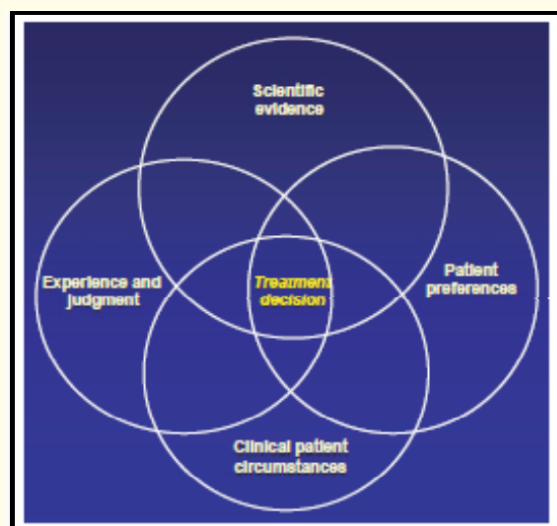
Figure 2: Process of evidence based decision making.

and applied to clinical practice. This approach is standardized and repeatable and facilitates the practice of evidence-based dentistry. The application of evidence is essential in modern periodontology, and this approach is the core of the evolution towards an evidence-driven practice.

With the advent of the new classification system for periodontal diseases given by the American Academy of Periodontology and the European Federation of Periodontology, modern periodontal research can focus on this current classification and new developments must be made keeping this in mind [9].

In order to conduct clinically relevant research, we need to ask the important research questions of the day. Some of the clinical questions that should be discussed are highly relevant to modern periodontal practice, such as when to extract teeth and replace with implants, how to treat mucogingival defects, how to treat patients with compromised healing potential as a result of systemic diseases, and focussing on the potential for regenerating periodontal tissues that have been lost as a result of periodontal inflammation.

An example of this is the development of automatic method for staging periodontitis on dental panoramic radiographs using deep learning hybrid method which leads to highly accurate diagnosis and assessment of periodontal bone loss and staging of periodontal diseases [10], which can be used to assist the clinicians in their daily treatment and treatment planning. This is an example of how modern periodontal research should focus to include the use of technology and advances in machine learning to improve everyday practice. The use of newer technologies can also help develop newer research methodologies.

These important research goals need to develop methods to detect periodontitis and peri-implantitis at the earliest stage, in order to initiate treatment before the diseases progress. Such a therapeutic approach would require the use of biomarkers to distinguish between normal biologic processes and progressive disease. Future treatment with stem cells or other biomaterials may be able to regenerate lost periodontal attachment, and development of vaccines against periodontal pathogens may prove helpful in preventing and controlling periodontitis. More efficient methods of patient self-care will reduce the severity of periodontal disease and the need for therapy and help to avoid patient make difficult decisions regarding treatment needs and affordability issues.

Conclusion

In order to answer many of these clinical questions, more research studies will be needed. These studies should be performed in a systematic and scientific way, so as to achieve these clinical questions.

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