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REVIEW ARTICLE

Evidence Based Periodontal Therapy- A Review

NILIMA S *, VANDANA K.L **

ABSTRACT

With regard to dentistry, these are indeed the best of times. We have available materials and techniques that visionaries could only dream of 25 years ago. We can predictably replace missing teeth with implant-supported prosthesis, regenerate tissues lost to disease and trauma. Yet as our profession hurdles ahead these are also the worst of times. The new technologies are so enamoring that the collective common sense is lost.

This paper attempts to review the periodontal therapy and evidence based approach.

Key Words : Evidence based dentistry, Systematic Review, Meta analysis, Guided tissue regeneration(GTR), Open flap debridement(OFD).

Dept. of Periodontics, College of Dental Sciences, Davangere.
*Postgraduate student, ** Senior Professor.
Corresponding Author DR. VANDANA K.L.MDS,
Dept. of Periodontics, College of Dental Sciences, Davangere. PH: 001-08192-31285, FAX: 91-8192-51070
E-mail: vanrajs@hotmail.com

Introduction

The concept of evidence-based medicine dates back to the time of Frederick II, Emperor of the Romans and King of Sicily and Jerusalem, who lived from 1192 to 1250 AD, and who was interested in the effect of exercise on the digestion, took 2 knights and gave them identical meals. One was then sent out hunting and the other ordered to bed. At the end of several hours he killed both and examined the contents of their alimentary canals; digestion had proceeded further in the stomach of the sleeping knight. [1]

EBD was borrowed from medicine. [2] Evidence based medicine has only been known for just over a decade and the term was coined by the clinical epidemiology group at McMaster University in Canada. One of the earliest to take up the challenge in periodontology was Alexia Antczak Bouckoms in Boston, USA. [3]

1980s: Bouckoms and colleagues challenged the methods and quality of periodontal clinical research.
1994: Oral Health Group as part of the Cochrane Collaboration set up
1996: World Workshop in Periodontology held by the American Academy of Periodontology included elements of evidence- based healthcare, supported by Michael Newman at UCLA.
1997: The editorial base of the Oral Health group subsequently moved to Manchester University with Bill Shaw and Helen Worthington as co-coordinating editors.
2001: The first Cochrane systematic review in periodontology was published and researched the effect of guided tissue regeneration for infrabony defects.
2002: European Workshop on Periodontology became the first international workshop to use rigorous systematic reviews to inform the consensus.

The PICO Process[5]

The formality of using PICO to frame the question forces the questioner to focus on what the patient/client believes is the most important problem and the desired outcome. It allows you to determine the type of evidence and information required to solve the problem and the outcome measures that will be used to determine the effectiveness of the intervention.
One of the greatest difficulties in developing each aspect of the PICO question is providing an adequate amount of information without being too detailed. Each component of the PICO question should be stated as a concise short phrase.

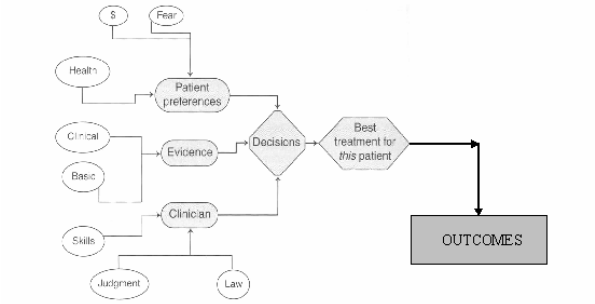
Applying the PICO Process

The first step in developing a well-built question is to identify the patient problem or population [P] by describing either the patient's chief complaint or by generalizing the patient's condition to a larger population.

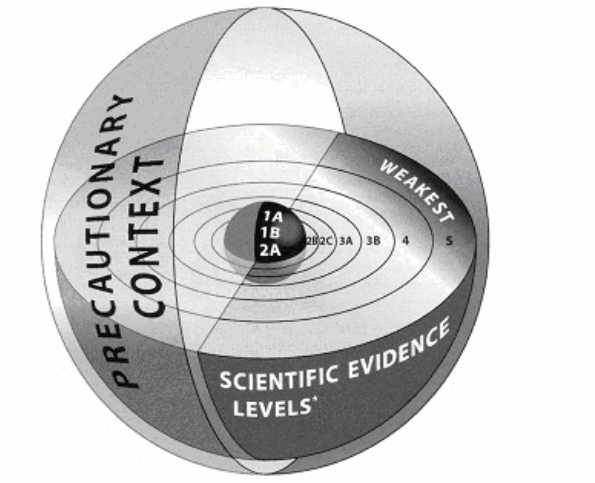
Identifying the Intervention [I] is the second step in the PICO process. It is important to identify what you plan to do for that patient. This may include the use of a specific diagnostic test, treatment, adjunctive therapy, medication, or the recommendation to the patient to use a product or procedure. The intervention is the main consideration for that patient.

The third phase of the well-built question is the Comparison [C], which is the main alternative you are considering. It should be specific and limited to one alternative choice in order to facilitate an effective computerized search. The Comparison is the only optional component in the PICO question since oftentimes there may not be an alternative.

The final aspect of the PICO question is the outcome [O]. This specifies the result(s) of what you plan to accomplish, improve, or affect, and it should be measurable. Outcomes may consist of relieving or eliminating specific symptoms, improving or maintaining function, or enhancing esthetics. Outcomes yield better search results when defining them in specific terms. "More effective" is not acceptable unless it



Table/Fig 1. The decision pathway starts with the recognition of the three essential elements; patient preferences, the evidence, and the clinician. Each of those factors are in turn influenced by a large number of antecedents. All of the information is used to make decisions that are (hopefully) the best for the patient. Good decisions increase the chances of good outcomes. [4]

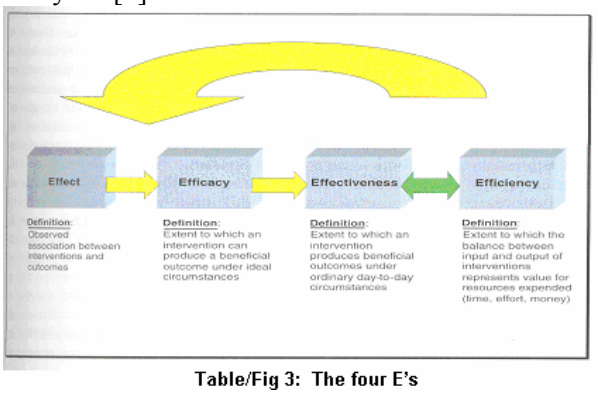


Table/Fig 2: "The Current Hierarchy Of Quality Of Evidence"

The Current Hierarchy Of Quality Of Evidence:[6]

Level Study category: therapy/prevention, etiology
1a: Systematic review of randomized controlled trials (RCTs)
1b: Individual RCT (with narrow confidence intervals)
2a: Systematic review of cohort studies
2b: Individual cohort study (including low-quality RCT; e.g. <80% follow-up)
2c: "Outcomes" research; ecologic studies
3a: Systematic review of case-control studies
3b: Individual case-control study
4: Case series (and poor-quality cohort and case-control studies)
5: Expert opinion without explicit critical appraisal, or based on physiology, bench result research, or "proof of principle study"describes how the intervention is more effective.

Systematic review is an overview of the primary research that has an explicit statement of objectives, materials and methods and has been conducted following previously established rigorous and reproducible methodology. When the systematic review includes a statistical synthesis of the numerical results of several trials that examined the same question it is termed as Meta analysis. [7]



Table/Fig 3: The four E's

Anatomy of a Systematic Review [7]

The following specific features illustrate the systematic approach:

- Preparation of a detailed research protocol that outlines the clinical question of interest.
- Selection of criteria for inclusion of articles in the review.
- Systematic search of relevant published and unpublished research.
- Determination (by two reviewers) of articles that meet predefined inclusion criteria.

- Critical appraisal of the quality of selected articles.
- Extraction of outcome data from the selected articles.
- Data combination (where appropriate) to synthesize and summarize the best evidence.
- Report of findings relative to the knowledge base and new questions raised by the findings.

What To Look For In A Useful Systematic Review[7]

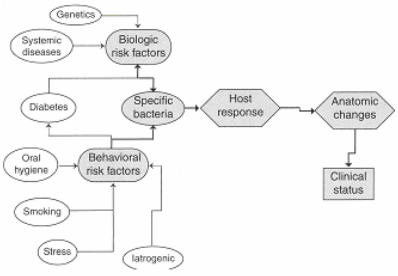
- Was a clinical question clearly stated and addressed?
- Were the search methods comprehensive enough to find all relevant articles?
- Were explicit methods used to evaluate which articles to include in the review?
- Was validity of the articles assessed, and was this assessment reliable and free from bias?
- Were inconsistencies in the findings of the included studies analyzed?
- Were the findings of the primary studies combined appropriately?
- Were the reviewers' conclusions supported by the data?

Different clinical research questions require evaluation through different study designs. Although RCTs and systematic reviews of RCTs may well be the 'gold standard' upon which to base the decisions on the effectiveness of interventions, they are not necessarily appropriate, or ethical to answer all the questions. For questions regarding prognosis or etiology, cohort studies would be more appropriate.

The emphasis on patient centered decision making has facilitated the focus on patient outcomes in particular, research design for questions of therapeutic effect, based on a clear understanding of the difference between effect, efficacy, effectiveness and efficiency.[8]

To offer patients the best treatment for their unique set of problems and preferences, the clinician must be able to do the following:[4]

- Have accurate historical, physical, behavioral information about the patient; perform a comprehensive periodontal, restorative, and occlusal examination on all patients.
- Find out about as many risk factors as possible and determine how they will modify treatment decisions and treatment response.
- Have access to the best and latest information about the patient's problems and the treatment alternatives best suited to solve the problem.
- Have a system for evaluating the evidence and a method for incorporating a new technique in the practice.
- Having justification for choosing the end points of treatment and monitoring the patients' status. These include both the physical endpoints such as probing pocket depths, and patient centered end points such as preferences.



Table/Fig 4: The influence of risk factors on the anatomic changes that in turn determine the clinical status of the patient.[4]

Routes of evidence [9]

- Asking someone.
- Consulting a textbook.
- Finding relevant article in our own reprint file.

Using bibliographical database such as medline

Advantages [9]

It does not take clinical decisions out of the clinician's hands and put them into the hands of literature. EBD gives guidelines for the clinician and relies first on clinical expertise.

It relies on evidence rather than authority for clinical decision-making.

It uses resources more effectively. The clinical problem solving approach to dentistry favours the early uptake of new and better treatments. Systematic reviews in the form of overviews or meta-analyses offer a solution for busy practitioners who have difficulty keeping abreast of current literature. Because systematic reviews can condense numerous studies into reliable and valid summaries of the best available evidence for a specific clinical problem, they offer significant benefit to busy clinicians.

Systematic reviews are now considered the most reliable method for summarizing large volumes of research evidence. These reviews are less prone to subconscious and subjective forms of bias often seen in reports by experts because they follow

principles of research design similar to those found in primary research.

Disadvantages:

- Amount of evidence
- Quality of evidence
- Dissemination of evidence
- Practice based on authority rather than evidence

Information in an article about the prognosis of a condition should be applied to a special patient can be decided by the following questions:[10]

- Will the results lead directly to selecting or avoiding treatment for an individual patient?
- Are the results useful for reassuring or counseling patient?

Example with the clarification of the prognosis of juvenile periodontitis treatment can be more focused and aggressive.

Certain questions specific to article about therapy will help determine when to apply improvements to patients and when not to:

- Are the results reported as outcomes that are important to patients?
- Were all clinically important outcomes reported?
- Are the likely treatment benefits worth the potential harms & costs?

For example a Meta analysis presented recently suggested that GTR procedures would result in a mean increase in attachment level of 4.0mm. The result is impressive but the application of this information to an individual patient requires that an increase in attachment level predicts greater tooth longevity- an outcome more likely to be of interest to the patient than the level of attachment. [10]

Table/Fig 5[11]-Consensus findings:Nonsurgical treatment of Gingivitis a Periodontitis.

Treatment category	Treatment	Strengths	Weaknesses	Type of evidence
Professional mechanical therapy-used in the treatment of gingivitis and periodontitis	Scaling and root planing with manual instrument	Decreases gingival inflammation by 40% to 60%; decreases probing depth; facilitates gain in clinical attachment level	Requires attention to detail	Many longitudinal, cohort and randomized clinical trials
	Ultrasonic and sonic scaling and root planing	Results are similar to those for manual scaling and root planning		Longitudinal, cohort and randomized clinical trials
Chemical plaque control with mouth-rinses and tooth-pastes	Chlorhexidine; triclosan with copolymer or triclosan with zinc citrate; essential oils; stannous fluoride	Significant reduction in gingival inflammation	No clear evidence that there is a substantial long-term benefit in periodontitis except to control coexisting inflammation	Randomized, double-blind clinical trials
Irrigation	Supragingival and subgingival irrigation used as an adjunct to brushing	Aids in the reduction of gingivitis	No clear evidence that there is a substantial long-term benefit for periodontitis	Randomized double-blind clinical trials
Sustained-release antimicrobials	Intrapocket resorbable delivery systems containing a tetracycline antibiotic	When used as an adjunct to scaling and root planing, gains in clinical attachment level and decreases in probing depth and bleeding	A few reported side effects include transient discomfort, erythema, recession, allergy and, rarely, Candida	Randomized, double-blind clinical trails
Systemic antibiotics	Tetracyclines, metronidazole, spriamycin, clindamycin and combinations such as metronidazole and amoxicillin	May be useful to treat aggressive, destructive periodontitis	Not indicated for gingivitis; not indicated for most adult patients with periodontitis	Assessment of risk-benefit ratio; randomized, double-blind clinical trials; longitudinal assessment of patients conditions

Table/Fig 6[11]- Consensus findings: Diagnosis of Periodontitis

Test	Application	Strengths	Weaknesses	Type of evidence
Periodontal screening and recording	All patients in every practice	Cost-effective, quick, easy, defects patients with periodontal disease	Does not provide a tooth-by-tooth assessment for later comparison during maintenance therapy; a full periodontal examination is needed for this purpose	Epidemiologic studies
Probing pocket depths	All patients	Shallow probing depths associated with a lack of future disease progression	Moderate-to-deep pockets in a single probing depth examination will not distinguish with certainty which teeth will undergo progressive periodontal destruction	Longitudinal studies
Gingival inflammation assessment	All patients	Absence of inflammation is associated with a lack of future disease progression; in treated patients, bleeding on probing is associated with an increased risk of progressive loss of attachment.	Presence of inflammation will not distinguish with certainty which teeth will undergo progressive periodontal destruction	Longitudinal studies
Radiographic evidence of bone loss	At-risk patients as determined by PSR screening or periodontal examination	Absence of bone loss is associated with a lower risk of future disease progression	Presence of bone loss on a single radiograph will not distinguish with certainty which teeth will undergo progressive periodontal destruction .	Longitudinal studies
Microbial plaque tests	High risk or refractory patients	Absence of supragingivgingival plaque is associated with a lack of disease progression	Routine testing offers limited benefit in adult periodontitis	Cross-sectional and longitudinal studies
Biochemical profiles in gingival crevicular fluid		In compromised or refractory patients, may be useful in determining the presence of pathogens		Case reports
	Not yet determined	A number of biochemical markers may identify individuals at risk.	At present, there are no specific biochemical profiles that characterize specific periodontal diseases	Cross-sectional and longitudinal studies.

Conclusion

A major push to integrate the principles of the evidence-based approach into the mainstream of clinical practice has come from the fact that there is great variation in both clinical decision-making and results of therapy.

Evidence based approach conducts systematic appraisal of quality evidence, is more objective, transparent and less biased. It allows greater acceptance of levels of uncertainty.

Table/Fig 7[11]-Consensus Findings: Surgical Periodontal Therapy-Selected Procedures

Category and goal	Treatment	Strengths	Weaknesses	Type of evidence
Pocket therapy provides access to root surfaces and bony defects, reduces probing depths, facilitates plaque control and enhances restorative and cosmetic dentistry	Modified Widman flap to provide access to roots and bony defects for debridement; apically repositioned flap with or without bony recontouring; gingivectomy	All procedures decrease pocket depth; with the exception of gingivectomy, all increase clinical attachment level; after 5 years, greatest reduction in probing depth with osseous recontouring; apically repositioned flap with or without bony recontouring used in crown-lengthening procedures to provide biologic width High potential for bone growth	Procedures designed to reduce probing depths may increase recession; lack of professional maintenance and patient compliance can be detrimental to the long-term success	Randomized clinical trials; longitudinal studies
Regenerative procedures to facilitate growth of new periodontal ligament, cementum and bone over previously diseased root surfaces	Extraoral autogenous bone grafts		Second surgical site (such as iliac crest); root resorption may be associated with fresh grafts	Limited case report data
	Intraoral autogenous grafts (such as maxillary tuberosity, healing extraction sites, osseous coagulum)	Case reprotes indicate bone gain of more than 50%; controlled studies comparing grafts with nongrafted bone show improved clinical attachment levels and bone, but not as great as those in case reports		Case reports; comparative controlled clinical studies
	Allografts – tissue transferred from one person to another; freeze-dried bone allograft Alloplasts-synthetic grafts • Absorbable : plaster, calcium carbonates, ceramics such as tricalcium phosphate and absorbable hydroxyapatite (HA) • Nonabsorbable : dense HA, porous HA, bioglass • Calcium-coated polymer polymethylmethacrylate and hydroxymethylmethacrylate	Bone fill has been reported in a high proportion of defects involving freeze-dried bone allograft Improved probing depth and attachment level Some evidence of histologic regeneration in calcium-coated polymer polymethylmethacrylate and hydroxymethyl-methacrylate	Osteogenic potential may vary from vial to vial; patient differences; clinician variability Histologic findings indicate that synthetic grafts primarily act as fillers, with little if any regeneration	Field test; controlled clinical trials Controlled clinical trials
Guided tissue regeneration-physical barriers are used to facilitate selective cell population of the root surface after periodontal surgery to promote regeneration	Nonresorbable membranes	Significant improvement in clinical attachment level compared with debridement alone; most favorable results are in Class II furcations in the mandible and infrabony defects; no need for second surgery (resorbable only)	Less favorable results in maxillary molar and Class III defects; nonresorbable membrane requires a second surgery to remove the membrane	Randomized, controlled clinical trials; uncontrolled studies; and case reports
	Resorbable materials		Clinical results similar to those for nonresorbable membrane but less evidence available to allow a comparison of predictability with respect to nonresorbable membranes	
Gingival augmentation to promote root coverage	Pedicle graftsFree soft-tissue grafts (epithelialized or connective-tissue graft)Combination grafts : • Connective tissue or biodegradable membrane barrier plus pedicle graft •Coronally positioned, previously placed soft-tissue graft • Nonbiodegradable membrane barrier plus pedicle graft	Improve esthetics/cosmetic results; decrease root sensitivity; manage defects resulting from root caries removal or cervical abrasion; manage mucogingival defects		Case reports; comparison studies
Endosseous dental implants	Two-stage and one-stage implants; titanium; titanium alloy; hydroxyapatite-coated implants	Dental implants are predictable replacements for missing teeth in fully and partially edentulous patients	While there are few studies in the literature, the clinician should use caution in the following cases: smoking, untreated periodontal disease, poor oral hygiene, uncontrolled systemic disease, history of radiation therapy, active skeletal growth	Longitudinal studies

The traditional approach however has unclear basis of evidence, unclear or absent appraisal or quality evidence, is more subjective, more opaque and more biased. It has greater tendency to black and white conclusions.

Despite the cited differences both the evidence-based and traditional approach emphasize on high value of clinical skills, experience and integrating evidence with patient values. Research evidence helps to decide which interventions are most effective. It should not replace our clinical findings from history and examination, but harness our clinical intuition from years of experience and help us recognizing gaps and uncertainties in our knowledge.

Table/Fig 8 Examples of clinical care changes resulting from absence of evidence:[6]

Procedure Protocol	Before Evidence-Based Approach	After Evidence-Based Approach
Output irrigation solution for all non-dental implant surgical procedures	Contaminated irrigation solution: tap water, filtered tap water, filtered bottled water Risk of harm: disease transmission	USP sterile saline output irrigation
Dental unit waterlines (DUWL)	Use of non-sterilizable traditional DUWLs with indwelling filters · Use of air-water syringes attached to DUWLs Risk of harm: disease transmission	Use of detachable irrigation tubing sterilized for each procedure Use of sterile irrigation syringes
Rotary drill use for surgical bone recontouring and root surface modification	Use of conventional high-speed, air-driven dental hand pieces (sterilized) Use of sterilized multiuse burs Risks of harm: introduction of air emboli into surgical spaces; heat trauma to and excessive reduction of bone and tooth structure	Use of low speed variable torque electric motor hand pieces (sterilized) Use of single use sterile burrs For bone recontouring
Grafting material	· Allogeneic (human cadaver) · Xenogeneic (animal tissue) · Autogenous (patient tissue) Risks of harm with allogeneic and xenogeneic tissues: disease transmission	Autogenous Tissues
Resorbable suture material	Xenogeneic (gut) Risks of harm; disease transmission; autoimmune inflammatory reaction at surgical site	Synthetic

Examples of clinical care changes resulting from presence of evidence:[6]

Procedure/protocol	Before Evidence-Based Approach	After Evidence-Based Approach
In-office caries prevention procedures immediately following all periodontal flap surgery suturing and at postop. appointments.	No treatment	Fluoride varnish application
In-office caries prevention procedures at dental hygiene maintenance appointments for higher caries risk patients and root sensitivity patients	Fluoride gel application	Fluoride gel application
Root form end osseous implant (titanium screw) brands/manufacturers	Single	Multiple Single
Toothbrush recommendations	Manual soft tooth brush	Manual soft tooth brush Powered tooth brush with rotation oscillation
Perio Systemic links	Cursory discussion with diabetic patients and people who smoke	In-depth counselling, education, referral, and/ or treatment Diabetic patients People who smoke Moderate to higher-risk pregnancy & pre pregnancy patients with moderate to advanced periodontitis Moderate to higher-risk cardiac patients with moderate to advanced periodontitis

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