

Evidence Based Periodontology – A Compressive Conspectus

Sarda Trupti^{1,*}, Rathod Surekha²

PG Student, Department of Periodontics, VSPM Dental College and Research Centre, Nagpur

Email: drtruptisarda89@gmail.com

Abstract

Periodontology has a rich history and a strong passion for science. Evidence-based periodontology is the application of evidence-based health care to periodontology. The substantial and extensive periodontal information base, developed over the years, has provided a rational basis for choosing the best treatment for patients. The goal of evidence-based dentistry is to help practitioners provide their patients with optimal care. The practice-related element in evidence-based dentistry is the clinician's integration of the resulting knowledge with clinical expertise and patient preferences to determine the treatment to be recommended to individual patients. Various components of evidence-based periodontology include the production of best available evidence, the critical appraisal and interpretation of the evidence, the communication and discussion of the evidence to individuals seeking care and the integration of the evidence with clinical skills and patient values. Evidenced based approach offers a bridge from science to clinical practice.

Introduction:

Periodontology has a rich background of research and scholarship. A simple MEDLINE search of "Periodontal Diseases" OR "Periodontitis" alone from 1966 to 2003 brings up more than 45,000 hits.¹ Hence, periodontal practice needs to make efficient use of this wealth of research data. The substantial and extensive periodontal information base, developed over the years, has provided a rational basis for choosing the best treatment for patients. Evidenced based approach offers a bridge from science to clinical practice.

What is "Evidence Based Medicine"?

The term was coined by the clinical epidemiology group at McMaster University in Canada. It is defined as the integration of the best research evidence with clinical expertise and patient values.

Evidence based health care as proposed by Muir Gray is "An approach to decision making in which the clinician uses the best evidence available, in consultation with the patient, to decide upon the option which suits that patient best".²

What is "Evidence Based Periodontology"?

It is a tool to support decision making and integrating the best evidence available with clinical practice. It is composed of various levels, which starts with the recognition of a knowledge gap. From the knowledge gap comes a focused question that leads on to a search for relevant information. It is the comprehensive integration of appropriate research evidence, patient preference and clinical expertise. (Fig. 1 and 2)

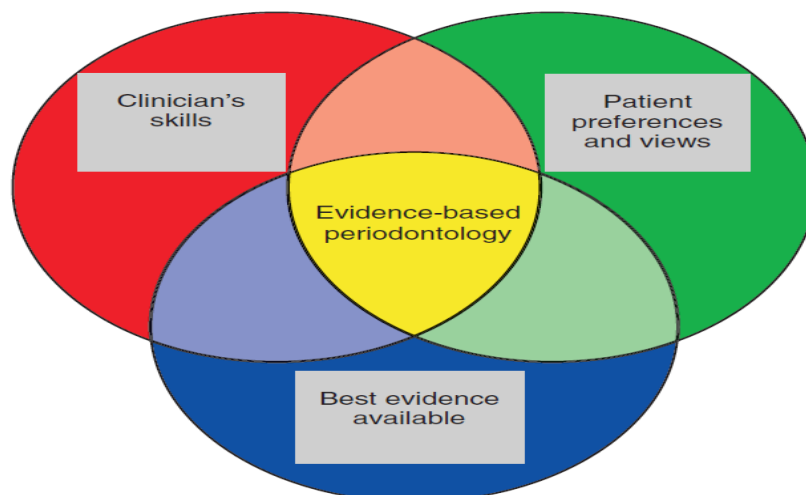


Fig. 1: Components of Evidence Based Periodontology

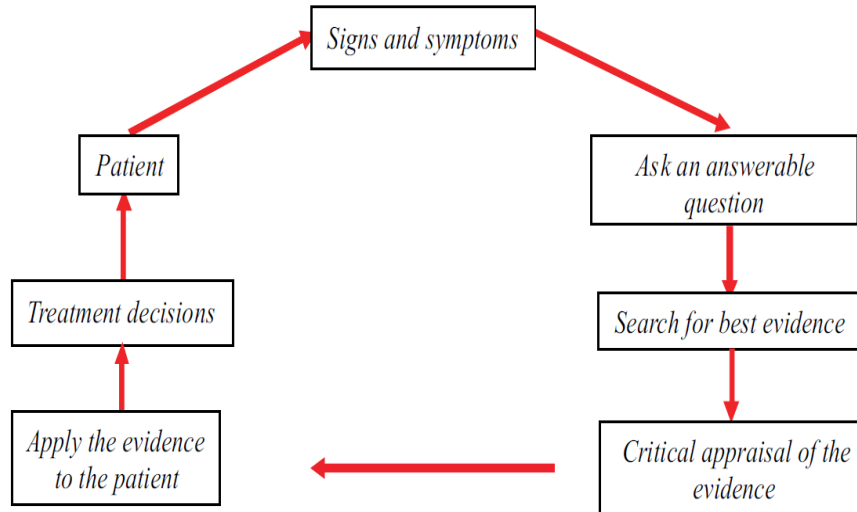


Fig. 2: Model of evidence-based approach

Why Evidence is based dentistry required?

- Encourage dentist to look for evidence available & apply to everyday clinical problems.
- Enable high quality, clinically oriented & relevant research to be applied
- Better information to clinician.
- Improved treatment to patient.
- Increased standing of the profession.
- Reduce variation in patient care. ⁽³⁾

Terminologies used in evidence-based approach-

1. **Systematic review:** Review of a clearly formulated question that attempts to minimize bias using systematic and explicit methods to identify, select, critically appraise and summarize relevant research.
2. **Bias:** Bias is a systematic error. It leads to results which are consistently wrong in one/other direction. Bias leads to incorrect estimate of the effect of a risk factor/exposure.
3. **Confounding:** Describes the situation where an estimate of the association between an exposure and the disease is mixed up with the real effect of another exposure on the same disease, the two exposures being the same.
4. **Confidence Interval:** A method of statistical inference that allows statement to be made about the publication using data from the sample.
5. **Odds ratio:** Ratio of exposure among cases to exposure among controls. ⁽⁴⁾

clinical research in the mid1980s and set up an Oral Health Group as part of the Cochrane Collaboration in 1994. The editorial base of the Oral Health group subsequently moved to Manchester University in 1997 with Bill Shaw and Helen Worthington as coordinating editors. The first Cochrane systematic review in periodontology was published in 2001 by Needleman et al and they researched the effect of guided tissue regeneration for infrabony defects. ⁽⁵⁾

Remarkable events in evidence based periodontology are as follows:

1. The 2002 European Workshop on Periodontology became the first international workshop to use rigorous systematic reviews to inform the consensus. The workshop was organized by the European Academy of Periodontology for the European Federation of Periodontology, under the chairmanship of Professor Klaus Lang. Sixteen focused and rigorous systematic reviews formed the basis of intense consensus discussions.
2. American Academy of Periodontology used a similar approach for the Contemporary Science Workshop in 2003. ⁽¹⁾

Historical background of Evidence Based Periodontology

Development of evidence based Periodontology was influenced by the McMaster group. Alexia Antczak Bouckoms in Boston, USA was one of the earliest to take up the challenge in periodontology who challenged the methods and quality of periodontal

Evidence-based Periodontology vs. Traditional Periodontology

The differentiation between the two approaches emanate from how research informs clinical practice (Table 1).⁽¹⁾

	Evidence-based Periodontology	Traditional Periodontology
Differences	<ul style="list-style-type: none"> • Best evidence available is used. • Systematic appraisal of quality of evidence. • More objective, more transparent and less biased process. • Greater acceptance of levels of uncertainty. 	<ul style="list-style-type: none"> • Basis of evidence is unclear. • Unclear or absent appraisal of quality of evidence. • More subjective, more opaque and more biased process. • Greater tendency to black and white conclusions.
Similarities	<ul style="list-style-type: none"> • High value of clinical skills and experience. • Fundamental importance of integrating evidence with patient values. 	

The components of Evidence-Based Periodontology-

Evidence-based periodontology begins with the recognition of a knowledge gap (Fig. 3). From this comes a focused question that leads on to a search for relevant information. After locating the relevant information, the validity of the research is considered in two broad areas. Firstly, is the science good (internal validity) which focuses on the methodology of research. Secondly, can the findings be generalized outside of the study (external validity).The way treatment was performed affects the external validity. After locating and appraising the research, the results then need to be applied clinically, or at least included in a range of options. Finally, the results in clinical practice need to be evaluated to reveal whether the adopted technique achieved the expected outcome.⁽¹⁾

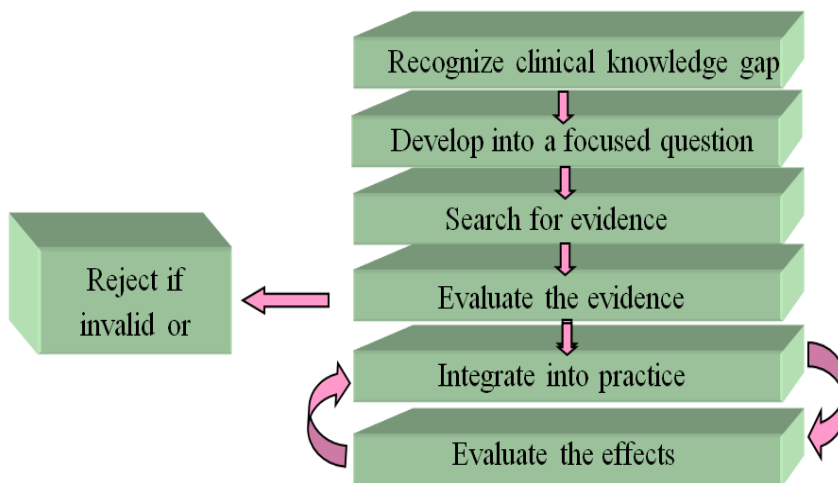


Fig. 3: Steps of Evidence-based Periodontology

Critical Appraisal and various study design

Given that some evidence is better than other evidence, it seems reasonable to place greater emphasis on good than on poor quality evidence when making clinical decisions. The problem arises as to how exactly we decide what constitutes good quality evidence. This process is critical appraisal.

Different clinical research questions require evaluation through different study designs. Fig. 4

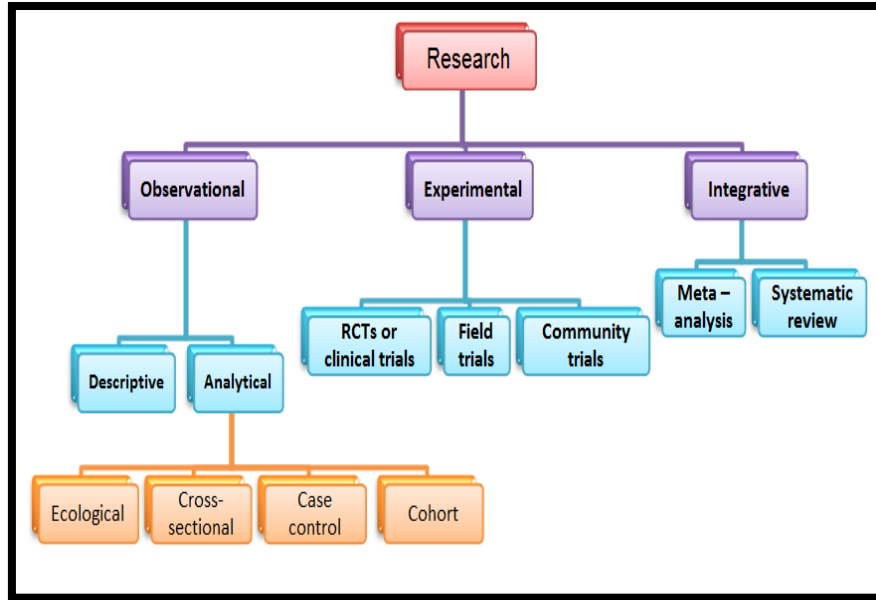


Fig. 4: Various Study Designs

Hierarchy of Evidence

Richards in 2003 wrote a toolbox article for the journal Evidence-based Dentistry entitled: Not all evidence is created equal i.e., the quality of evidence may vary according to study design and that this has led to the concept that there can be a hierarchy of evidence.⁽⁶⁾

One hierarchy is illustrated in following table and is specific to studies on therapy, prevention, etiology, and harm.

Level	Types of Evidence
1a	Systematic review of randomized controlled trails (RCT)
1b	Individual RCT
2a	Systematic review of cohort studies
2b	Individual cohort study
2c	Outcomes research
3a	Systemic review of case-control studies
3b	Individual case-control study
4	Case series
5	Expert opinion

Evidence-Based Approach in Periodontal Therapy

It is discussed under the following headings:

1. EBA and mechanical nonsurgical pocket therapy
2. EBA and effect of smoking on NST
3. EBA in periodontal regeneration
4. EBA and open flap debridement
5. EBA and mucogingival surgery
6. EBA and dental implants

1. Evidence-Based Approach And Mechanical Nonsurgical Pocket Therapy

A total of nine reviews were evaluated to find the best evidence.

- A positive effect was seen after nonsurgical pocket therapy (NST) with the exception of pockets <3 mm.
- Therapy delivery is affected Patient, environmental, and operator factors.

- No significant difference was found between the effect of machine-driven instruments and hand instruments.
- Only difference was that machine-driven instruments were faster than hand-driven instruments.⁽⁷⁾

Conclusions from 1996 world workshop on periodontics:

Chemical plaque control:

- The various antiplaque and/or antigingivitis agents do not offer a substantial benefit for the treatment of periodontitis.
- The benefit obtained from them is the control of gingival inflammation that exists with periodontitis.
- Supragingival irrigation has been shown to aid in the reduction of gingival inflammation when used as an adjunctive to tooth brushing.

- There are no clear substantial long-term benefits for the treatment of periodontitis even when sub gingival irrigation is used.

Antibiotic therapy and periodontics:

- The risk-benefit ratio indicates that systemic antibiotics should not be used for the treatment of gingivitis and common forms of adult periodontitis. But systemic antibiotics may be useful in aggressive forms of periodontitis.

Local delivery of antimicrobial agents:

- Modest gain in clinical attachment level and decrease in probing depth and gingival bleeding was seen.
- Side effects demonstrated were transient discomfort, erythema, recession, allergy, and rarely, candida infection.⁽⁸⁾

Implications for future research:

1. Effect of NST in different population groups is to be estimated.
2. Operator aspects should be included in therapy effectiveness.
3. Patient-oriented research to be conducted.
4. Efficiency studies to be performed.
5. Use of NST in maintenance treatment to be investigated.
6. Details of study design, conduct, and analysis should be provided by researchers.
7. Future studies should be designed to be incorporated in future systematic reviews.

It was concluded that though adjunctive therapies continue to be explored, mechanical debridement is still the single best option available. It remains the foundation treatment for many adjunctive antimicrobial treatment investigations.

2. **Effect Of smoking on Non-Surgical Therapy (NST):** Labriola et al. in the year 2000 conducted systematic review on the effect of smoking on NST.⁽⁹⁾ Search strategy included Medline, Embase and Central. Controlled clinical trial was carried out.

The outcomes were:

- There was reduced pocket depth reduction in smokers, compared with nonsmokers.
- There was no significant difference in the change of Clinical Attachment Level (CAL) between smokers and nonsmokers. This could be due to increased vasoconstriction in peripheral blood vessels of smokers which leads to decrease in bleeding and edema. Also, smokers would have less potential for resolution of inflammation and edema within the marginal tissues and therefore less potential for gingival recession.

3. Evidence-Based Approach in Periodontal Regeneration.

- A. **Guided Tissue Regeneration:** The study was conducted on chronic periodontitis patients, 21 years or older.

The outcomes assessed were:

- **Short-term clinical outcomes:** soft tissue changes such as increased CAL and decreased PPD were evaluated.
- **Long-term clinical outcomes:** It included disease recurrence and tooth loss.
- **Patient-centered outcomes:** It included various factors such as ease of maintenance, change in esthetics, p/o complications, cost/benefit ratio, and patient well-being.

The meta-analysis done by Needleman et al⁽⁵⁾ and Murphy et al⁽¹⁰⁾ revealed:

- a. When compared with OFD, guided tissue regeneration (GTR) showed increase in CAL, decrease in PPD, and defect fill.
- b. When GTR with bone substitutes was compared with GTR alone, the results were similar.
- c. No evidence was found for difference in use of ePTFE versus bioabsorbable membranes.
- d. Long-term clinical outcomes/patient-centered outcomes could not be determined due to lack of available data. Heterogeneity was large and bias could not be eliminated.

B. Grafting Procedures:

Meta-analysis was done by Reynolds et al⁽¹¹⁾ and Trombelli et al⁽¹²⁾.

• Short-term changes:

- a. **Autogenous bone:** Trombelli et al demonstrated greater CAL gain in autogenous graft group than the control group, but the result was not statistically significant. Statistically significant gain in CAL was found in the study done by Reynolds et al.
- b. **Bone allograft:** When bone allograft was used it showed gain in CAL, PPD reduction and increased defect fill.
- c. **Dentin allograft:** When dentin allograft was used it showed a gain in CAL of 2.8 mm in grafted patients as compared with 2 mm CAL gain in controls.
- d. **Coralline calcium carbonate:** Use of the graft showed a gain in CAL and bone fill. But there was no improvement in pocket depth reduction.
- e. **Bioactive glass:** There was improvement of bony lesion when compared with open flap debridement [OFD]. Mean difference in CAL between the two was 1.04mm. Change in bone fill noted was greater for bioactive glass, but the change was not statistically significant. Heterogeneity was present due to a study conducted by Org et al⁽¹³⁾ which

demonstrated a more favorable change following an OFD procedure.

- f. **Porous/ nonporous hydroxyapatite:** showed gain in CAL and decrease in PPD.

• **Long-term outcomes:**

- a) Fleming et al⁽¹⁴⁾ did a 6.36 months follow-up study and found that there was 0.12 mm gain in clinical attachment level gain in test group and 0.43mm decrease in clinical attachment level in control group.
- b) Galgut et al⁽¹⁵⁾ assessed and compared clinical attachment level at 12 months and 48 months. The results showed a 0.27mm decrease in clinical attachment level in grafted group and 0.14mm gain in clinical attachment level gain in open flap debridement group.
- c) Yukna et al⁽¹⁶⁾ followed up hydroxyapatite grafted patients for a period of five years. The results showed that two-thirds of the patients showed again in clinical attachment level in the grafted group and one third of open flap debridement showed a decrease in clinical attachment level.

- **Patient-centered outcome:** In most of the studies reviewed, there were no systemic or local adverse effects. The adverse effects noted in some of the studies were transient slight gingival inflammation, pebbled surface texture of grafted site, and delayed soft tissue healing, exfoliation /shedding of graft material.

4. **Evidence-Based Approach And Open Flap Debridement:** Heitz Mayfield et al⁽¹⁷⁾ and Antczak et al⁽¹⁸⁾ conducted systematic reviews: If pocket depth reduction is the main aim, surgical treatment is the treatment of choice. If increase in clinical attachment level gain is the main aim, nonsurgical therapy is of more benefit for shallow and moderate pockets and surgical therapy is the treatment of choice for deep pockets. Predictability of treatment outcome at sites with furcation involvement or angular defect is unclear.

5. **Evidence-based Approach And Mucogingival Therapy:** Critical review by Pagliaro⁽¹⁹⁾ on surgical root coverage led to the following

conclusions: The overall clinical outcome of different techniques appears to be satisfactory, but the great variability among different studies creates difficulties in deciding which procedure is best suited for each clinical situation. The data are quite heterogeneous. The data are seldom eligible for further comparative analysis even after some missing data are computed. The editors of periodontal journals could promote decisive measures for establishing clear mandatory standards for presenting data in research articles.

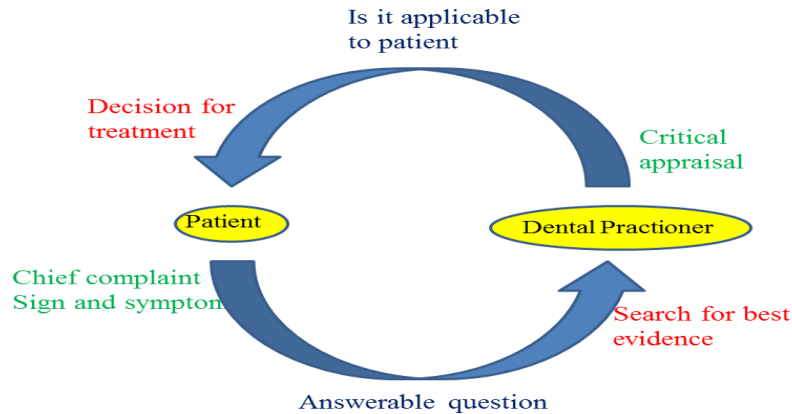
Carlo Clauser⁽²⁰⁾ in his meta-analysis found that: All the surgical procedures allow complete root coverage. Connective tissue grafting achieves complete root coverage more frequently than does GTR. The probability of complete root coverage is high if the initial recession is shallow, irrespective of the surgical procedure employed. The probability of achieving complete root coverage decreases dramatically as the initial recession depth increases.

6. **Evidence-based Approach And Dental Implants:** Mostly evidence is available for titanium implants, but some evidence exists to support the use of hydroxyapatite and titanium-plasma sprayed implant surfaces.⁽²¹⁾

There is also evidence to support the use of both two-stage systems which require a second surgery to expose the implant, and one-stage implant systems. Clinicians should exercise caution when treating patients who smoke and those with untreated periodontal diseases, poor oral hygiene, uncontrolled systemic disease and a history of radiation therapy in the region or active skeletal growth.

Conclusion:

Structure and guidance are provided by the principles of evidence-based healthcare to facilitate the highest levels of patient care. Generation of best evidence alone is not enough to practice evidence-based healthcare. However, an understanding of the principles should help to underpin the latter aspects. Evidence-based healthcare is not an easier approach to patient management, but should provide both clinicians and patients with greater confidence and trust in their mutual relationship.



“You and your patient make the final decision”

References:

1. Ian Needleman, David R, Moles & Helen Worthington. Evidence-based periodontology, systematic reviews and research quality. *Periodontol 2000*. 2005;37:12-28.
2. Gray JAM. Evidence-based Healthcare. Edinburgh: Churchill Livingstone, 1997.
3. Newman M, Caton J, Gunsolly J. Evidence-based periodontology. *Ann Periodontol* 2003;8:1.
4. Evidence-based approach. *Dent Clin North Am* 2002;46:54-62.
5. Needleman IG, Giedrys-Leeper E. Guided tissue regeneration for periodontal infra-bony defects. *Cochrane Database Syst Rev* 2001;2:CD001724.
6. Richards D. Not all evidence is created equal – so what is good evidence? *Evid Based Dent* 2003;4:17–18.
7. Suvan JE. Effectiveness of mechanical nonsurgical pocket therapy. *Periodontology* 2000;37:49-50.
8. Jeffcoat MK, McGuire M, Newman MG. Evidence based periodontal treatment: Highlights from the 1996 World Workshop in Periodontics. *J Am Dent Assoc* 1997;128:713-23.
9. Labriola A, Needleman I, Moles DR. Systematic review of the effect of smoking on nonsurgical periodontal therapy. *Periodontology* 2000;37:124-37.
10. Murphy KG, Gunsolley JC. GTR for the treatment of periodontal intrabony and furcation defects: A systematic review. *Ann Periodontol* 2003;8:266-302.
11. Reynolds MA, Branch-Mays GL, Gunsolley JC. The efficacy of bone replacement grafts in the treatment of periodontal osseous defects: A systematic review. *Ann Periodontol* 2003;8:227-65.
12. Trombelli I, Heitz-Mayfield LJ, Needleman I. A systematic review of graft materials and biological agents for periodontal intraosseous defects. *J Clin Periodontol* 2002;29:117-35.
13. Org MM, Eber RM, Wang HL. Evaluation of a bioactive glass alloplast in treating periodontal intrabony defects. *J Periodontol* 2000;71:1821-8.
14. Fleming TF, Ehmke B, Bolz K. Long-term maintenance of alveolar bone gain after implantation of autolyzed, antigen-extracted, allogenic bone in periodontal intraosseous defects. *J Periodontol* 1998;69:47-53.
15. Galgut PN, Waite IM, Book shaw JD. A 4 year controlled clinical study into the use of a ceramic hydroxyapatite implant material for the treatment of periodontal bone defects. *J Clin Periodontol* 1992;19:57-7.
16. Yukna RA, Mayer ET, Amos SM. A 5-year evaluation of Durapatite ceramic alloplastic implants in periodontal osseous defects. *J Periodontol* 1989;60:544-51.
17. Heitz-Mayfield L, Trombelli L, Heitz F. A systematic review of the effect of surgical debridement vs non-surgical debridement for the treatment of chronic periodontitis. *J Clin Periodontol* 2002;29:92-102.
18. Antzack A, Joshipura K, Burdick E. Meta-analysis of surgical vs nonsurgical methods in the treatment of periodontal diseases. *J Clin Periodontol* 1993;20:259-68.
19. Pagliaro U, Nieri M, Franceschi D, Clauser C, Pini-Prato G. Evidence-based mucogingival therapy, Part I: Critical review of the literature on root coverage procedures. *J Periodontol* 2003;74:709-40.
20. Clauser C, Nieri M, Franceschi D. Evidence-based mucogingival therapy, Part 2: Ordinary and individual patient data metaanalysis of surgical treatment of recession using complete root coverage as the outcome variable. *J Periodontol* 2003;74: 741-56.
21. Taylor TD, Weins J, Carr A. Evidence-based considerations for removable prosthodontics and dental implant occlusion: A literature review. *J Prosthet Dent* 2005;94:555-60.