

Position Paper

Current Understanding of the Role of Microscopic Monitoring, Baking Soda, and Hydrogen Peroxide in the Treatment of Periodontal Disease*

THE KEYES TECHNIQUE CAME to national attention following a reference in *The New York Times* in the late 1970s. Several lay press articles and discussions on national television served to further focus the interest of patients, general dentists, and periodontists on this potential approach to periodontal therapy. Early evaluations of the data on the technique resulted in an Academy position paper in 1981. Recognizing that there was a lack of well-controlled studies on the technique led to extensive research efforts supported by the National Institute of Dental Research. The results of those efforts have provided substantial new information that serves as the basis of the present position paper. Although this technique is no longer widely used in the United States, some patients and dentists may have not had the benefit of the new data. *J Periodontol* 1998;69:951-954.

In recent years a system termed the "Keyes technique" has been promoted for the treatment of periodontal diseases. The system takes its name from its original developer Dr. Paul Keyes. Since there have been many variations and misinterpretations of this system described in both the lay and professional literature, it is important to define the system in detail as described and reported by Dr. Keyes and his colleagues.¹⁻⁸

The Keyes technique has two major components involving monitoring and therapy. The monitoring component of the system involves the use of phase contrast microscopy to evaluate certain qualities of the bacterial populations in subgingival plaque samples. These observations are used to guide or "modulate" therapy. The treatment phase includes three subcomponents. The first subcomponent is local mechanical therapy, scaling and root planing. The second subcomponent is local chemical therapy, including patient oral hygiene with baking soda and peroxide, and professional and patient irrigations with various agents. The third subcomponent involves systemic antibiotics.

The rationale proposed by Keyes for the use of this

technique is that periodontal disease is caused by specific bacterial populations that can be monitored microscopically and that control and monitoring of these bacterial populations will assure control of the disease.^{1,2,5}

Extensive research is now available to adequately assess this technique and provide perspective for both practitioners and patients who are interested in periodontal care. This evaluation of the system is based on data currently available for each component of the technique.

MICROSCOPIC MONITORING

Extensive data have accumulated indicating that specific bacteria are associated with periodontal diseases.^{9,10} Our current understanding of this information indicates that the mere presence of specific pathogens may not be indicative of a disease state due to the complex host-bacterial interactions required for producing clinical signs of disease. Although the presence of specific bacteria does not guarantee the presence of periodontal disease, the complete absence of certain bacteria appears to be predictably associated with periodontal health. A few bacteria, most notably *Actinobacillus actinomycetemcomitans*, *Porphyromonas gingivalis*, and *Prevotella intermedia* have been strongly associated with the presence and progression of periodontal disease,¹⁰ but up to 17 different

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bacterial species have been associated with periodontal diseases.

Microscopic monitoring allows the description of bacterial components based on size, shape, and motility. Most of the species thought to be periodontal pathogens cannot be identified or distinguished by phase contrast microscopy. In fact, most of these species look microscopically like health-associated species. This is especially true for the bacteria such as *Actinobacillus actinomycescomitans* associated with early-onset forms of periodontitis such as juvenile and rapidly progressive periodontitis.

Although treatment of the early-onset forms of periodontitis may benefit from microbial monitoring,⁹ microscopic monitoring does not discriminate among the pathogens that are associated with these forms of disease. A few of the suspected pathogens in adult periodontitis are spirochetes. Spirochetes as a group, both those associated with disease and those that have not been associated with disease, may be distinguished microscopically by their shape and motility.

The microscopic monitoring of the Keyes technique emphasizes the qualitative appearance of microbial complexes in the plaque mass.³ These complexes are consistently seen with the aging and maturation of subgingival plaque and, therefore, are primarily an indication of plaque control.¹¹⁻¹³ In cases of gingivitis and adult periodontitis, it is likely that many of the bacterial pathogens are not present until later stages of plaque maturation. For this reason, an assessment of plaque maturation, such as microscopic monitoring, may provide an indirect assessment of the presence of some periodontal bacterial pathogens. It should be emphasized that the availability of current technology, such as nucleic acid and antibody probes, for monitoring specific bacteria is such that phase contrast microscopy is generally regarded as an outmoded and inaccurate technology for the assessment of specific bacterial populations.⁹

Based on current data, the following advantages and limitations of microscopic monitoring may be noted at this time.

Advantages of Microscopic Monitoring

1. This technique emphasizes the importance of bacteria as the essential and primary component of periodontal disease.
2. This technique is effective in assessing plaque control in some types of periodontal disease.
3. This technique may be a useful patient motivational tool in some types of disease.
4. This technique emphasizes the value of additional therapeutic endpoints beyond current clinical parameters.

Limitations of Microscopic Monitoring

1. This technique does not assess the majority of suspected bacterial pathogens in periodontal diseases.
2. This technique is very sensitive to the quality of the equipment and the expertise of the user. Most importantly, with improper techniques it is most likely to give false-negative results that would result in inadequate treatment under the guidelines of this system.
3. The most aggressive forms of periodontal diseases, including early-onset periodontitis and rapidly progressive periodontitis, often involve bacteria that, under microscopic monitoring, mimic those seen in health.
4. Since microscopic monitoring primarily assesses plaque maturation, it does not appear to have added diagnostic value over conventional clinical techniques for the assessment of disease or the monitoring of the progress of a case.

TREATMENT: LOCAL THERAPY

Treatment of periodontal disease using the Keyes technique, as described by Dr. Keyes, involves extensive scaling and root planing and oral hygiene instructions. These techniques have been a part of conventional therapy for many years and are known to reduce gingival inflammation. Extensive short-term and long-term studies evaluating the use of baking soda and peroxide as an adjunct to home plaque control have demonstrated no added value over conventional oral hygiene alone.¹⁴⁻²¹ The use of chemical agents to irrigate periodontal pockets during the cleaning procedure is theoretically appealing as a means of further reducing subgingival bacterial load. Although this approach has been commonly used for many years as a part of routine periodontal therapy, the added benefits over scaling and root planing alone appear to have value for a limited time period.²²⁻²⁵

The primary benefit of the local therapy phase of the Keyes technique is its emphasis on the importance of conventional periodontal therapies of local cleaning and patient home care. The primary limitations of the technique are that patient energies in home care are directed toward oral hygiene practices that do not give added value over conventional techniques and abuse of the practices may lead to gingival injury.²⁶

TREATMENT: SYSTEMIC ANTIBIOTICS

The Keyes technique indicates that if the microscopic monitoring continues to show certain bacterial complexes after the above treatment, the patient should be placed on short-term antibiotic therapy. Initially, this therapy was tetracycline hydrochloride, but more recently Dr. Keyes has also suggested the use of metronidazole. The benefit of this approach is, again, the emphasis on the primary role of bacteria in the disease process. The use of systemic antibiotics as described by this technique, however, has

substantial limitations that lead to the following important concerns:

1. In well-controlled studies, use of systemic antibiotics alone or in conjunction with local therapy has shown only limited to no added value over local therapy in the treatment of adult periodontitis.²⁷⁻³⁰

2. The indications for using antibiotics in this technique appear to be inappropriate. The most likely cause for bacterial persistence in adult periodontitis cases is poor plaque control or inadequate scaling and root planing.³¹⁻³³ In both of those situations, systemic antibiotics will produce a very transient and limited antimicrobial effect which is of no therapeutic significance.^{28,31,33}

3. There appear to be some very appropriate uses of systemic antibiotics for the management of periodontal diseases, but these cases are primarily the more aggressive forms of disease that also happen to be the forms not identified by the microscopic monitoring used in this technique.^{30,34-36}

4. Use of systemic tetracycline significantly increases the number of bacteria resistant to multiple important antibiotics. Unnecessary use of systemic tetracycline may therefore pose a significant medical risk to the patient.

CONCLUSION

Conventional periodontal therapy today involves the recognition of the role of specific bacteria in the initiation and progression of periodontal diseases. Substantial evidence indicates that specific bacterial host interactions result in multiple periodontal diseases with different courses of progression and different therapeutic responses. Current therapeutic guidelines for adult periodontitis emphasize the need for control of subgingival bacterial populations by scaling and root planing and maintenance of supragingival plaque control by means of patient home care. In this form of disease, the inability to control clinical signs of disease results from either inadequate home care or inadequate access for subgingival cleaning.

The Keyes technique as practiced and described by Dr. Keyes represents conventional periodontal therapy as taught and practiced today with the exceptions of the addition of microscopic monitoring, the use of local chemical agents, and the increased use of systemic antibiotics. As described above, these additional aspects do not appear to provide added value over conventional periodontal therapy in cases of adult periodontitis and offer substantial negative aspects in some situations. Conventional periodontal therapy has been shown in many extensive long-term studies to provide predictable control of gingivitis and adult periodontitis. New technologies involving identification of specific bacteria, new disease diagnostics, and new chemotherapeutic agents offer great promise for aiding in the management of periodontal diseases. All new technologies must be carefully assessed in controlled longitudinal studies and should show added

value over current conventional technologies prior to adoption for routine use.

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