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Chairside Diagnostic Kits in Periodontal Practice: An Overview

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Abstract---The goal of periodontal diagnostic procedures is to provide useful information to the clinician regarding the present periodontal disease type, location and severity. Various diagnostic chair side tests have been developed recently. These tests provide information on the destructive process, current disease activity, rate, pattern, and extent of disease, severity of future break down and response to treatment. The chairside periodontal kits provide immediate reports of the microflora associated with the disease compared to cumbersome and time-consuming traditional laboratory procedures, such as: cultural and microscopic methods.

Keywords---diagnostics, periodontitis, gingivitis, chairside.

Introduction

Periodontitis is a group of infectious disease caused by micro-organisms present in dental plaque that colonize the tooth surfaces at or below the gingival margin. These micro-organisms lead to the destruction of the periodontal ligament and alveolar bone that surrounds the teeth, thus causing loss of attachment and alveolar bone loss. The 1990s saw the emergence of a multitude of diagnostic tests based on physical, chemical, microbiological and immunological methodologies. Researchers have identified biomarkers that indicate the presence or absence of periodontal pathogens, gingival and periodontal inflammation, the host inflammatory- immune response to certain pathogenic species, and host tissue destruction. The biological media of choice includes saliva, serum, sub gingival plaque, tissue biopsies, and gingival crevicular fluid.² The philosophy behind the emergence of such tests is that as earlier the active disease is diagnosed, the less invasive and time consuming, the required treatment will be,

and the better the long term prognosis for patients with destructive disease.³ Furthermore, with the recognition that risk groups and unpredictable disease patterns do exist, the benefits of objective testing for initial diagnosis and for the long-term maintenance of periodontal patients become clear.⁴

Classification

Among the various diagnostic tests available in periodontics chairside periodontal test kits can be categorized as:⁵

<ul style="list-style-type: none"> • Microbiological test kits 	<ul style="list-style-type: none"> • OMNIGENE • EVALUSITE • PERIOSCAN
<ul style="list-style-type: none"> • Biochemical test kits 	<ul style="list-style-type: none"> • PERIO 2000 • PROGNOS-STIK • PERIO-CHECK • PERIOGAURD • POCKET WATCH
<ul style="list-style-type: none"> • Genetic kits 	<ul style="list-style-type: none"> • PST® genetic susceptibility test

BANA Test

The BANA Test is a simple, inexpensive, chairside in-vitro test which can be used in the dental office. The test is designed to detect the presence of one or more anaerobic bacteria commonly associated with periodontal disease, namely, *Treponema denticola*, *Porphyromonas gingivalis*, and *Tannerella forsythia* (formerly called *Bacteroides forsythus*) in plaque samples taken from periodontally diseased teeth or from the tongue coating of individuals with oral malodor.⁶

Toothpick method

Use a soft wood toothpick like the STIM-U-DENT®. Insert the toothpick interproximally. Choose dental papilla that appear to be inflamed. Remove the toothpick and record whether there is any bleeding about the papilla. Take the toothpick and wipe each side onto the same spot on the lower reagent pad. Take a new toothpick and sample a second dental papilla in another quadrant. Wipe both sides onto a different zone of the reagent strip. Sample any additional areas of concern using additional test strips if necessary. Discard the toothpicks as with any bacterially contaminated material.⁷

Curette method

Remove supragingival plaque prior to sampling. Use a curette to obtain subgingival plaque from the apical third of any deep pocket. Apply the specimen

to the lower test pad on a BANA Test strip. Before taking another specimen, wipe the curette on a clean cotton gauze pad to prevent carry-over of plaque.⁸

Enzyme Linked Immuno Sorbent Assay (Elisa)

ELISA is so named because the technique involves the use of an immunosorbent, an absorbing material specific for one of the components of the reaction: the antigen or antibody. This may be a particulate for example cellulose or agarose, or a solid phase such as polystyrene, polyvinyl or polycarbonate tubes or microwells, or membrane or discs of polyacrylamide, paper or plastic. ELISA is usually done using 96 well microtitre plates suitable for automation, The principle of the test can be determined by outlining its application for detection of rota virus antigen in feces.

Procedure

- The wells of a microtitre plate are coated with antibody. After thorough washing, the sample to be tested is added and incubated overnight at 4 °C or for 2 hours at 37 °C. suitable positive and negative controls are also set up.
- The wells are washed and antiserum of the antibody, labeled with alkaline phosphatase, added and incubated at 37 °C for 1 hour.
- After washing, a suitable substrate (para-nitrophenyl phosphate) is added and held at room temperature till the positive controls show the development of yellow color. The phosphatase enzyme splits the substrate to yield a yellow compound.

Wolff et al developed a method to first concentrate *Aggregatibacter. actinomycetemcomitans* and *Porphyromonas. gingivalis* in the specimen, followed by immunofluorescence labeling and detection of the cells with monoclonal antibody to whole cell antigens. The assay showed a detection limit of 10^4 cells for both *Aggregatibacter. Actinomycetemcomitans* and *Porphyromonas. Gingivalis* and provided a semiquantitative estimate of the target organisms up to 10^6 cells. Compared with culture, the assay showed 100% sensitivity and 68% specificity for *Aggregatibacter. actinomycetemcomitans* and 100% sensitivity and 57% specificity for and *Porphyromonas Gingivalis*.⁹

Omnigene and Btd (Biotechnica Diagnostics)

The DNA probe systems (Figure 17) are used for detecting a number of subgingival bacteria. Probes are available for the detection of *A. actinomycetemcomitans*, *P. gingivalis*, *P. intermedia*, *F. nucleatum*, *C. rectus*, *T. denticola* and *E. corrodens*. The probe is prepared by selecting specific pathogen as marker organism that is lysed to remove their DNA. Their double helix is denatured, creating single strands that are individually labeled with a radioactive isotope. Subsequently when the plaque sample is sent for analysis, it undergoes lysis and denaturation. Single strands are chemically treated, attached to a specific filter paper and then exposed to DNA library. After the filter is washed to remove any unhybridized strands, it is covered with a radiographic plate. The

radioactive label creates spots on the film, which is read by a densitometer. Reports are provided within very short time periods (few hours to few days).⁵

Conclusion

The most useful information for the clinician can be obtained by using a combination of these various analytic methods. The tests appear to have their greatest utility when used on patients with chronic periodontitis and aggressive periodontitis who do not respond favorably to conventional mechanical therapy. These systems may be useful in motivating patients to achieve better oral hygiene. They also have been used to monitor end points of treatment, such as the elimination of spirochetes and motile bacteria from treated pockets.

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