Phobia No More
A Kinder Dental-Care Technology

BY JAMES SCHULTZ

Approximately 35.7 million Americans have some type of periodontal disease.
ONCE, A DENTAL DRILL’S HIGH-PITCHED SQUEALS would be enough to send panicky patients rushing toward a door, any door, that would free them and spare their teeth from anticipated trauma. Better patient care, advances in analgesics and next-generation equipment have largely banished phobia from the dentist’s office. But anxiety remains. For many, sharp metal near soft tissue remains an intimidating sight.

Alternative approaches may not only spare sensibilities, but in the long run prove more effective and less expensive. One such innovation may eventually allow dentists to permanently shelve traditional periodontal probes in favor of a device that emits high-frequency sound waves. Derived from diagnostic instruments used by NASA to evaluate stress and damage to Space Age materials, like those used in the heat-ablating shields of America’s space shuttle fleet, the ultrasonic periodontal probe gauges the health of the sulcus, the tissue that acts as a kind of fleshy collar around the gum, pocketing the teeth.

When the College of William and Mary asked Old Dominion’s Dental Hygiene Research Center to be the site for clinical trials of the device, Gayle McCombs, Center director and assistant professor in the University’s School of Dental Hygiene, was only too happy to oblige. The Center helped developer Mark Hinders, a William and Mary professor, to make improvements that ranged from improved software protocols to better ergonomics: that is, the way the probe actually feels in a human palm. Hinder’s work was supported by NASA, the National Institute of Dental and Craniofacial Research and Virginia’s Center for Innovative Technology.

“We started with something that had to be brought in on a cart and took three people to move, and ended with something that could fit in the hand of a dental hygienist,” McCombs says. “When I saw the first version of the probe, the [business] end looked like a shark’s tooth. We helped the developers refine their design. Now they have something that is very portable, very usable.”
A Key Role

Given its mission, McCombs says the Center’s participation is only natural. The DHRC is a 30-chair, state-of-the-art dental care and training facility housed within the University’s School of Dental Hygiene. The Center annually logs approximately 12,000 patient visits, with oral health services provided at a minimal fee to citizens in the surrounding Hampton Roads area. There is no predominant demographic, but rather a wide diversity in age, gender, ethnic, religious and social backgrounds.

As evidenced by the ultrasonic-probe project, the DHRC has developed a mutually beneficial collaboration with other academic institutions, major pharmaceutical companies, healthcare facilities, industry and private medical practices. The Center also plays a key educational role, exposing undergraduate and graduate students to research and clinical practice alike, which underscores the link between theory and application. While evaluating behaviors, interventions, products and devices to combat oral disease and maintain health, the Center makes available space and resources for faculty and provides employment for Hampton Roads students and professionals.

Maintaining dental health without the proper diagnostics would be impossible. That’s the main reason the ultrasonic’s potential to spot early onset, specifically of periodontal disease, is so important, according to McCombs. “Periodontal disease is a disease of gum and bone,” she says. “The prospect of identifying disease before the dental professional can detect it clinically is what this device is all about.”

Periodontal diseases are infections caused by bacteria that collect between teeth and gums. Gingivitis is an inflammation of the gums characterized by redness, swelling, bleeding and sensitivity. These changes result from an accumulation of microorganisms along the gingival margins and the immune system’s inflammatory response to the release of destructive bacterial byproducts. Although the early stages of gingivitis are reversible with thorough brushing and flossing, left untreated, the condition can lead to chronic infections and severe periodontitis.

Diagnosis And Prevention

Periodontal disease is one of the most pervasive dental diseases in adults. According to the American Academy of Periodontology, in a recent study of Americans aged 30 years and older, half exhibited gingival bleeding at one or more sites. More than one in three people over age 30 have periodontitis. Experts believe approximately 35.7 million Americans have some type of periodontal disease and 80 percent of the world’s population will have some form of periodontal disease in their lifetime. Most adults show signs of periodontal or gingival diseases. And the vast majority of adult tooth loss is attributable to periodontal disease.

Periodontitis is especially difficult to diagnose because it is not a continuous process. Instead, the disease progresses in random bursts in which short periods of breakdown of periodontal ligament and bone alternate with periods of quiescence. Furthermore, these episodes occur randomly over time and at random, if localized, sites in the mouth. Besides causing bad breath and potentially leading to tooth loss, bac-
Bacteria responsible for periodontal disease can spread into the lungs or bloodstream and travel throughout the body. According to one Surgeon General’s Report on Oral Health, studies have found associations between periodontal disease and systemic diseases, such as those of the heart and lung, stroke, diabetes, and complications from pregnancy.

The ultrasonic probe has the potential to spot problem areas before periodontitis spreads. Placed on top of the gum, the probe’s function and output can be compared to that of a sonogram made of an infant while in the womb. The probe emits a wave of sound, which travels painlessly through the gum tissue and echoes back. The resultant echoes are funneled to and interpreted by computer, revealing a complex picture of the internal structure of the sulcus.

Two clinical trials of the ultrasonic probe have been conducted at the Center. While promising, they revealed that additional refinements are needed before the probe becomes routinely available for diagnosis. “During our trials we did end up with more questions than answers. But that’s what research is all about,” McCombs says. “The probe needs more work before it ends up in dentists’ offices. That will mean more investment in testing and evaluation. But I think the technology has a lot of potential.”

Other projects are ongoing at the Center. One involves evaluation of a hand-held sensor than can detect levels of the chemical sulfide within gums — evidence of the metabolic activity of anaerobic bacteria that can begin to break down tissues in the absence of care or treatment. Others will judge the efficacy of new toothpaste formulations and a just-developed brand of antibacterial toothbrush. “Our basic focus is new product and device testing that will benefit the general population and will be widely used by dental professionals,” McCombs says. “These are tools or instruments that end up in the hands of dental hygienists. The focus is all about prevention and diagnosis. If you stop disease before it starts, you’re obviously way ahead of the game.”

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