



# NAVIGATING RISK ASSESSMENT

By assessing the hidden risk factors your patients may be harboring in six key areas, you may be able to provide a higher standard of intervention that could result in more conservative therapies and better outcomes.

By Allison M. DiMatteo, BA, MPS

In dentistry today, assessing patient risk is a critical component of a well thought-out treatment plan. Generally speaking, risk is defined as the likelihood that injury, damage, or loss will occur. In dentistry, a patient risk assessment can be developed by analyzing a patient's presenting conditions and assessing the potential ramifications of those conditions based on the clinician's knowledge and historical documentation, where possible.

"As dentists, when we treatment plan, we really want to team risk with prognosis. Prognosis is defined as the forecast of the probable result of a disease or course of treatment," explains Michael R. Sesemann, DDS, sitting president of the American Academy of Cosmetic Dentistry (2009 to 2010). "When taken together, a practitioner can extrapolate the effects of not treating a certain condition and what would occur if the condition were to be treated in one way or another. This analysis forms the rationale of our recommendations to the patient."

After assessing the patient's presenting condition(s) and determining the course a condition would take without treatment, dentists then can propose how a particular treatment would affect the natural course. In general, clinicians

strive to make treatment decisions that will lower the risk for continued deterioration of a particular condition. If a suggested treatment is supported by dental science to lower risk, then that treatment is validated, Sesemann says. Conversely, if a treatment is considered that adds to the risk in the general overall oral health of the patient, then that treatment must be refuted, he says.

"Complexities arise when a treatment solution achieves one set of objectives, yet the overall oral health of the patient becomes at higher risk in a different area. The trade-offs are not worth implementing the treatment," Sesemann explains. "For instance, in a practice that has a high volume of patients wanting esthetics, people present wishing to have certain esthetic objectives fulfilled. In these cases, the biomechanical implications of various treatment options must be strongly considered. There must be an overall appraisal if a proper risk assessment is to be utilized. By reducing risk across myriad factors, we ultimately want to render treatment that lowers stress and failure and increases treatment prognosis and predictability."

Therefore, when it comes to patient risk assessment, Sesemann believes the single most important piece of equipment is the practitioner's brain—which

is essentially what patients are buying, not a dental commodity. Continuing education after graduation is essential. Further, he adds that in order to responsibly treatment plan, clinicians must have command of the risk profiles associated with dental disease in four major categories: dentofacial, biomechanics, functional, and periodontics.

For example, with biomechanics, when patients are at high risk for caries, proper treatment will include certain restoration designs that may differ from a low-risk patient, Sesemann says. A high-risk caries patient also requires a treatment plan that would include a protocol to lower the future caries risk after restorative treatment; this could include preventive resin restorations (eg, sealing remaining pits and fissures, fluoride treatments, fluoride varnish, a caries-free rinse protocol, etc).

"Knowing the difference between a high-risk caries patient and a low-risk caries patient through proper data collection and treatment planning can be the difference between a long-term, successful dentist/patient relationship without high amounts of restorative dentistry, versus a relationship in a continuous, protracted struggle to keep up with decay," Sesemann cautions.

In periodontics, risk factors in conjunction with bacteria and the host

response can affect the severity of the disease, patterns of destruction, and the response to therapy. Given the diversity among individuals and teeth with respect to susceptibility to periodontal disease, a determination through data collection of specifically innate (eg, high natural amounts of pathologic bacteria or extensive immune response to bacterial insult), acquired (eg, health changes or medications), and environmental (eg, smoking) criteria can help form an overall risk assessment of the individual to periodontal changes, Sesemann elaborates. Based on an understanding of the role each factor plays, treatment plans can be formulated to effectively combat the disease and contain future risks. Without that determination and inclusion in the diagnosis, treatment plans may be successful long-term, or they may not, he emphasizes.

This month, *Inside Dentistry* explores where dentistry stands in terms of risk assessment by examining what's taking place in the areas of diagnosing and assessing patients for caries, periodontal disease, oral cancer, craniofacial pain and temporomandibular joint disorder (TMD), erosion, and dry mouth. In particular, we examine what dentistry has done in the past and look to what lies ahead.

## Caries Risk Assessment

In early 2009, the American Dental Association (ADA) Council on Scientific Affairs released a position statement endorsing the use of caries risk assessment as a standard care procedure for all new patient and returning patient examinations. Previously, in 2006, the same council established guidelines for determining low-risk, moderate-risk, and high-risk caries patients; one set addressed children under the age of 6, and a different set of guidelines was developed for patients 6 and older.

Simultaneously, coalitions of educators, researchers, and clinicians such as CAMBRA (Caries Management by Risk Assessment) have been working to incorporate caries risk assessment as a standard of care within the dental school curriculum. Spearheaded by Douglas Young, DDS, and based on the risk assessment forms developed by John Featherstone, MSc, PhD,<sup>1</sup> several different focus groups meet regularly across the country. Today, according to V. Kim Kutsch, DMD, a

private practitioner in Albany, Oregon, at least 40 dental schools have implemented caries risk assessment as a standard of care into their curriculum.

"There are a number of caries risk assessment forms designed to do the same thing, and that is basically to help the practitioners determine what the caries risk is for the individual," Kutsch explains. "However, the real value of the risk assessment form is that dentists can identify the specific risks for an individual patient which are causing or contributing to the disease. This then enables the dentist to help the patient correct them so the disease can be stopped, along with the development of new cavities or new lesions."

For example, risk factors such as home care, insufficient saliva, behavioral aspects like diet (eg, snacking between meals), and medications are different risks that need to be identified specifically in high-risk caries patients individually. Once known, dentists can then direct their counseling and therapeutic measures correctly for that individual patient, Kutsch emphasizes.

### The Past

While Kutsch acknowledges that there are a few individuals who have been advocating risk assessment for 20 years or more, he says that by and large, the profession itself has not done caries risk assessment in a formal way. Of course, he says every dentist who sits down to evaluate a patient at least generally has looked at those who are at higher risk than others and tried to create more therapies to help them, such as an extra fluoride protocol in their home care.

However, in terms of looking at risk assessment as an evaluation, it traditionally has been based on the oral examination, radiographs, and dental history, if there is one. Then mentally, clinicians have speculated whether or not patients will continually get cavities, or if they'll be safe with normal or routine instructions and being seen once or twice a year in order to maintain their oral health without extra therapies.

Over the years, dentistry developed biometrics for determining if patients had caries-causing bacteria, such as *Streptococci mutans* and *Lactobacillus*.

Unfortunately, Kutsch believes only a very small percentage of dentists were actually performing these tests on a routine basis. "I started doing that about 10 years ago. More recently, better, easier, and faster biometrics (eg, CariScreen Meter, a bioluminescence meter and swab; GC America's Saliva-Check Buffer Kit) have become available to help clinicians in their chairside decision-making," Kutsch says.

"Now we also have the risk assessment forms, so we have five basic data points that we can use to assess the patient and identify individual risk," Kutsch adds.

### The Protocol & Technology

Despite the introduction in recent years of new biometrics and greater use of caries risk assessment forms, Kutsch observes that there aren't very many technologies or protocols in place for assessing caries risk. Earlier biometrics to test for *Streptococci mutans* and *Lactobacillus* took 48 hours. Today, such tests can be performed chairside in minutes. Whereas earlier tests may have looked at the amount and buffering capacity of saliva, today's biometrics now evaluate the pH of the saliva, as well as its sugar metabolism.

This is in contrast to the availability and use of caries-detection technologies (eg, DIAGNOdent, KaVo, www.kavousa.com; Caries I.D.™, DENTSPLY Professional, www.dentsply.com), Kutsch explains. Dentistry has seen technology develop in this area, he says, which isn't really applicable to assessing a patient's caries risk but more for identifying specific lesions. In terms of a real, true marker or biometric test for caries, he says only a few tests exist.

### The Future

Kutsch predicts that dentistry will see continued development of better, more long-term data about which risk factors are most important. Within risk assessment forms, additional validation will be obtained about which questions should be asked of patients in order to best determine their risks, identify the best therapies for bringing them back into a healthy balance, and maintain their oral health.

Also in development are screening tests to assess the caries risk of children at 6 months of age—when their first tooth eruption occurs—so that those patients who will be at high risk for decay, versus

## Risk Assessment in Cosmetic Dentistry

Today, risk assessment is inextricably linked to the prognosis of the patient's inherent presenting condition. When various treatment options are considered, risk/prognosis profiles of any potential treatment are calculated, and the dentist and patient can precisely determine what is best for them. Essential to such an approach is accurately conveying and illustrating to the patient what needs to be done in order to ensure the best chance of long-term success with a given treatment.

"The first person that I heard speak of accurately assessing a risk profile for a patient work-up was Dr. John Kois at the Kois Center in Seattle, Washington," recalls Michael R. Sesemann, DDS. Through his involvement in the American Academy of Cosmetic Dentistry (AACD), Sesemann has tried to share a philosophy of "Responsible Esthetics" that also encompasses strong risk/prognosis assessments. "It is an essential part of the diagnostic work-up, which Dr. Kois has termed the 'diagnostic opinion.'"

Cosmetic dentistry initially was rooted in conservative techniques, but as the growth of the field escalated in the 1990s and the early part of the 21<sup>st</sup> century, some of the conservative philosophies were forgotten. As a result, healthy tooth structure was being eliminated through aggressive preparation at an alarming rate, Sesemann says. Those techniques contradicted the basic risk assessment of biomechanics in that enamel and the dentin-enamel-junction

(DEJ) were removed to complement procedures that relied on bonding protocols, he explains.

"Despite the tremendous materials we have, there is nothing in our armamentarium that can replace the physiologic marvels of the DEJ. Further, we know unequivocally that the longest lasting impervious bond occurs between resin and properly prepared enamel when we rely upon bonding for treatment success," Sesemann emphasizes. "When these two anatomical entities are removed for a 'want-based' dental procedure, it should be performed following absolute analysis of the risk-to-benefit goal."

With a risk assessment in place, Sesemann believes there would be a greater motivation by practitioners and patients alike to strive for conservative cosmetic procedures. Additionally, he says there also should be a strong commitment toward interdisciplinary care between the orthodontist and the restorative dentist to limit the amount of preparation needed to accomplish the patient's esthetic goals.



<sup>1</sup>Young DA, Featherstone JD, Roth JR, et al. Caries management by risk assessment: implementation guidelines. *J Calif Dent Assoc.* 2007;35(11):799-805.

patients at 6 months who are not going to be at risk for decay, can be identified immediately. Kutsch explains that one of the real challenges dentistry faces today is the continued caries rate increase in the age 0-to-5 years population. As a result, pediatric dentists face a real crisis with the amount of decay they see, as well as taking many of these children to the operating room to perform full-mouth restorative dentistry on them.

"That's a real challenge for us, particularly when you consider that this [caries] is truly a preventable disease," Kutsch says. "What we have to do is better identify those patients that are high caries risk at an earlier age, so that we can prevent them having to go to the operating room at age 3 or 4."

## Assessing Patients' Risk for Periodontal Disease

### *The Past & Even the Present*

Many different diagnostics have been developed over the last 20 years to assess patients' risk for periodontal disease. However, most dental schools are not using them as part of their periodontal risk assessment, believes Connie Drisko, dean and Merritt Professor of the Medical College of Georgia School of Dentistry. Rather, most general dentists in dental schools,

and probably the majority of periodontists, still use health history, dental history, radiographs, and clinical examinations to assess periodontal risk.

"Factors such as smoking history, diabetes, family history of periodontal disease, and tooth loss are characteristics clinicians normally look at to try to establish both a diagnosis and a risk factor for that patient for a response to therapy or for future bone loss," Drisko explains. "Currently there are some tools available that look at genetic susceptibility, as well as those typically used by physicians, such as C-reactive protein tests, that have been associated with periodontitis and also are associated with heart disease, primarily coronary artery disease, and stroke."

Although there also are tests for identifying specific periodontal pathogens, Drisko says those really have not been shown to have a major additive effect to the clinical diagnosis. Unfortunately, many of those tests are fairly costly, she adds, so unless there is a value added to them, clinicians can get a good, predictive value of their patient's risk assessment from the clinical examination and dental history.

### *The Protocol*

Currently, general dentists or periodontists who evaluate periodontal risk for patients base that assessment on probing depths, calculus, plaque level, and in some cases, the occlusion and

current state of inflammation (ie, level of gingivitis, bleeding on probing), Drisko says. Additionally, dental offices also may use the PSR (Periodontal Screening Recording), which enables clinicians to use the deepest area in each quadrant and a specific formula for determining whether a full-mouth probing is necessary.

"In our institution, we have used it [PSR] for years and find it to be a good way to help guide us toward a more extensive, more time-consuming periodontal examination," Drisko explains.

### *The Future*

The future of assessing patients' risk for periodontal disease will involve tests that look for inflammatory mediators that are fixated in the saliva, which are being investigated by such researchers as Giannobile and colleagues,<sup>2</sup> Drisko explains. Additionally, other research includes—but is not limited to—developing predictive formulas to ascertain the likelihood of a patient's susceptibility for chronic or aggressive periodontitis. This includes investigations into the host inflammatory process, rather than performing microbial tests, as investigated by VanDyke and colleagues.<sup>3</sup>

"We're not quite there yet on the future stuff, but we will be. I really believe that eventually we'll have a multipurpose diagnostic test involving saliva that will test for 10, 15, or 20 different markers," Drisko predicts. "I think that will be

generally used within the next 10 years."

Although many individual companies have developed different kinds of diagnostic tests to facilitate risk assessment, Drisko has found that none of them have really been accepted by the general dental population and used to a great extent. That's not to say they aren't good, she emphasizes. Rather, they haven't been able to establish the cause and effect, nor demonstrate a significant benefit to having that additional information, Drisko suggests.

Drisko believes work remains to be done to make gathering data easier, and she alludes to the incorporation of technology as a means to accomplish this. For example, she has seen dental hygienists in private practice use foot-operated devices (eg, Dental R.A.T.) to enter probing depths into the computer, which freed them from having to leave the patient's mouth to lay down the probe to record the probing depth.

"I think if technology becomes more sophisticated so that it is more production—for example, voice-activated recording of information—more general dentists would be including probing in diagnosis and risk assessment than they do now," Drisko says. "I believe part of the reason that some general dentists don't do full-mouth probing to evaluate their patients' periodontal status is because it takes too much time. Therefore, as technology develops, it will help increase the compliance of general dentists, in particular, in doing more risk assessment."

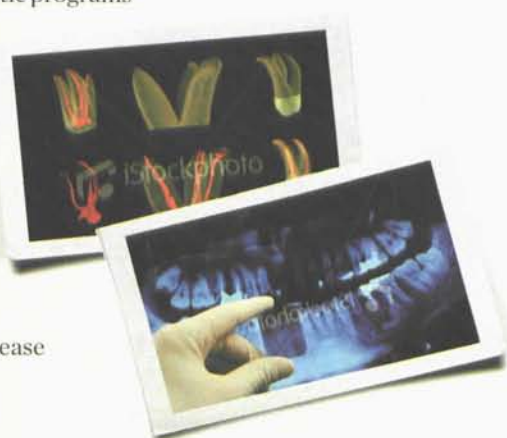
## Snapshot of Risk Assessment in Dental Education

In most dental schools, including the Medical College of Georgia School of Dentistry, dental students are trained to a significantly sophisticated level of risk assessment, explains Connie L. Drisko, DDS, dean and Merritt Professor of that institution. There, a significant part of the curriculum throughout multiple courses addresses risk assessment, she says. In fact, as much time in the curriculum is spent on diagnosis and risk assessment as on any other subject.

"Our students graduate knowing the association between oral health and systemic health. They are highly trained in radiographic diagnosis," Drisko says. "We have many lectures about genetic risk factors, caries detection, and risk assessment for diabetes besides periodontal disease, such as cardiovascular disease."

But what's new are the innovative technologies that are being integrated, such as CAT scans and 3D imaging, which are used in the graduate periodontal, oral surgery, and endodontic programs to enable students to formulate a good diagnosis and better determine a patient's risk. Drisko believes the 3D imaging and CAT scan technology with which today's dental students are being taught will be part of everyday practice within the next 20 years.

"We also are using those technologies for assessing patients for implants, for any kind of oral lesion that might be a bony lesion, impacted teeth such as cupids that could affect orthodontics, and difficult root canals," Drisko elaborates. "The more we know about the history of a patient's disease, the better we can assess how fast they're going to continue losing bone or losing teeth unless they either have therapy or change their habits—such as quit smoking or increase their oral hygiene."



## Oral Cancer Risk Assessment

### *The Past*

Traditionally during new patient examinations, dentists have performed the classic four vital sign tests (ie, body temperature, blood pressure, pulse rate, and respiration rate), then reviewed the patient's medical, dental, and social histories. Vital signs, until recently, have been considered risk factors associated more with other health problems, not necessarily oral health. However, according to Michael A. Kahn, DDS, chair and professor of the Oral and Maxillofacial Department at Tufts

<sup>2</sup>Giannobile WV, Beikler T, Kinney JS, et al. Saliva as a diagnostic tool for periodontal disease: current state and future directions. *Periodontol 2000*. 2009;50:52-64.

<sup>3</sup>Zhang Y, Syed R, Uygur C, et al. Evaluation of human leukocyte N-formylpeptide receptor (FPR1) SNPs in aggressive periodontitis patients. *Genes Immun*. 2003;4(1):22-29.

University School of Dental Medicine, when assessing oral cancer risk, dentistry has emphasized considering the rest of the body and asking the patient for a complete medical history, as well as family history.

"Did anyone else in the family have cancer? If so, what type? Are they alive? What diseases do they have?" Kahn emphasizes. "That's all important to establish. Once you have that and the vital signs, then you can get into the social history questions."

Almost every dentist's new patient form includes a battery of social history questions, but Kahn encourages dentists to develop a comfort level with verbally asking patients about their habits. For example, "Do you now or have you ever smoked? If so, cigarettes, smokeless, or cigars?"

The same kind of questions should be asked about beverage alcohol, Kahn says. For example, "Do you consume alcoholic beverages on a regular basis? If so, what types and how much? If only occasionally, what types, and how much?" He says the goal is to try to get as specific as possible.

And of course, the intraoral and head/neck examination also have been part of the traditional oral cancer screening.

### The Present

Today, however, dentists are now being asked to develop a comfort level in discreetly asking patients about their sexual activity, particularly due to the connection between certain types of HPV (human papilloma virus) and oropharyngeal (ie, base of tongue, tonsil, and pharynx) cancer,<sup>4</sup> Kahn explains. It should be noted that this causality has not been proven in the anterior two thirds of the mouth. Unfortunately, based on some surveys of oral medicine dentists and oral pathologists conducted during the past year through the American Dental Education Association, and which are now being used to survey dental hygienists, most clinicians avoid the sexual activity-type questions, he says.

"Traditionally, there was no HPV question, and that subject wasn't broached," Kahn says. "Today, dental schools are teaching dental students and recent graduates about the HPV link, so hopefully dentists are learning about the HPV connection to cancers of the posterior oral cavity and oral pharynx."

### The Protocol

There is a variety of specialty organizations that have established guidelines for conducting oral cancer screenings, and all of them agree that the classic, conventional, comprehensive soft

tissue oral visual examination with incandescent lighting and finger palpation is the standard of care, Kahn emphasizes.

"You must do that," Kahn reiterates.

As newer oral cancer screening technologies are brought into the marketplace, it's important to note that inclusive, evidence-based studies have not shown unequivocally that in a general population seen by a general dentist in a typical practice, performing oral cancer examinations have enabled dentists to effectively flag, screen, or segregate out those people with higher risk, Kahn says. Dentists are often able to not only find existing, potentially malignant, or malignant lesions but, at times, can flag patients who are more likely to develop oral cancer, he elaborated.

Kahn is hopeful that dentistry will have evidence-based tests similar to those available now for screening for breast cancer. Presently, the profession has adjunctive screening lights (bluish wavelength rather than white light) that can help some clinicians do a more thorough screening; however, they are not yet considered standard of care by specialty organizations, he notes.

"Many of the specialty organizations still maintain that if you do a very rigorous, methodical, organized, conventional oral examination, you should be able to see any oral pathology present," Kahn says. "Disturbingly, some recent scientific articles have reported patients with microscopic epithelial dysplasia when clinically the tissue appears normal."

The dilemma, Kahn ponders, is that if the eye isn't going to see it, fingers aren't going to feel it, and perhaps even the adjunctive screening lights aren't going to detect it, then how are dentists going to handle such potentially malignant oral cases? To the best of his knowledge, there is no definitive study (ie, a randomized clinical trial of sufficient power of the general population performed by general dentists with a double-blind placebo design) that shows these adjunctive screening lights can consistently find potentially malignant tissue when it clinically appears normal.

### The Future

Groups of researchers are working on different salivary tests to screen for oral cancer, Kahn says. Different protein substances in saliva have been shown to indicate people who have occult cancer or are thought to be more likely to develop a primary or recurrent lesion in the future.

Other researchers are investigating different types of light screening

technology that hopefully would be more sensitive and specific, in addition to having a better positive predictive value; however, all of these are still experimental at this point, Kahn says.

## Assessing Patient Risk for TMD and Craniofacial Pain

### The Past

Historically, when dentistry considered temporomandibular joint disorder (TMJD), everyone said TMJ. However, the term *TMJ* related to the temporomandibular joint, the surrounding muscles of the face, and that meant just the jaw muscles. Clinicians rarely looked at anything beyond the joint, such as the temporalis, or the medial and lateral pterygoid muscles, which move the jaw during function, recalls Noshir Mehta, DMD, MDS, MS, professor and chairman of general dentistry and director of the Craniofacial Pain Center at Tufts University School of Dental Medicine. As a result, treatment programs were designed to diagnose and treat the TMJ; because it was a very small, specific area, treatments were designed mostly in a dental arena and incorporated bite appliances or occlusal adjustment of grinding teeth.

Patients then began presenting with other signs and symptoms, and these included headaches, neck pain, and back pain, Mehta explains. TMD treatment very quickly became a free-for-all, where dentists were diagnosing and treating a variety of muscle and jaw pains, as well as diagnosing headaches, yet still only treating just the specific area of the jaws, he points out. Jaw position and stability have a lot to do with the stability of the head and neck muscles, so by inserting guards in the mouth, dentists were successful in treating some of these patients, but unsuccessful in treating many more of them.

"As our diagnostics improved, or at least as we started to broaden our area of assessment, we started to find out that people had multiple disorders, so we now changed the term to temporomandibular disorders," Mehta says. In the early 1980s, there were two academies that emerged: the Academy of Orofacial Pain, which focused on biopsychosocial techniques for treating

<sup>4</sup>Campisi G, Panzarella V, Giuliani M, et al. Human papillomavirus: its identity and controversial role in oral oncogenesis, premalignant and malignant lesions (review). *Int J Oncol.* 2007;30(4):813-823.

## The INSIDE LOOK from...

Issue after issue, the feature presentations in *Inside Dentistry* deliver coverage of the relevant and thought-provoking topics affecting the greater oral healthcare profession at large. The publishers and staff could not bring the underlying concerns and trends surrounding these timely issues to the forefront without the insights shared by our knowledgeable and well-respected interviewees. For their collective generosity of time and perspectives, we extend our sincere gratitude.

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“We need to teach this ‘whole person’ approach more in dental schools. Dental students need to understand that they’re actually going to be treating people, not just teeth.”

Noshir Mehta, DMD, MDS, MS

people with TMD; and the Academy of Craniofacial Pain, which dealt primarily on the dental issues of treating patients with TMD.

### The Present

Mehta says that dentistry’s assessment of its patients in terms of TMD risk has improved because the profession has expanded into the medical model of assessment, not just the dental model, and includes assessing the whole person, not only the needs of the teeth. Today, TMD risk evaluation includes an assessment of a patient’s psychosocial issues and the psychological implications of chronic pain.

“We now see TMD as a chronic pain condition, so temporomandibular disorder, which was once purely a temporomandibular joint problem, has now gone beyond that to what we consider a chronic head-neck-and-face-pain problem,” Mehta emphasizes. “The name has changed to orofacial and craniofacial pain, rather than TM joint pain, and it is treated in the same manner as other chronic pain conditions.”

Therefore, a much broader knowledge of medications for chronic pain use is required, as well as a broader base of treatments with physical medicine, such as physical therapy, chiropractic care, and osteopathic care, Mehta says.

Sometimes treatment of the muscles using injections and medications is required, he adds.

### The Protocol

The historical way of assessing a patient medically has been to take a very good history, which is an extremely important science and art. Without the proper history and without listening to the patient, dentists rarely can develop a proper diagnosis, Mehta says. When it comes to TMD assessment, the amount of time dentists spend on history taking has actually increased, particularly since listening to the patient is the main way of ascertaining what is happening with the patient’s problem, he explains.

“Of course, there are specific dental tests that can be performed to determine if the teeth themselves are a problem. You can examine the teeth, gums, and periodontium; perform an oral cancer examination inside the mouth and around the mouth to ensure that the pain is not coming from a tumor; and examination of the posterior part of the mouth to evaluate the airway space,” Mehta suggests. “After evaluating the

tonsils—if they are there, and determining if the adenoids are swollen, then you can actually examine the joint.”


The TMJ examination includes customary palpation, but a stethoscope for an auscultation of the joint sounds also could be used, as well as to auscultate the arteries and carotid arteries, and look for other medical conditions that are in or around the head and neck region, Mehta says. The head, neck, and jaw muscles are palpated, and three types of diagnostic images are obtained (eg, a panoramic radiograph and, for specific problems related to the joints, a CT scan for hard tissue problems and an MRI for soft tissue problems). Those are the three gold standards of diagnostics at the present time, Mehta explains.

In addition, there are some dentists who use other types of equipment to screen TMD patients, such as those who use neuromuscular EMG assessments. Others advocate joint sound analysis and joint movement analysis.

“However, the most commonly approved way to examine a patient is by listening to the patient, examining the patient with hands-on examination,

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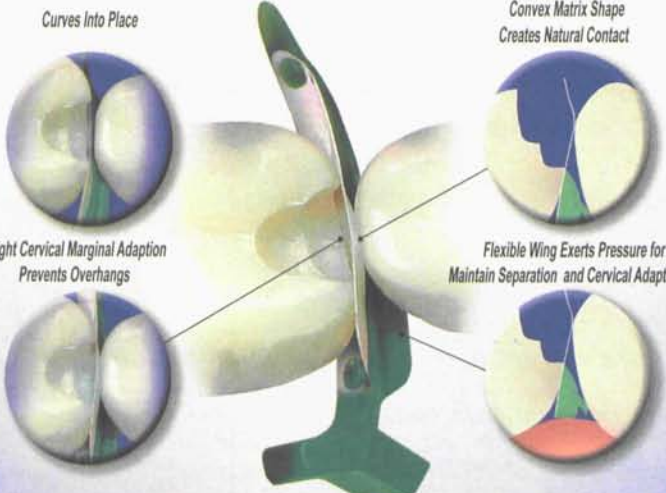
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performing an intraoral mouth and cancer examination, doing a head-and-neck examination with the hands, and then listening to the sounds in the TMJ area," stresses Mehta.

### The Future

Mehta acknowledges that dentistry is beginning to recognize that what occurs in the mouth can affect the rest of the body and the health of the human being, so more detailed information is

being obtained during dental examinations. Clinicians are using more psychological tests and questionnaires, in addition to more medical-based examination procedures, such as looking at heart rate variability.

"We are looking at the effect of what we do on blood pressure, diabetes, and a host of systemic issues," Mehta says. "Therefore, what we are starting to do as dentists treating people with TMD is ask patients to fill out forms about sleep

problems, anxiety, and depression, because a large number of our patient population has problems in these areas."

In fact, Mehta says that a large number of patients who have TMD also have irritable bowel syndrome and other autoimmune disorders. Therefore, it is no longer feasible to categorize TMD patients as a special patient population, he says. Rather, they are patients who have chronic pain along with other autoimmune-type issues.

"Ultimately, it doesn't matter which technology you use in your diagnostics and assessment. It comes down to what your criteria of assessments are and how you broaden your field of assessing these patients, because you can no longer just look at the jaw," Mehta emphasizes. "We need to teach this 'whole person' approach more in dental schools. Dental students need to understand that they're actually going to be treating people, not just teeth."

## Who's At Risk for Dry Mouth?

According to David Hamlin, DMD, who operates the Dry Mouth Relief Center in Oxford Valley, Pennsylvania, few dentists are trained and specialized in oral medicine, despite the fact that they are all exposed at some level to medical complications of the mouth. In the world of either insurance-led dentistry or in reimbursement-based dentistry, oral medicine really hasn't come to the forefront because there aren't many codes developed around the diagnosis and assessment of medical-dental risks for the patient, he says. Dry mouth and hyposalivation are one prime area with a lack of diagnosis and treatment codes.

"Code development in salivary diagnosis and treatment must be done in order to close the risk of dry mouth and obvious outcomes such as root caries, nutritional deficiencies, negative oral microbiological change, and general reduction in quality of life. All of these are significant, present today, and will be even more so in the future as more of us are anticipating to be put onto prescription medicines that are known to have side effects like hyposalivation," Hamlin explains.

### The Past

In terms of assessing patients' risk for dry mouth in the past, Hamlin has observed that most dentists have been really in a mode of listening to patients' complaints about the outcome of hyposalivation problems and not with reversing the curve and leading that discussion. Hyposalivation and its related consequences have only recently come into greater focus through articles published in the dental literature and significant increases in patient questions about the subject, he says.

### The Present

Today there are some kits on the market (eg, GC America's Saliva-Check Buffer Kit) that provide a few salivary



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assessment tools in one package, Hamlin says. Such kits check salivary flow levels, saliva pH, and the buffering capacity of the saliva, as well as tools for asking patients questions about their lifestyle modifications based on hyposalivation. However, there aren't any specific risk assessment forms widely available today and specifically geared toward risk assessment of dry mouth and hyposalivation, he notes.

"I'm fortunate to have a full-time

master's-prepared nurse working with me who has a pharmaceutical background and is able to help me decipher the medicines in the marketplace that are predominantly causing the hyposalivation that we see," Hamlin says. "I don't think many doctors have that kind of skill base in their own offices, so they're going to rely on their own training, as well as that of their hygiene team, to stay current on uncovering the drugs causing about 80% of this issue."

Ultimately the challenge is to integrate our knowledge of dentistry into the medical system to help our patients minimize the side effect of dry mouth, without impacting the patient's therapeutic outcome.

Additionally, the US adult population includes a number of individuals suffering from immune-based salivary disorders such as Sjögren's syndrome. Sjögren's syndrome remains very difficult to diagnose, Hamlin says. On average,

there are approximately 6 years between the onset and the actual diagnosis of that disease process, he says.

"It's very frustrating for patients to undergo the diagnostic steps, because they're in front of many different practitioners, including rheumatologists, dentists, and regular practitioners in medicine," Hamlin emphasizes. "It's very difficult to put all the data together and arrive at a cause of hyposalivation in that particular patient, whereas it is very easy to diagnose someone who has been treated radiologically for cancer or has a specific chemotherapeutic regimen that may affect the salivary glands."

### The Future

Hamlin says he and his staff are in a unique position because they are working to create tools and technologies specific to hyposalivation and dry mouth because that's where their attention is strictly focused. One of the latest tools he's been developing is a salivary reading system that enables him to obtain an oral tissue moisture level without collecting saliva.

"I also think there will more functionality for our tomographic 3D scanning systems. With higher energy levels, they may be able to reveal the glandular structure on the head-and-neck examinations being performed," Hamlin postulates. "Although most doctors are buying these units for implants and hard tissue applications, including periodontal assessment, it's not far-fetched to consider that there might be a next generation that could provide soft-tissue imaging and allow us to have access to that information for a complete diagnosis without referring the patient to a hospital-based CT scan."

In general, Hamlin believes it behooves dentists to avoid turning the opportunity to treat patients with hyposalivation and dry mouth into a crusade or some form of aggressive campaign that promises relief and delivers far less. For instance, he recalls the early days of whitening systems and halitosis treatments when there were certain companies and individuals that stepped outside the boundaries of science and became pure marketers, leaving a bad taste in the mouths of patients and dental professionals alike.

"It would be wise for us to examine those history points and not recreate them. There's too much of an opportunity to change patients' lives," Hamlin explains. "In my mind, this is the next frontier of dentistry. The body cannot survive without blood, nor can the mouth survive without saliva."



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## Erosion—A Growing Risk to Oral Health

As today's population ages and lives longer, maintaining more of their teeth for a longer time, the extent of tooth erosion increases while the loss of saliva decreases. According to Athena S. Papas, PhD, DMD, Johansen Professor of Dental Research and head of the division of Public Health Research and Oral Medicine at Tufts University School of Dental Medicine, when the level of saliva decreases below a certain threshold, individuals lose the remineralizing potential and buffering action of the saliva, and more erosion results.

Add to that the fact that individuals use harder-bristled brushes, compared to soft brushes, and that too can contribute to dental erosion, Papas says. Other factors contributing to today's epidemic of dental erosion include—but aren't limited to—increased consumption of acidic beverages, such as sports drinks and carbonated drinks, followed by a rush to brush (ie, the tooth structure is demineralized by the acid and brushed away); and the ironic negative consequences of frequently eating healthier fruits, which contain acid and can wear down tooth structure. Gastroesophageal reflux (GERD) also is an intrinsic cause of erosion.

In general, Papas says there are many reasons for erosion. Dentists have long known about bulimia and its erosive effects on tooth structure. If it's caught early, an intervention can be done before the acid actually destroys the bite and the occlusion collapses, she explains. With patients who have no saliva, such as those with Sjögren's syndrome, the entire tooth can be eaten away in months just from eating fruits, so these patients should be cautioned and advised about eating and drinking acidic foods and beverages in moderation, and following quickly with water to help rinse their mouths. Prescription fluoride treatment and remineralization with calcium and phosphate are necessary in high-risk populations.

In the past, very little attention was paid to dental erosion. Dental professionals weren't fully aware of it, Papas explains. Despite the fact that Pindborg, a renowned pathologist,<sup>5</sup> identified dental erosion as far back as the 1950s and 1960s, Papas notes that it wasn't until recently that researchers in the United Kingdom and United States recognized it as a significant problem.

### The Present

"Dentists are suddenly becoming aware of dental erosion, and one way they can see

it is to take impressions of their patients now and compare them to impressions from 5 years ago," Papas explains. "This demonstrates to the dentist and patient how much tooth structure is gone."

In terms of the consumption of acidic foods and beverages being contributing risk factors for dental erosion, Papas explains it's the frequency of contact, not the total amount that causes the risk. For instance, if someone drinks orange juice or sugary lemon tea all day long, or even hot lemon tea, they'll have more erosion than someone who consumes either of them once a day, she explains.

"Even sports drinks that we consume when we go for a run can cause erosion," Papas says. "Your mouth is dry after you've been running a long distance, and then you put something acidic in your mouth. It's going to demineralize your teeth."

Therefore, one of the things dentists can advise their patients of is to not brush immediately after they've had an acidic food or beverage, perhaps waiting half an hour, so that their natural saliva can do its job, Papas says.

Also, the time of day makes a difference. People have their maximum saliva in the middle of the day. Therefore, if they drink orange juice immediately when they wake up in the morning—when they have the lowest level of saliva—they are more likely to cause a problem, Papas adds.

To help counter the effects of erosion-causing foods and beverages, Papas advises dentists to advocate the use of xylitol gum, as well as orange juice with calcium in it, which will help protect the teeth. Additionally, eating cheese helps buffer acid in the oral environment and helps prevent acid erosion, she says.

### The Protocol

There are many ways to measure erosion, including a series of scales developed both in the United States and the United Kingdom.<sup>6</sup> However, Papas says these are mostly used as research tools for epidemiology, not by general dentists to measure loss of tooth structure.

To demonstrate erosion, dentists can use the previously mentioned before and after impressions, or they can shine a light on the tooth surface that, when it's eroded, will appear dull, rather than shiny. As erosion encroaches the dentin, the tooth color will change, Papas says, and all of this can be shown to a patient.

To counter the effects of dental erosion, Papas says dentists can advise their patients about how often and when to consume certain types of foods and beverages, as well as what type of

toothbrushes to use and how soon to brush their teeth after eating. There also are products (MI Paste, GC America, Inc. [www.gcamerica.com](http://www.gcamerica.com); Caphosol, EUSA Pharma; [www.eusapharma.com](http://www.eusapharma.com)) that capitalized on early research into the protective benefits of calcium phosphate, as well as prescription-level fluoride pastes, that can be dispensed to patients who are starting to have erosion, she explains.

"This is where a dentist can really intervene and provide remineralizing solutions, such as fluoride, MI Paste, and xylitol gum to stimulate saliva," Papas says.

### The Technology

Currently no technology is generally available to measure or assess dental erosion, Papas explains. However, she anticipates that in the future, as dentists become more sophisticated in their use of technology, such devices as digital impression systems might be used to track tooth wear and show it on a computer screen to patients for educational purposes.

"I think that as we become more sophisticated in dentistry, we'll enter into high-level diagnostics," Papas predicts. "Then, once we assess the risk for erosion, whether it's intrinsic or extrinsic, we can put patients in preventive, remineralizing protocols."

## Concluding Thoughts

Speaking as someone with an eye for the future evolution of esthetics, Sesemann urges keeping the conservation of healthy tooth structure as an ever-present factor in treatment plan decision-making. When the risks of one treatment

over the other are considered, the one with the least risk must be emphasized.

"Practitioners must pursue command of all restorative treatments in their continuing educational endeavors so they're not only competent in preparing and bonding, but also competent in rendering a no-preparation composite and/or no-preparation veneer," Sesemann says.

Kutsch emphasizes that risk assessment is really the future for dentistry, whether it's looking at the implications of periodontal disease on pregnancy and other health risks, or the impact of an individual's occlusion on the health of their teeth throughout their lifetime. He says that in general, dentistry is beginning to look at the patient as a whole in terms of risk assessment-based diagnosis.

"I think you're going to see dentists do more of this, and it's going to be a standard of care," Kutsch says. "We're going to be doing more risk assessment, and we're going to be able to have better and more predictable treatment outcomes for these cases as we're able to truly—maybe for the first time in our profession—effectively treat and really truly prevent dental caries."

### Disclosure:

Although not interviewed in this capacity, it is disclosed here that Dr. Kutsch is a founder, inventor, and CEO for CariFree.

<sup>5</sup>Holbrook WP, Arnadóttir IB, Kay EJ. Prevention. Part 3: prevention of tooth wear. *Br Dent J*. 2003;195(2):75-81.

<sup>6</sup>Young A, Amaechi BT, Dugmore C, et al. Current erosion indices—flawed or valid? Summary. *Clin Oral Investig*. 2008;12(Suppl 1): S59-S63.

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