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• All tables contained within this issue are from Dr. Garg's practice.

Considering the Revised Recommendations for Antibiotic Prophylaxis in Patients with Valvular Disease

By Arun Garg, DMD

In 2007, the American Heart Association (AHA) revised its longstanding recommendations for antibiotic prophylaxis in patients with valvular heart disease, changing the way dentists have been managing patients for more than 50 years. This article reviews these important changes, looks at the pathophysiology of infective endocarditis, and weighs the highs and lows of changing the standards of practice.

What is Infective Endocarditis?

The hallmark of infective endocarditis is an entity called the vegetation — a collection of microorganisms, platelets, and thrombi that adhere to parts of the endocardium like valve leaflets and any defects in typical endocardial anatomy (septal defects, etc.). The causative agent can be bacterial, fungal, or viral, but most commonly it is *Staphylococcus aureus* in both native and prosthetic valves.[1] *Streptococcus viridians* is also commonly implicated in non-IV drug users. Importantly, normal, healthy endocardium does not tend to attract platelet formation or bacterial colonization. It is only the weakness, defect, redundancy, or replacement of valve tissue that becomes a potential site for the growth of vegetations. Mitral-valve prolapse (MVP) is a condition affecting 2% of the population in which there is a redundancy of valve material specific to the mitral valve. Most commonly benign, it can cause heart murmurs and sensations of chest pain and/or anxiety. Prior to 2007, all individuals with mitral-valve prolapse were treated with antibiotic prophylaxis in advance of any dental procedure.

Inside This Issue

New Guidelines

The new guidelines include the following patient groups for antibiotic prophylaxis in advance of a dental procedure:[2]

- Prosthetic heart valves
- Prosthetic material used for a cardiac valve repair
- Prior history of infective endocarditis
- Unrepaired cyanotic con genital heart defect
- Repaired heart defects that used prosthetic material or device within the first six months after the repair
- Repaired congenital heart disease with defects at the site or at the site of the prosthetic device
- Significant leaflet pathology and regurgitation (valvulopathy) in a transplanted heart.

No longer needing antibiotic prophylactic include the following groups of patients: those with bicuspid aortic valves, those with acquired aortic or mitral-valve disease, including MVP and those who have undergone valve repair, and those patients with hypertrophic cardiomyopathy with latent or resting obstruction.

Table 1

Antibiotic Dosages and Types

Antibiotic	Usage in patients	Dosage
Amoxicillin	Standard usage	2 g po 30-60 min before procedure[2]
Cephalexin	Allergy to penicillin	2 g po 30-60 min before procedure[2]
Azithromycin or clarithromycin	Allergy to penicillin	500 mg po 30-60 minutes prior to procedure[2]
Clindamycin	Allergy to penicillin	600 mg po 30-60 minutes prior to procedure[2]

For dental procedures, if no significant manipulation of the gingival tissue is prescribed, antibiotics are not recommended. If the periapical region of the teeth is to be manipulated, or if perforation of the oral mucosa is anticipated, antibiotics are required. Dosages and types are listed in *Table 1*.

Note from the Editor: Current Guideline Controversy

When guidelines change, patients, practitioners, administrators, insurers, and the public must process the new information and adjust accordingly. This is not always a smooth and easy transition, even if the evidence clearly indicates that the change needs to be made. Consider the heated and ongoing debate over the appropriate age to begin mammogram screenings in women. Prior to this year, the accepted age was 40 years old; indeed, many breast cancers were brought to light due to mammography screenings at this age, even in individuals without a family history of the disease. Yet, a major health care organization, the United States Preventive Services Task Force (USPSTF), changed the age for routine mammography screening; 50-years-old is now considered the new "guideline-appropriate" age for mammography to begin.

The result on behalf of breast-

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cancer survivors was confusion, ardent disagreement, even disappointment and shock. After all, their lives were saved by this technology. There was also significant backlash against the current political administration under whose tenure the change was made; the public was outraged at the prospect that perhaps, regardless of the epidemiological data, this is a cost issue. Medical groups, specifically radiologists, put forth their own guideline for mammography screening to begin at the previous age — 40. Physicians are now allotting valuable in-office face time in an effort to field questions about the real age for mammography to begin.

So what is the appropriate age for mammography screening to commence? The answer is far more significant than a numerical value. It cuts to the heart of a fundamental issue in terms of ethics, economics, morality, and health care: is more health care better health care? Few women would argue that the increased risk of radiation over a ten-year period is relevant in the face of a potential malignancy. Certainly breast cancer, a malignancy with tremendous fear and stigma attached to it, is worth detecting at all costs for women who want the test. But is it? Realizing that the number needed to screen is 1,904 changes the picture somewhat. The number needed to screen indicates that 1,904 women would need to have a mammography before a single breast-cancer death was averted. Additionally, for every 1,000 mammograms, there are 97.8 false-positive radiological findings. Obviously, a false-positive result can cause a tremendous amount of worry and stress for the woman, not to mention the increased risk of infection that a biopsy poses.

Changing the guidelines for antibiotic therapy in the MVP patient had the potential to cause significant backlash. This is, after all, a rule that doctors, dentists, and patients had been following for decades. Medical students and dental students graduating this year and last year were taught about the need to use prophylaxis for MVP patients in their cardiology courses. And while this generation of health care providers is trained in the importance of evidence-based medicine (EBM), will the practitioners who have been in business for as long as 30 years be ready to make the change without a fight?

The trend away from prescribing antibiotics for MVP patients in advance of a dental procedure did not garner the attention that the mammography debate is attracting. In the face of growing multidrug-resistant organisms and a smaller arsenal to treat progressively worsening and potentially fatal bacterial illnesses, diminishing the use of antibiotics seems a valid idea. But sporadic cases of infective endocarditis in patients with MVP are still occurring, and the damage to the heart that this can cause is significant, not to mention the increased duration of treatment, associated medical costs with probable intensive care unit utilization, serious decline in overall health and, potentially, death. In-hospital mortality for infective endocarditis is estimated at 15%-20%.[1]

There have been those who have published dissenting opinions since the new guidelines were established, citing the lack of randomized, controlled trials to evaluate the risk and benefit of antibiotic prophylaxis in patients with common valvular defects like mitral valve prolapse.[3] In one case study, the authors report the development of cardiogenic shock and subsequent death of a patient who had undergone a dental extraction two weeks prior; perforating vegetations were seen at autopsy, suggesting infective endocarditis as the causative agent of this patient's demise.[3] The second patient was a female with a history of a heart murmur and MVP who was not given antibiotic prophylaxis in advance of dental work. She required six weeks of intravenous penicillin and two weeks of intravenous gentamycin to treat a mobile, pedunculated vegetation on the mitral valve.[3] Other practitioners simply feel it is safer to attempt to prevent what is otherwise a debilitating and life-threatening disease than to attempt to treat it after the vegetations are coating the valve leaflets.[4]

Regarding mammograms, three major organizations are supporting mammography for women in their 40s: the American Cancer Society, the American College of Radiology, and the American College of Obstetricians and Gynecologists. Additionally, a poll of 2,932 physicians showed that 76% of physicians would not stop performing routine mammographies on patients between 40 and 49 years of age.[5] Where the bulk of community dentists fall in terms of the use of antibiotic prophylaxis for patients with moderate valvular conditions like MVP remains to be seen. Stay tuned.

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What's in Your Patient's Mouth? How Lifestyle, Disease, and the Environment Affect the Oral Cavity

By Arun Garg, DMD

There is an expansive amount of data on the microflora of the mouth, and these data are newly growing due to advanced techniques in molecular sequencing that enhance our understanding of the bacterial species that inhabit the oral cavity. As many as 700 bacterial species have been known to coexist within the human mouth, and 50% of these have been cultured. To further complicate the relationship between microflora and host, there is the fact that different bacteria prefer different surfaces of the mouth, depending on adhesion sites and characteristics of the bacteria (for example, some bacteria are found uniquely in saliva, some live solely on soft-tissue structures, there are those that prefer to be below the gingiva, or above, etc.). With so many factors to consider, I have selected a group of patients who have unique microflora and oral manifestations due to lifestyle factors, disease processes, and/or environmental susceptibilities and analyzed the overt symptoms and the implications for dental implant treatment.

The Smoking Patient

In the January 2010 issue of *Dental Implantology Update*, I outlined the pathophysiology of tobacco smoke and its effect on the dental implant patient. In addition to the fact that tobacco products are highly carcinogenic, nicotine acts as a potent vasoconstrictor and has been shown to diminish platelets and macrophages.

Oral Manifestations: Tobacco smoke has been linked to periodontal disease, oral cancers, leukoplakia and erythroplakia (premalignant lesions), stomatitis, gingival hyperpigmentation (melanosis), bone loss, and hairy tongue.[1,2,3] One study indicated that informing patients that tobacco use was the likely cause of detected lesions was a good way to initiate tobacco cessation discussions.[4] To further underscore the need for patients to quit, a recent study in the *Journal of Adolescent Health* demonstrated that household smoking may actually be a risk indicator for caries in adolescent teeth,[5] though further evidence is needed.

Considerations before implant therapy: Advising the implant patient to quit in advance of an implant procedure is essential. A detailed guide to helping the implant patient quit smoking is available in the January 2010 issue of *Dental Implantology Update*.

The Regular Alcohol User

Chronic alcohol use can have a variety of effects on total health. Second only to tobacco, it is the highest cause of preventable morbidity and mortality. Chronic alcohol use, and abuse, is generally determined by a strong genetic component, although exogenous factors also play a role. In general, alcohol abusers tend to have poor oral hygiene. Chronic alcohol users present with unique oral microflora for multiple reasons. Because they tend to be aspiration prone, gram-negative bacilli can colonize the pharynx and oral cavity.[6,7]

Oral Manifestations: Chronic alcohol use has been shown to increase incidence of oral, pharyngeal, and esophageal cancers in multiple studies. Some studies suggest that elevated levels of acetaldehyde in the mouths of these patients is the pathological initiator of malignant transformation.[8,9] In animal models, regular alcohol use is also a risk indicator for periodontal disease,[10] and this

Table 1

Inherited T-cell Deficiency Disorders (BMT= bone marrow transplant)

Disorder	Disease type	Prevalence
Ataxia telangiectasia	Neurodegenerative disease; half are affected by immune dysfunction. Bacterial infection predominates	Very rare - 1 in 40,000 to 1 in 100,000 people[13]
Autoimmune Polyglandular Syndrome Type 1	Autosomal recessive autoimmune disease conferring at least two of the following: mucocutaneous candidiasis, hypoparathyroidism, and Addison's disease	Extremely rare - Only 500 cases worldwide[13]
Di George Syndrome (22q11.2 Deletion Syndrome)	Deletion near the middle of chromosome 22 causing multiple systemic abnormalities which can vary widely but include, cardiac defects, cleft palate, autoimmune disorders, kidney dysfunction, hypocalcemia, thrombocytopenia, and hearing loss. T-cell deficiency is due to a hypoplastic thymus	Rare - 1 in 4000 people[13]
Severe combined immune deficiency (SCID)	Total absence of immune function due to genetic mutation in one of several genes; usually fatal within first two years of life without BMT	Very rare - 1 in 50,000 people[13]
Adenosine deaminase (ADA) deficiency	Deficiency of this enzyme causes 15% of SCID cases. ADA is found throughout the body but primarily in lymphocytes	Extremely rare - 1 in 200,000 to 1 in 1,000,000

has been seen in some studies as well, though more longitudinal studies are required to confirm the relationship.[11]

Considerations before implant therapy: Patients with suspected alcohol use disorders should be evaluated by the CAGE questionnaire, a four-question screening tool that can be asked by dental practitioners, as well as medical health professionals. It includes the following questions:

1. Have you ever felt you should cut down on your drinking?
2. Have people annoyed you by criticizing your drinking?
3. Have you ever felt guilty about your drinking?
4. Have you ever had a drink first thing in the morning ("an eye-opener")?

Two or more "yes" answers on the CAGE questionnaire is considered a positive screening test for an alcohol-use disorder.

Patients with advanced alcohol-use disorders may have some degree of liver dysfunction as a result of the repetitive toxic injury of ethanol. Cirrhosis is seen in roughly one in four heavy drinkers, and a dose-dependent relationship between quantity of alcohol consumed and incidence of alcoholic cirrhosis has long been established.[12]

Patients with periodontal disease as a result of alcohol use or dental neglect should be treated before the initiation of implant procedures to assure maximal implant success rates.

The Immunocompromised Patient

Various disease states, medications, surgical procedures, and genetic defects can compromise the immune system. The most common type of immunosuppression seen in dental-implant patients is iatrogenic, namely, patients receiving chemotherapy for cancer or corticosteroids for inflammatory processes.

Inherited immunodeficiencies do exist in the population, though they are very rare. Specific to the mouth, T-cell deficiency can cause susceptibility to fungal infections and, commonly, Candida infections are seen in these patients. For completeness, these inherited disorders are listed in *Table 1*; most have low survivability into adulthood and will not be seen by dental implant specialists.

Patients with human immunodeficiency virus (HIV) and acquired immune deficiency syndrome (AIDS) may, however, present for a dental-implant procedure. These patients have systemic immunological dysfunction secondary to a low T-lymphocyte count, and this is a relative contraindication to dental-implant therapy due to the increased probability of peri- and postoperative infection.[14] That said, however, it is clear that with the advent and widespread use of highly active antiretroviral therapy (HAART), patients with CD4+

Table 2

HIV- and AIDS-related Infections That Can Be Seen in the Mouth

HIV/AIDS-Associated Illness	Oral Manifestation
Oral candidiasis	Multiple presentations, including white patches in the oral cavity (pseudomembranes), that can be scraped away, erythematous (atrophic) lesions, and angular chelitis. Causitave agent is Candida and infection may extend down the esophagus. Thrush is a common presentation in the HIV patient who is not on HAART therapy. Oro-pharyngeal pain with dysphagia often brings the patient to medical attention before other symptoms.
Herpes simplex virus (HSV)	Eruption of one or more erythematous and painful vesicular lesions around the mouth or other mucous membrane surfaces. Can also be present in the oral cavity but vesicles will likely not be apparent. Herpes Simplex can be seen in non-HIV infected individuals; a more severe, prolonged, or intractable presentations may be an indicator of immune compromise.
Herpes zoster	Erythematous vesicular lesions that present along a dermatomal distribution. Lesions will not cross the midline. Patients will report pain, sometimes in advance of the appearance of lesions. Zoster is positively associated with a weakened immune system. Like herpes simplex, Zoster alone is not an indicator of HIV status.
Oral hairy leukoplakia	White lesions on the tongue that cannot be removed or scraped away. May vary in presentation: smooth, flat, irregular, verrucous, or "hairy" as the name indicates have all been described.[3] Associated with smoking, as well as immune compromise (CD4+ count < 200 cells/mm^3).
Kaposi's sarcoma (Human Herpesvirus 8)	Red, blue, or purple lesion. May be flat or raised, multiple or solitary. Commonly seen on the hard palate, but may present on gingival and mucosal surfaces as well. Lesions may coalesce and ulcerate.[3] Biopsy is necessary to differentiate KP lesions from benign lesions. Rarely seen outside of the immune-compromised patient.
Periodontal Disease: Linear gingival erythema (LGE)	Characterized by red bands around the necks of the teeth caused by bacterial proliferation in the gingival sulcus; friable gum tissue with bleeding at minimal manipulation; can progress to necrotizing ulcerative periodontitis.[18]
Periodontal Disease: Necrotizing ulcerative periodontitis (NUP)	Necrotizing lesions that may extend from the gum to the bone; thought to be caused by underlying bacterial or fungal infestation. Can progress to rapid destruction of alveolar bone, maxilla, and mandible if not treated immediately.[3] Progression of LGE does in some cases lead to NUP. A marker of severe immunodeficiency.

counts above 400 cells/mm^3 and a low viral load are likely to have outcomes similar to the non HIV-infected patient. Few studies have considered the effects of immunodeficiency on implant success; those that tackled the topic indicate a low complication rate (as low as 0.9%),[15] even in patients with CD4+ counts below 200 cells/mm^3 (considered the numerical value for a diagnosis of AIDS if no AIDS-defining illness is present).

Oral manifestations: Oral lesions seen in HIV and AIDS patients include oropharyngeal candidiasis, hairy leukoplakia, oral ulceration, necrotizing lesions, coinfection with Herpes Simplex, coinfection with Herpes Zoster, aphthous stomatitis, and acute periodontitis that may be difficult to treat.[16,17] As the disease progresses, or as the CD4+ count drops (if the patient discontinues HAART therapy), disease susceptibility widens (*see Table 2*).

Considerations before implant therapy: Patients with HIV and AIDS should be seeing a physician regularly for treatment and monitoring of CD4+ count and viral load. It is this author's recommendation that implant experts confer with the treating physician in advance of any oral-surgery procedure. Complete lab work, including liver function tests (PT, INR, APTT), should be reviewed. Practitioners should be aware that HIV- and AIDS-related hematological disorders include thrombocytopenia; therefore, a complete blood count should also be analyzed. Provided no risk of bleeding exists and that the patient is in otherwise good health, an implant procedure is not absolutely contraindicated. Antibiotic prophylaxis may also be administered, though little evidence on the duration of treatment is available. Benefit has been shown in immunocompromised patients when the gingival sulcus is irrigated with antiseptic solution in conjunction with antibiotic prophylaxis.[19] Good oral hygiene is of extreme importance in this group of patients, and regular dental check-ups should be encouraged.

The Coffee Drinker

Good news for the coffee lover: Coffee consumption has

been shown to be inversely associated with the development of oral, pharyngeal, and esophageal cancers.[20] In a recent population-based prospective study in Japan, 38,697 individuals aged 40-64 years were evaluated for cancers of the mouth, pharynx, and esophagus for a period of 13.6 years. In this group of patients, 157 cases of cancer developed. From a self-administered questionnaire, coffee consumption was determined. At one or more cups of coffee per day, a protective effect was observed against oral, esophageal, and pharyngeal cancers. Case-control studies in Italy and Switzerland yielded a similar trend, but the Japanese study is the best evidence to date.

Additionally, recent studies investigating the plaque in individuals with different drinking habits show that drinking coffee decreases the adhesive ability of *Streptococcus mutans*, the causative agent of dental crown caries.[21] Similar results were seen in individuals who drink red wine, tea, and barley coffee (all high in naturally occurring polyphenols).[21]

The combination patient:

No single entity or pathology exists in isolation. Unfortunately, individuals who use alcohol often, smoke and drink coffee as well. Diabetics smoke and are at an increased risk of infection, periodontitis, and oral abscesses. The combination patient has multiple risk factors for oral pathology and should be evaluated thoroughly. ■

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