Oral disease in the geriatric patient: the physician's role

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SUMMARY In the elderly, oral health has a profound impact on general well-being. The ability to quickly identify potentially harmful oral health problems is valuable to the physician, who generally will see an older patient more often than the dentist will.

KEY POINTS Many medications and conditions can contribute to xerostomia and, therefore, to the development of dental caries and destruction of the teeth. Periodontal disease can also lead to increased susceptibility to caries and loss of teeth but is preventable through regular dental care. Bacteremia originating in oral foci can cause serious conditions such as endocarditis, infections of prosthetic joints, and contamination of vascular-access devices, especially in immunocompromised patients. To reduce their risk of bacteremia, neutropenic patients should receive broad-spectrum antibiotics before undergoing dental procedures. Oral cancer is easily treated if detected early. Patients undergoing cancer chemotherapy have special problems, as chemotherapeutic agents are highly toxic to the oral mucosa.

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PHYSICIANS HAVE a unique opportunity to detect significantly deteriorated dentition and other important oral abnormalities, because older patients are more likely to visit their physicians than their dentists during a given period.[1]

The prevalence of oral disease remains highest in the geriatric population (although the percentage of edentulous people over age 65 has improved from 60% in 1957 to 42% in 1985).[2,3] While oral diseases seldom seriously impair health or threaten life, they worsen the quality of life.[4] Poor dentition and oral functional impairment may hamper one's ability to live without pain or discomfort, ingest and enjoy food, engage in satisfying interpersonal relationships, maintain a favorable self-image, and be reasonably content with one's personal appearance.

An approach to oral health in geriatric patients should emphasize enhancing function and the quality of life. Dolan[5,6] has proposed that oral health is characterized by "a comfortable and functional dentition that allows individuals to continue in their desired social role"[6];

physicians share a similar goal in regard to the general health of the patient.

Simple guides to oral health assessment offer a systematic approach that may be useful in medical practice.[7,8] These guides can help physicians identify gross oral abnormalities for which they would refer a patient to an appropriate dental professional for follow-up. Promptly identifying and treating significant diseases such as oral cancer can spare the patient much pain and expense and result in lower overall medical costs.

TABLE 1
HOW SALIVA INFLUENCES ORAL HEALTH*

Lubricates
Protects mucous membrane
Promotes wound healing
Maintains ecologic balance
Debrides
Impairs bacterial adherence, activity
Maintains oral pH
Maintains tooth integrity

*Adapted from Mandel, reference 11

COMMON ORAL PROBLEMS IN THE ELDERLY

Edentulism

Thanks to advances in research, public health (including education and water fluoridation), and preventive care, great progress has been made in the last 30 years in preserving the natural dentition. According to the National Institute of Dental Research, people over age 65 have an average of 17 remaining natural teeth.[3] Still, the current edentulism rate of 42% in the elderly emphasizes the continuing need for preventive care.

As more older people retain their teeth, more of them are at risk of dental disease. Patients with cognitive decline and functional disabilities and who take many medications find oral health difficult to maintain. These factors compound the problem of providing definitive dental treatment in medically compromised patients.

Preserving the natural dentition is crucial because the presence of natural teeth preserves the alveolar bone of the maxilla and mandible. Once teeth are extracted, whether because of periodontal disease, caries, or trauma, physiologic processes begin that resorb the alveolar bone on a slow, continual basis for the remainder of one's life. The bone of the maxilla and mandible is sensitive to the pressures that natural teeth provide during mastication. Without natural teeth, these functional pressures are lost and the physiologic process of resorption begins. The greatest amount of bone loss occurs in the first 18 months after extraction; thereafter, loss progresses at a rate of approximately 0.5 mm per year.

For many people age 65 and over who lost their teeth in young adulthood, edentulism has resulted in severely resorbed mandibles or maxillae or both. Resorption is usually most troublesome in the mandible, where the resorption pattern leaves the bone flattened. This may impede the use of soft-tissue undercuts and hydrostatic pressure to retain prosthetic appliances.

Additionally, mandibular resorption is often severe enough to cause dentures to impinge upon the mental nerves, making mastication painful. This resorption has been shown to influence the type and consistency of food selected by denture wearers.[9,10]

Dentures in themselves have limitations. On the average, a dental prosthesis is only 25% as efficient as the natural teeth and may have a functional life span of only 5 to 7 years.

Salivary function and xerostomia

Saliva plays an important role in maintaining oral health (*Table 1*).[11,12] It lubricates oral tissues and contains important enzymes and buffers that protect against the initiation and progression of decay.

Saliva may also play an important role in preventing gram-negative bacteria from colonizing the oropharynx, from where they may be aspirated and cause pneumonia.[13] Colonization by gram-negative bacteria is more frequent in patients with severe illness; however, its basis is not fully understood. Decreased salivary flow has been suggested; salivary proteins such as lactoferrin, lysozyme, and secretory immunoglobulin A may prevent gram-negative bacterial colonization by inhibiting bacterial adherence.[14] The relationships among salivary flow, salivary components, and gram-negative bacterial colonization have not yet been fully researched.

The subjective feeling of oral dryness is common. Although salivary-gland function was once thought to decline as a normal effect of aging, both the volume and composition of saliva actually remain stable despite documented changes in gland morphology with age.[15] Xerostomia is now attributed to local or

TABLE 2
MAJOR DRUG CLASSES THAT MAY CAUSE XEROSTOMIA*

Anticholinergics
Antidepressants
Antihistamines
Antihypertensives
Antiparkinsonians
Antipsychotics
Diuretics
Gastrointestinals
Sedative-hypnotics

*Adapted from Baker et al, reference 23, and Mazer, reference 24

systemic disease, to the sequelae of radiation therapy to the head and neck, or to medications.[16,17]

Radiation therapy to the head and neck often causes irreversible salivary-gland changes as a side effect. The rather rapid onset of dry mouth is caused by the initial effects of ionizing radiation on the blood vessels and nerves of the glands. Later, extensive destruction of the parenchyma, especially the acini, may be seen. If residual functioning glandular tissue remains, decreased salivary flow may be evident for up to 6 months after irradiation.

The most common systemic condition that contributes to dry mouth is the chronic, multisystem, autoimmune disorder, Sjögren's syndrome.[18–20] In this disorder, lymphocytes infiltrate the salivary glands in a periductal pattern. The infiltrate is easily documented by biopsy of the minor salivary glands of the lip.

The most common cause of xerostomia, however, is medication.[12,17] More than 400 medications have been implicated.[21] Clinical studies have shown that the elderly are more likely to be taking drugs, and that the number of drugs taken increases with advancing age.[22]

Specific classes of drugs cause xerostomia as a side effect. These drugs may either alter the physiologic response to salivary secretion or contribute to the subjective feeling of dryness in patients without documented decreases in flow rate. The most common classes of drugs known to promote dry mouth are listed in *Table 2*.[23,24]

Without the protection saliva provides, the bacteria in plaque are more adherent to the teeth. Hence, the most important consequence of dry mouth is the rapid destruction of the teeth due to caries.

Treatment. Regardless of the cause of xerostomia, treatment options remain limited to increasing salivary flow when functioning glandular tissue remains or to providing exogenous moisture when salivary flow cannot be increased.

Patients who have some functioning of the glands can stimulate salivary flow by chewing sugar-free gum or noncitrus candy. Gustatory stimulation by tart substances will also enhance salivary flow. However, acidic citrus extracts can cause demineralization of the tooth structure, predisposing the teeth to caries. Currently, researchers are studying the effects of pilocarpine as an agent to stimulate flow in patients with residual salivary-gland function.

For patients with no salivary-gland function, symptomatic treatment with artificial saliva and water-based jellies can temporarily alleviate the dry feeling.

Modification of drug regimens may alleviate medication-induced xerostomia. Eliminating the drug, reducing the dose, altering the dosing schedule, or prescribing another drug within the same class as the implicated drug may be appropriate alternatives in certain patients.

All patients with dry mouth should be encouraged to seek regular dental care. A structured program that includes periodic prophylaxis and daily topical application of a 1.1% neutral fluoride gel in a custom-made tray is recommended to prevent caries from starting or progressing. In some patients, 0.12% chlorhexidine gluconate rinses (Peridex, Procter & Gamble) can be an effective adjunct to daily oral care. This rinse, which has long-lasting beneficial effects, is effective in treating gingivitis that arises from bacterial deposits in plaque.

Caries

Because the elderly are now retaining more of their natural teeth, more teeth will be susceptible to dental disease. Dental caries remain destructive in older groups and are one of most common causes of tooth loss in adults.

One type of caries frequently seen in the elderly is unique to this age group and occurs on root surfaces exposed to the oral environment.[25] Root exposure (recession) occurs physiologically with age and also as a consequence of periodontal disease. Loss of gingiva or bone surrounding the teeth, or both, leaves the root areas susceptible to bacterial attack. This area of the tooth is composed of a softer material than the enamel covering the crown, and be-

cause it is softer, when caries occur there they progress rapidly.

The bacteria that cause root-surface caries are the same as those that cause coronal caries. Putative risk indicators for root-surface caries include older age, certain microorganisms, coronal caries, and loss of periodontal attachment.[26] A recent report also implicated frequent intake of simple sugars, high lactobacilli counts, and low salivary buffering.[27]

Treatment. The strategies for preventing caries in the elderly parallel the preventive techniques for people with xerostomia. Routine measures include dental checkups and adjunctive therapies such as 1.1% neutral fluoride gel in a custom-made tray and chlorhexidine gluconate rinse. Control of dietary and microbial factors may also decrease the incidence of root-surface caries.[27]

Periodontal disease

Periodontal disease, like caries, has bacteria as its primary cause. When specific bacteria indigenous to the oral cavity remain within the gingival crevice around each tooth for longer than 24 hours, they can initiate an inflammatory response that can progress to destruction of the alveolar-bone and soft-tissue attachments around each tooth, resulting in the loosening of the tooth and, eventually, tooth loss.

Although the elderly show the greatest degree of periodontal destruction, the disease is thought to result from cumulative insults over a lifetime rather than from aging itself.[28] A recent review of epidemiologic studies summarized the risk indicators for periodontal disease: people at risk are older, use tobacco, use dental services infrequently, have a history of periodontal disease, have plaque or calculus deposits, or are heavily infected with specific microbes.[29] Behaviors and infections can therefore influence disease status, regardless of age.

Halitosis

Bad breath can be a significant problem in people susceptible to predisposing conditions. This problem can be intensified in dependent people who require caregivers to perform daily oral hygiene procedures. Bad breath odors usually arise from a combination of factors, including an alkaline pH and the presence of sulfur-containing compounds from gram-negative bacterial metabolism. Predisposing factors for halitosis include poor oral hygiene with accumulation of plaque and calculus deposits (periodontal disease); xerostomia caused by medications, radiation therapy, or systemic or local disease; and factors contributing to putrefaction of tissues, such as major aphthae, tumors, or infection.[30] Systemic conditions, such as diabetic ketoacidosis, hepatic failure, uremia, or upper respiratory tract disease, can also contribute to unpleasant mouth odor.

Treatment. Impeccable oral hygiene and eradication of dental disease are essential to prevent offensive mouth odors. Brushing and flossing the teeth daily to eliminate bacteria-laden plaque and brushing the tongue (which can be a trap for bacteria, food particles, and exfoliating epithelial cells) will help assure more pleasant breath. Oral hygiene regimens paralleling those used for patients with xerostomia are appropriate preventive measures to decrease plaque and prevent incipient caries.

RECIPROCAL INFLUENCES OF ORAL AND SYSTEMIC CONDITIONS

Bacteremia

Infections in the mouth and teeth have been implicated in causing bacteremia in patients who have specific cardiac conditions, prosthetic joints, renal disease, neutropenia, and diabetes, or who have undergone splenectomy. The management of these patients is a multidisciplinary responsibility. The objectives of dental treatment are to (1) eliminate or control oral and odontogenic disease, which could present a risk to patients susceptible to infection; (2) identify and reduce drug-related oral and odontogenic complications; and (3) initiate and maintain a program of patient education.

To reduce the risk of morbidity and mortality, patients should have a comprehensive clinical and radiographic oral examination before undergoing cardiovascular surgery, organ transplantation, immunosuppression, or total joint replacement; after undergoing splenectomy; or after being found to have diabetes. Emphasis is placed on identifying infected or nonrestorable teeth, advanced periodontal disease, and other foci of oral or odontogenic infections. Emergent problems must be eliminated aggressively.

Elderly patients who have undergone cardiovascular surgery, organ transplantation, or splenectomy or are diabetic or neutropenic need regular evaluation to assess compliance with preventive measures and to monitor drug-induced complications that can

TABLE 3
INDICATIONS FOR ENDOCARDITIS PROPHYLAXIS*

Most congenital cardiac malformations
Hypertrophic cardiomyopathy
Mitral valve prolapse with regurgitation
Previous bacterial endocarditis
Prosthetic cardiac valves
Rheumatic valvular dysfunction

*Adapted from Dajani et al, reference 33

TABLE 4
ANTIBIOTIC PROPHYLACTIC REGIMENS*

Standard regimen: Amoxicillin 3.0 g 1 hour before procedure, 1.5 g 6 hours after initial dose
For patients allergic to amoxicillin or penicillin: Erythromycin ethylsuccinate 800 mg 2 hours before procedure, 400 mg 6 hours later; or erythromycin stearate 1.0 g 2 hours before procedure, 0.5 g 6 hours later
Clindamycin 300 mg by mouth 1 hour before procedure, 150 mg 6 hours after initial dose

*Adapted from Dajani et al, reference 33

contribute to new sources of oral or odontogenic problems, including infections. Finally, patients and their families should be fully informed about the importance of oral and dental health, with particular emphasis on its relationship to a particular disease.

Cardiac disease

Transient oral or odontogenic bacteremias may seed previously damaged cardiac endothelium, resulting in valvular vegetation, congestive heart failure, myocardial infarction, abscesses, and conduction abnormalities. Infective endocarditis may result from oral streptococci, staphylococci, enterococci, *Candida albicans*, and other microorganisms.[31,32] Therefore, any patient susceptible to infective endocarditis who undergoes dental treatment likely to cause gingival or mucosal bleeding should be given antibiotics prophylactically, and emergent dental problems must be treated vigorously. The current recommendations of the American Heart Association for prophylaxis against bacterial endocarditis are found in *Tables 3* and *4*.[33]

Prosthetic joints

Prosthetic replacement of the hip, knee, and other joints because of arthritis, trauma, congenital abnormalities, or previous surgical failure has become common in the United States.[34] Infections of these joints may result from contamination at surgery or hematogenous spread from another site, and commonly involve *Staphylococcus aureus* and *Staphylococcus epidermidis* species. Experiments in animals show that seeding of a prosthetic joint from distant sources of infection is possible.[35] However, only a few cases of joint infection resulting from foci of odontogenic infections or transient bacteremia generated by dental procedures have been documented.[36]

Although most orthopedic surgeons believe infection of a prosthetic joint by transient dental bacteremia is of minor significance, 93% recommend antibiotic prophylaxis before any dental procedure likely to cause bacteremia.[37] Because no formal recommendations exist for prophylactic regimens in these patients, American Heart Association guidelines are usually followed unless the orthopedic physician prefers a specific antimicrobial agent.

Splenectomy

Compared with people who have a spleen, asplenic patients are at 40 times the risk of serious infection and 17 times the risk of fatal sepsis.[38] Infection is most likely within the first 12 months after splenectomy, but overwhelming infections have been reported many years later.[39] Microorganisms implicated include streptococci, staphylococci, gram-negative bacilli, and other microorganisms found in the aerodigestive tract. Although there are no clinical studies to support the efficacy of antibiotics given prophylactically before dental treatment, splenectomized patients are clearly at increased risk of serious sepsis, and appropriate antimicrobial prophylaxis should be considered.

Renal disease

The typical streptococci and staphylococci associated with dental bacteremias can contaminate vascular-access sites used for dialysis or cause significant infection in immunocompromised transplant recipients.[40] Dental treatment is usually provided on the day after dialysis, and antimicrobial prophylaxis is recommended to prevent endarteritis and, possibly, infective endocarditis.[41] Transplant recipients require aggressive treatment of acute oral infections, including oral candidiasis, in addition to antimicrobial prophylaxis.

Neutropenia

Given the predictability of bacteremias associated with dental procedures and the risk of uncontrolled infection, it would seem reasonable to give neutropenic patients antibiotics prophylactically before dental treatment.[42] Neutropenic patients who are afebrile and clinically stable should receive a broad-spectrum antibiotic starting 1 hour before dental treatment. Many neutropenic patients will already have systemic infections and will be taking broad-spectrum antibiotics. In this situation, it may be necessary to ensure the coverage of periodontopathic anaerobic organisms; either clindamycin or metronidazole (oral or parenteral form) may need to be added to the antibacterial regimen.

Diabetes mellitus

Diabetes mellitus currently affects more than 12 million Americans, and the number is growing at a rate of 600 000 new cases per year. Many physiologic changes associated with this condition decrease the immune response and increase the chance of infection. Studies have demonstrated a higher prevalence of gingivitis, periodontitis, and caries in diabetic patients than in the general population.[43] Rapid alveolar bone loss and acute infection appear to be directly related to elevated blood glucose concentrations and periods of uncontrolled diabetes. Other oral manifestations of diabetes mellitus may include xerostomia, bilateral asymptomatic parotid-gland swelling, unexplained odontalgia, increased susceptibility to opportunistic infections, and acetone on the breath.[44] Although the presence of oral or odontogenic infections in diabetic patients may affect insulin requirements, and although both good diabetic control and oral hygienic measures are needed to maintain or restore oral health, a recent study concluded that clinicians caring for diabetic outpatients seldom note oral health problems.[43]

Oral cancer

An estimated 31 000 cases of oral cancer were expected to be diagnosed in 1993.[45] Because oral cancer is primarily a disease of older patients, and because the mean age of the population is shifting upward, the incidence of both premalignant and malignant oral lesions will likely increase correspondingly. In addition, patients who have had oral cancer are at risk of primary malignant diseases of the pharynx, esophagus, larynx, and lungs and are at high risk for recurrence of the primary oral cancer. In addition, about one third of patients develop a second, separate oral malignant disease as a consequence of multifocal malignant changes throughout the oral mucosa ("field cancerization").[46]

Prevention and early treatment are essential to control oral cancer. Health care providers should inform patients of the relationship between tobacco or alcohol and oral cancer. This may be a challenging endeavor, especially with older patients with established smoking and drinking habits. Additional factors implicated in the development of oral malignant diseases include chronic irritation from ill-fitting dentures, irregular or sharp teeth, hot or spicy food, ultraviolet radiation, infection, vitamin deficiency, and altered immunocompetence.

The association of malignant diseases with specific, predominant risk factors in the United States results in a well-recognized anatomic distribution of oral cancers. The four specific areas predisposed to the development of squamous cell carcinoma are the lips, floor of the mouth, ventrolateral border of the tongue, and the complex involving the soft palate, retromolar trigone, and anterior tonsillar pillar.[47] A diagnosis of advanced squamous-cell carcinoma is not difficult to establish. Early lesions, however, are asymptomatic and frequently remain undetected. The association of a white patch or leukoplakia with oral cancer is well documented. Erythroplakia or erythroplakia with leukoplakia are other important mucosal lesions that often indicate premalignant or malignant changes.

No malignant disease is easier to cure than oral cancer—if the tumor is smaller than 1 cm in diameter. Unfortunately, because symptoms and size are directly related, most lesions are not detected until they reach stage II (T2 or larger). When an asymptomatic red or white lesion is detected in the oral cavity, acute or chronic irritants should be removed, and the use of alcohol and tobacco should be determined and curtailed. Inflammatory lesions resulting from acute or chronic trauma markedly improve in 10 to 14 days. Any lesion that persists longer than 14 days with no apparent cause should be considered malignant until proven otherwise by biopsy.

Cancer chemotherapy

Because chemotherapeutic agents are nonspecific, they adversely affect normal cells that have a high mitotic index, including those of the oral mu-

cosa. Oral effects of cancer chemotherapy include mucositis, infection, hemorrhage, xerostomia, neurologic disorders, and nutritional problems.[48] The severity of these conditions may be affected by patient- and therapy-related variables. Patient-related variables include the oral health of the patient before and during chemotherapy; therapy-related variables include the type of agent or agents used, the dosage, the frequency of treatment, and whether combination therapy is used. It is of paramount importance for the health care provider to recognize and anticipate the conditions that predispose patients to complications. Studies suggest that early and aggressive dental intervention according to standardized protocols reduces the frequency of oral problems during chemotherapy.[49]

The objectives of dental treatment for patients undergoing cancer chemotherapy are to (1) prevent morbidity and mortality caused by infection from an oral source by eliminating or minimizing these sources before the initiation of chemotherapy; (2) prevent oral hemorrhage by minimizing the need for acute dental treatment during chemotherapy; (3) prevent delays or interruptions of chemotherapy caused by supervening acute dental treatment during chemotherapy; (4) minimize the frequency of serious oral mucosal infections caused by treatable viruses, fungi, and bacteria and minimize the impact of oral mucositis on the patient's nutritional status; and (5) initiate and maintain a program of patient education.

Before starting chemotherapy, patients should have a comprehensive clinical and radiographic regional examination that emphasizes conditions known to cause problems during chemotherapy, such as infected or nonrestorable teeth, advanced periodontal disease, and oral mucosal ulcers. Emergent problems should be eliminated. Because of the potentially serious consequences of systemic extension of infections, patients should be monitored during chemotherapy, and, when appropriate, diagnostic and therapeutic services should be initiated for herpetic, candidal, and other oral or odontogenic infections.

Radiotherapy of the head and neck

Radiotherapy, effective in the treatment of many head and neck cancers, produces progressive and persistent cell damage and eventual cell death, not only within the tumor, but also within adjacent normal tissue. Swelling and occlusion of small vessels, edema, thrombus formation, and fibrosis lead to mucositis, infection, soft-tissue necrosis, xerostomia, caries, loss of taste, osteoradionecrosis, and physiologic, anatomic, and psychologic morbidity.

Managing patients undergoing radiation therapy of the head and neck is a multidisciplinary responsibility. Oral and dental care and maxillofacial rehabilitation should be coordinated both before radiation therapy is started and when oral complications of radiation therapy develop.

The objectives of dental treatment in these patients are (1) to avoid, through timely intervention and strong preventive measures, severe side effects such as caries and osteoradionecrosis; (2) to reduce morbidity and improve the quality of life for patients who develop certain inevitable side effects such as mucositis, xerostomia, loss of taste, and infection; (3) to ensure the survival of the natural dentition, which will facilitate prosthetic rehabilitation when osseous resection of the maxilla and mandible is planned; (4) to implement a program of follow-up and long-term preventive care; and (5) to initiate and maintain a program of patient education.

Before starting radiation therapy, the patient should have a comprehensive clinical and radiographic regional examination that emphasizes conditions known to cause problems during or after radiation therapy, such as infected or nonrestorable teeth, advanced periodontal disease, impacted teeth, and other pathoses. When osseous resection of the maxilla or mandible is planned in addition to radiation therapy, preoperative casts and registrations should be part of the initial workup. Whenever possible, extraction of nonrestorable teeth and other oral surgical procedures should be completed 14 to 21 days before initiation of radiation therapy. Patients with salvageable teeth should undergo an intensive preventive maintenance program.

During radiation therapy, palliative and supportive care can significantly reduce morbidity by providing symptomatic relief of pain, mucositis, and xerostomia. Regular examinations during this period minimize infections and reinforce preventive measures. After radiation therapy, daily applications of fluoride gel, the use of saliva substitutes and sialagogues, increased oral hygiene efforts, and regular evaluation to assess compliance with the prescribed preventive care program will minimize morbidity. This strategy, combined with the restoration of orofacial function and appearance for patients with significant hard- and soft-tissue defects from

ablative surgery, will significantly improve the quality of life.

As in other conditions, patients and their families should be fully informed about the importance of oral and dental health, with particular emphasis on its relationship to their disease.

SUMMARY

Despite the impact of dental public-health initiatives, preventive care, and education, the elderly will remain at risk of dental diseases. As future cohorts of aging people face functional decline and debilitating diseases, the oral health they have enjoyed may follow the path of general decline.

Dental professionals can play an integral role in assisting multidisciplinary team efforts to optimize the functional ability and quality of life of older people. When systemic problems overlap oral health problems, physicians and dentists should coordinate the care they give to more comprehensively address the patient's total needs.

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