

# Geriatric Patients: Oral Health and the Operating Room

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Many patients requiring surgery possess poor oral health. The presence of decayed teeth and periodontitis represent potentially potent causes of odontogenic infection that could significantly compromise the surgical outcome. Geriatric patients presenting for surgery who have not had a dental examination for years may be harboring an undetected oral infection. In the perioperative period, the harmful effects of such an infection are amplified in terms of treatment and expenses. This article will elaborate on the association between oral health and systemic disease, present unique intraoral characteristics of elderly patients, and emphasize the importance of obtaining a dental evaluation and treating any acute oral infection before surgery. Augmenting the awareness of the perioperative dental considerations in the geriatric population can lead to the implementation of effective and preventive measures that can contain costs and achieve optimal patient care. *J Am Geriatr Soc* 58:1382–1385, 2010.

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The percentage of older adults losing all of their natural teeth has declined substantially since the 1950s, when the majority of persons aged 65 and older were edentulous.<sup>1</sup> With greater tooth retention, elderly patients are at risk for dental caries (tooth decay) and periodontal disease.<sup>2</sup> The presence of decayed teeth or periodontitis represents a potential cause of odontogenic infection. The deleterious effects of such an infection may be magnified and expensive to treat in the perioperative period. This article will elaborate on the association between oral health and systemic disease and present unique intraoral characteristics of geriatric patients. It will also emphasize the importance of obtaining a dental evaluation and treating an acute oral infection before surgery. Enhancing awareness of these issues in the geriatric

population can aid in minimizing related perioperative costs while maximizing patient care.

## UNDERSTANDING THE CONNECTION BETWEEN ORAL AND SYSTEMIC HEALTH

The first theories of a connection between oral health and systemic health can be traced back to the 19th century.<sup>3</sup> This relationship has increasingly been gaining scientific and media attention. In May 2000, the U.S. Surgeon General published the first-ever report on oral health in the United States.<sup>4</sup> It highlighted the association between oral and systemic health. The report stated, “The mouth reflects general health and well-being. The mouth is a readily accessible and visible part of the body and provides health care providers and individuals with a window on their general health status.” Stated simply by former Surgeon General C. Everett Koop, “You are not healthy without good oral health.”

The link between oral bacteria and undesirable systemic effects has been the focus of researchers for many years.<sup>5,6</sup> For example, a number of epidemiological studies have examined the relationship between oral health and cardiovascular disease (CVD).<sup>7,8</sup> Current information regarding the pathogenesis and treatment of CVD suggests that oral health can be an important factor in the exacerbation of preexisting coronary disease.<sup>9,10</sup> Oral microbes congregate as dental plaque, coating the surfaces of teeth. Dental plaque provides a microhabitat for organisms that can translocate and colonize in other parts of the body, damaging vital organs.

## ADVERSE SEQUELAE OF ORAL INFECTIONS

Dental diseases are the most common infectious diseases in the world.<sup>11</sup> Poor oral health, especially if it involves compromised periodontal status, is an important associated risk factor for infective endocarditis (IE). IE is a serious complication that develops in individuals with underlying structural cardiac defects who develop a bacteremia.<sup>12</sup> Blood-borne bacteria may lodge in damaged or abnormal heart valves, the endocardium, or the endothelium near anatomic defects, resulting in this specific type of inflammation. The American Heart Association released updated guidelines for the prevention of IE.<sup>13</sup> An oral infection present during daily activities can lead to a costly bacteremia in surgical patients. Poor oral health has been found to

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be a risk factor for prosthetic hip and knee infections.<sup>14</sup> Maintaining good oral hygiene can decrease the frequency of bacteremias and enhance surgical outcomes.

Chronic infections such as periodontal disease may play a role in the initiation and development of CVD. Evidence also supports an association between periodontal disease and diabetes mellitus.<sup>15</sup> Periodontitis is a local inflammatory process involving a bacterial infection of the supporting structures of the teeth. Systemic inflammatory host responses that may contribute to the reported risk of CVD in patients with periodontal disease also characterize this disease process.<sup>16</sup> Several periodontal organisms including *Porphyromonas gingivalis*, *Treponema denticola*, *Streptococcus sanguinis*, and *Aggregatibacter actinomycetemcomitans* have been detected directly within atherosclerotic plaque lesions of vessel walls.<sup>17</sup> A dental infection that originates from within the tooth's pulp (nerve tissue) usually requires endodontic treatment (root canal). People with a greater self-reported history of endodontic therapy were found to be more likely to have coronary heart disease.<sup>18</sup> Moreover, optimizing a patient's dentition and periodontal health has been shown to lower the risk of CVD.<sup>19</sup>

In addition to the adverse systemic effects of dental decay and poor oral hygiene, the presence of advanced periodontal disease can have less-obvious perioperative implications. Periodontal disease commonly manifests in an adult's mouth as inflamed gingiva (gums), gingival recession, and calculus (tartar) accumulation<sup>20</sup> (Figure 1). As this disease progresses, bone support is lost, and tooth mobility becomes more pronounced. In the perioperative period, loose teeth can become a significant hazard. For example, upon the placement of an endotracheal tube during the administration of general anesthesia, a patient's unstable teeth are at risk of tooth avulsion (removal from socket) and subsequent aspiration into the lungs or ingestion into the stomach. Patients who present with significantly loose teeth are usually aware of such mobility but may not admit it because of their embarrassment, or their underestimation of the condition's perioperative significance. Securing a loose tooth preoperatively is a cautionary measure to prevent aspiration and assist in a tooth's retrieval should it become dislodged.<sup>21</sup>



Figure 1. Adult periodontitis.

Several other intraoral characteristics of geriatric patients warrant attention. Dry mouth (xerostomia) is a subjective sensation mostly caused by medications.<sup>22</sup> Xerostomia was found to affect 25% of the elderly population.<sup>23</sup> Severe hyposalivation compromises taste, swallowing, digestion, and nutrition. Erosion and ulceration of intraoral mucosal tissues can occur, as well as fungal infections such as candidiasis due to diminished immunity. In addition, the beneficial buffering effects of saliva are reduced, yielding teeth that become more susceptible to decay. Dry mouth can negatively affect denture fit in edentulous individuals. New and recurrent decay was found to be untreated in 30% of adults with teeth (dentate).<sup>24</sup> One effect seen in older adults is gingival recession (hence the term "long in the tooth"), which exposes root surfaces. Root caries can develop on these surfaces, usually along the gingival margin (gumline). Fifty percent of persons aged 75 and older were found to have root caries.<sup>25</sup> In addition to compromising the structural integrity of a tooth and rendering it more vulnerable to fracture, the presence of root decay can lead to a periodontal or endodontic infection.

If not treated preoperatively, an infection of dental origin can significantly compromise surgical outcomes in terms of treatment and finances. Postoperative infections may result in greater morbidity, delay wound healing, and extend hospital stays beyond the expectations of the patient and the surgeon.<sup>26</sup> In addition to the long duration of recovery, the development of a postoperative infection ultimately culminates in higher costs for those involved.<sup>27</sup>

### BENEFITS OF A DENTAL EXAMINATION BEFORE SURGERY

Improving one's oral health is usually dependent on receiving regular professional dental care.<sup>28</sup> However, patients with chronic diseases have unmet dental care needs,<sup>29</sup> and several barriers may limit obtaining routine intraoral care.<sup>30</sup> For example, people who are tired or dependent on help (e.g., have mobility problems) seem to be at higher risk of not using dental services regularly.<sup>31</sup> Financial constraints, inaccessibility to dental professionals, lack of patient education, and dental phobia all contribute to irregularly scheduled or even no visits to the dentist. Moreover, one study found that 31% of elderly patients had not seen a dentist in the previous 5 years.<sup>32</sup> As a result, these patients may experience a greater incidence of poor oral hygiene, tooth decay, and periodontal disease. Thus, geriatric patients presenting for surgery who have not had a dental examination for years may be harboring an undetected oral infection. This potential hazard can significantly compromise surgical outcome but can be detected with a preoperative dental examination.<sup>33</sup>

Currently, a dental screening is not conducted in the preoperative phase of most surgical procedures, although at some medical centers,<sup>34</sup> it is mandatory for a patient to undergo a complete physical examination by a series of specialists to exclude any potential source of infection. Incorporated into this systemic checklist is a thorough intraoral evaluation by a dentist. Patients scheduled for transplants of failing organs such as the heart, liver, and kidney may possess a concomitantly poor dentition and

oral hygiene. For example, patients awaiting a liver transplant may be on such a list because of alcohol-related cirrhosis of the liver. Secondary to the significant medical problems, intraoral neglect often manifests as excessive tooth decay or moderate to severe periodontal disease. Therefore, before proceeding with such a major operation, the patient must be optimized systemically, which includes being “cleared” for the surgery from an oral health standpoint.

The importance of a relationship between oral and systemic health has not been successfully impressed upon patients. One study<sup>35</sup> discovered that patients did not accept the link between their oral health status and their general health. Additionally, the patients revealed that oral health was not included on the agenda of the surgical team and suggested that the surgeon defined what was important to the patient and what was not. In the future, with the surgeon’s acceptance of the link between oral health and systemic disease, the dentist may become more regularly involved and valued in the presurgical phase.

Before surgery, it may not be a dentist who initiates or discovers the necessity of dental treatment for a geriatric patient. In the preoperative period, it may be a nurse, anesthesiologist, or other healthcare provider who is the first caregiver to look inside a patient’s mouth in years, or even decades. Adoption of a more-extensive intraoral examination by these practitioners is not suggested for most patients. Although in some instances a “hands on” evaluation of the patient’s dental status (wearing a glove and inspecting closely) is recommended to better appreciate any vulnerable teeth or soft tissues. Notable redness, swelling, purulent discharge, or fistulas may be visible along the gingiva and indicative of an odontogenic infection.<sup>36</sup>

## MANAGEMENT OF THE PREOPERATIVE ORAL INFECTION

When poor dentition has been identified before a major operation, the benefit of treating the condition before the planned procedure must be evaluated from a proper perspective. Often, a patient presents with a chronic condition such as moderate periodontitis that has been asymptomatic for many years. Multiple teeth may be loose, yet there are no signs of an acute infection, and the patient reports no signs of pain or distress. Treatment of this undesirable condition would be ideal, but it is not often practical given the immediacy of a major procedure. Comprehensive treatment of such a long-standing periodontal condition usually requires multiple and meticulous dental sessions, whose duration may span several months. Such a diseased state is not cured overnight. The consequences of postponing a case may include the depressing effect of cancellation on patients and their families because of the high level of emotional stress and anxiety associated with surgery,<sup>37,38</sup> such as working days lost and disruption to daily life. There is also the potential for revenue losses incurred by the hospital.<sup>39,40</sup>

An acute symptomatic infection, one that presents as an intraoral abscess for example (Figure 2), should be the focus of the preoperative dental clearance. If the tooth is deemed to be nonrestorable, its removal (extraction) may be necessary. Whether an extraction, periodontal treatment, or



Figure 2. Intraoral abscess.

endodontic therapy is indicated, healing of surrounding structures (bone, gingiva) is recommended. Dental procedures should be performed a minimum of 1 week before the scheduled operation to ensure adequate healing time and promote proper resolution of the disease process. A prolonged asymptomatic period of 1 month is even more beneficial to minimize the potential for recurrence of the infection and adverse effects on the surgery. The time line associated with allowing sufficient intraoral healing from such a dental procedure and a patient’s subsequently planned elective surgery is often compromised because of scheduling constraints and the urgency of the procedure. In these situations, an appropriate risk–benefit analysis is warranted.<sup>33</sup>

## CONCLUSIONS

The perioperative medical community is encouraged to view oral health from the perspective of systemic health. Geriatric patients scheduled for surgical procedures may possess poor oral hygiene and untreated odontogenic infections. Patients who are unaware of the presence of an intraoral infection or are uneducated with respect to its significance on their upcoming surgery are even more susceptible to a poor outcome. Therefore, if possible, patients who are to undergo major surgery should be screened preoperatively to ensure that any oral infection is diagnosed and definitively treated. A detailed inspection of each tooth and all intraoral tissues as well taking dental radiographs by members of the surgical community is not realistic. However, a consultation with a dentist should be considered before moving forward with a significant operation. If time permits, the surgery should not proceed until a detected dental abscess is thoroughly addressed preoperatively. This preemptive action may postpone the procedure, but in the long run, a thorough preoperative dental examination and indicated treatment may save invaluable time and money. Most importantly, such an investment can yield significant improvements in surgical outcome and overall patient health.<sup>38</sup> When healthcare providers become more familiar with perioperative dental considerations in geriatric patients, it is hoped that they will implement effective and preventive measures that can contain costs and achieve optimal patient care.

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## REFERENCES

- Burt BA, Eklund SA. Dentistry, Dental Practice and the Community, 5th Ed. Philadelphia, PA: WB Saunders Co., 1999.
- Centers for Disease Control and Prevention (CDC). Public health and aging: Retention of natural teeth among older adults—United States, 2002. *MMWR Morb Mortal Wkly Rep* 2003;52:1226–1229.
- Miller WD. The human mouth as a focus of infection. *Dent Cosmos* 1891;33:689–713.
- Oral Health in America: A Report of the Surgeon General—Executive Summary. Rockville, MD: U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health, 2000.
- Dorn BR, Dunn WA Jr, Progulske-Fox A. Invasion of human coronary artery cells by periodontal pathogens. *Infect Immun* 1999;67:5792–5798.
- Stelzel M, Conrads G, Pankuweit S et al. Detection of *Porphyromonas gingivalis* DNA in aortic tissue by PCR. *J Periodontol* 2002;73:868–870.
- Beck J, Garcia R, Heiss G et al. Periodontal disease and cardiovascular disease. *J Periodontol* 1996;67:1123–1137.
- Beck JD, Pankow J, Tyroler HA et al. Dental infections and atherosclerosis. *Am Heart J* 1999;138:S528–S533.
- Jansson L, Lavstedt S, Frithiof L et al. Relationship between oral health and mortality in cardiovascular diseases. *J Clin Periodontol* 2001;28:762–768.
- Buhlin K, Gustafsson A, Hakansson J et al. Oral health and cardiovascular disease in Sweden. *J Clin Periodontol* 2002;29:254–259.
- Dajani AS, Taubert KA, Wilson W et al. Prevention of bacterial endocarditis. Recommendations by the American Heart Association. *JAMA* 1997;277:1794–1801.
- Gordon SC, Barasch A, Foong WC. Does dental disease hurt your heart? *J Can Dent Assoc* 2005;71:93–95.
- Wilson W, Taubert KA, Gewitz M et al. Prevention of infective endocarditis: Guidelines from the American Heart Association. *J Am Dent Assoc* 2007;138:739–760.
- Berbari EF, Osmon DR, Carr A et al. Dental procedures as risk factors for prosthetic hip or knee infection: A hospital-based prospective case-control study. *Clin Infect Dis* 2010;50:8–16.
- Mealey BL, Oates TW. Diabetes mellitus and periodontal diseases. *J Periodontol* 2006;77:1289–1303.
- Geerts SO, Legrand V, Charpentier J. Further evidence of the association between periodontal conditions and coronary artery disease. *J Periodontol* 2004;75:1274–1280.
- Beck J, Eke P, Heiss G et al. Periodontal disease and coronary heart disease: A reappraisal of the exposure. *Circulation* 2005;112:19–24.
- Caplan DJ, Pankow JS, Cai J et al. The relationship between self-reported history of endodontic therapy and coronary heart disease in the atherosclerosis risk in communities study. *J Am Dent Assoc* 2009;140:1004–1012.
- Amar S, Han X. The impact of periodontal infection on systemic diseases. *Med Sci Monit* 2003;9:RA291–RA299.
- Boehm TK, Scannapieco FA. The epidemiology, consequences and management of periodontal disease in older adults. *J Am Dent Assoc* 2007;138(Suppl):26S–33S.
- Yasny JS. Perioperative dental considerations for the anesthesiologist. *Anesth Analg* 2009;108:1564–1573.
- Ship JA, Pillemer SR, Baum BJ. Xerostomia and the geriatric patient. *J Am Geriatr Soc* 2002;50:535–543.
- Fox PC. Dry mouth and salivary gland dysfunction. In: Max MB, Lynn J, editors. *Symptom Research: Methods and Opportunities*. National Institutes of Health/National Institute of Dental and Craniofacial Research, Baltimore: 2003.
- U.S. Department of Health and Human Services. Healthy People 2010, 2nd Ed. With Understanding and Improving Health and Objectives for Improving Health (2 vols.). Washington, DC: U.S. Department of Health and Human Services, 2000.
- U.S. Department of Health and Human Services. Oral health in America: A Report of the Surgeon General. Rockville, MD: U.S. Department of Health and Human Services, National Institutes of Health, National Institute of Dental and Craniofacial Research, 2000.
- Ferschl M, Tung A, Sweitzer BJ et al. Preoperative clinic visits reduce operating room cancellations and delays. *Anesthesiology* 2005;103:855–859.
- Dexter F, Abouleish AE, Epstein RH et al. Use of operating room information system data to predict the impact of reducing turnover times on staffing costs. *Anesth Analg* 2003;97:1119–1126.
- Johnson NW, Glick M, Mbuguye TN. Oral health and general health. *Adv Dent* 2006;19:118–121.
- Griffin SO, Barker KS, Griffin PM et al. Oral health needs among adults in the United States with chronic diseases. *J Am Dent Assoc* 2009;140:1266–1274.
- Riley JL, Gilbert GH, Heft MW. Dental attitudes: Proximal basis for oral health disparities in adults. *Commun Dent Oral Epidemiol* 2006;34:289–298.
- Avlund K, Holm-Pedersen P, Schroll M. Functional ability and oral health among older people: A longitudinal study from age 75 to 80. *J Am Geriatr Soc* 2001;49:954–962.
- Gilbert GH, Duncan RP, Crandall L. Older Floridians' attitudes toward and use of dental care. *J Aging Health* 1994;6:89–110.
- Yasny JS, White J. Dental considerations for cardiac surgery. *J Card Surg* 2009;24:64–68.
- Turcotte J, Magee J, Bromberg J et al. Update of the adult and pediatric liver transplant program at the University of Michigan. *Clin Transplant* 1996;203–216.
- Lowry RJ, Maunier P, Steele JG. Hearts and mouths: Perceptions of oral hygiene by at-risk heart surgery patients. *Br Dent J* 2005;199:449–451.
- Yasny JS, Silway G. The value of optimizing dentition before cardiac surgery. *J Cardiothorac Vasc Anesth* 2007;21:587–591.
- Tait AR, Voepel-Lewis T, Munro HM. Cancellation of pediatric outpatient surgery: Economic and emotional implications for patients and their families. *J Clin Anaesth* 1997;9:213–219.
- Ivarsson B, Kimblad PO, Sjöberg T. Patient reactions to cancelled or postponed heart operations. *J Nurs Manage* 2002;10:75–81.
- Dexter F, Marcon E, Epstein RH. Validation of statistical methods to compare cancellation rates on the day of surgery. *Anesth Analg* 2005;101:465–473.
- Strum DP, Vargas LG, May JH. Surgical subspecialty block utilization and capacity planning: A minimal cost analysis model. *Anesthesiology* 1999;90:1176–1185.