

The Hidden Wound Epidemic in our Midst

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“Out of sight, out of mind,” the old saying goes. Hidden in the mouths of patients are bleeding wounds that are missed in most health-care settings. Bad breath is thought to be an aspect of normal aging, when it may in fact be a sign of a raging bacterial infection. While a palm-sized wound on the skin triggers immediate assessment and treatment, a mouthful of bleeding and inflamed gums is often overlooked. This article describes gingival bleeding as an oral wound and discusses its causes and treatment. Also discussed are the roles of wound care practitioners and dental hygiene professionals in addressing oral wounds.

The COVID-19 pandemic has uncovered the reality of oral care’s low priority in long-term care (LTC) homes. One case study reported how a lack of oral care during a COVID outbreak caused infection and complete loss of teeth within a few months.¹ The Canadian Armed Forces identified poor mouth-care issues in their report on conditions in Ontario LTC homes.² This article outlines some of the issues surrounding wounds in the mouth, particularly as they affect residents in long-term care.

It is easy to forget that the epithelium that covers the body outside is also the gingival tissue that lines the mouth and esophagus. During fetal development, the gingiva originates from the ectodermal cells of the embryonic disk.³ The

functions of epithelial tissue inside the mouth are similar to those on the outside. Layers of stratified squamous, non-keratinized epithelial cells line



Figure 1. Gingivitis with swollen gums and bleeding at the gum-teeth interface and bits of white calculus

McKeown 2020. Photo used with permission.



the inner oral surfaces of the lips, cheeks, underside of the tongue and floor of the mouth. These non-keratinized tissues are highly vascularized. Gum tissue, which immediately surrounds the teeth and overlays the supporting bone, is highly keratinized; this allows it to withstand the forces of mastication and all other harsh conditions of the mouth.⁴ The gum tissues (attached gingiva) protect the supporting structures of the teeth, known as the *periodontium*. These keratinized tissues deflect food away from the teeth and resist damage caused by hard foods and ever-changing microflora. All oral epithelial tissues provide protection from acids and irritating foods. Fluids from the salivary glands lubricate the teeth and secrete enzymes to begin digestion. Saliva contains minerals that can assist in balancing the pH in the mouth as well as antimicrobial properties, and can aid in remineralization of the teeth. The oral cavity is a complex place.⁵

People tend to equate good oral health with clean teeth. They don't think much about gums or the periodontium that supports the teeth. Teeth arise from the bones, cutting through the gums in teething babies and children. The gums protect the roots and base of the teeth. Below the gum line is the periodontium, which comprises complex connective tissue fibres and capillaries that supply the tooth roots. Healthy gums look pink and stippled (like an orange peel) and are well adhered to the teeth. They DO NOT bleed when brushed. Like the skin, the mouth has its own microbiome. In a healthy mouth, chewing and

saliva help to buffer the bacteria. Saliva helps to naturally wash away sugars.⁵

Oral Health

Oral wounds start at the critical gum/teeth interface, the real "Achilles heel" in humans. Oral tissues exist in a very volatile environment, continually exposed to acids, heat, moisture and bacteria. Gum tissue relies on regular maintenance to thrive. This should include thorough daily brush cleaning of all sides of the gums and teeth. Interdental cleaning is often forgotten. Anatomically, teeth have five sides. If interdental care is ignored, approximately 40% of the tooth structures and critical surrounding gingival tissues are left unattended. Lack of oral care coupled

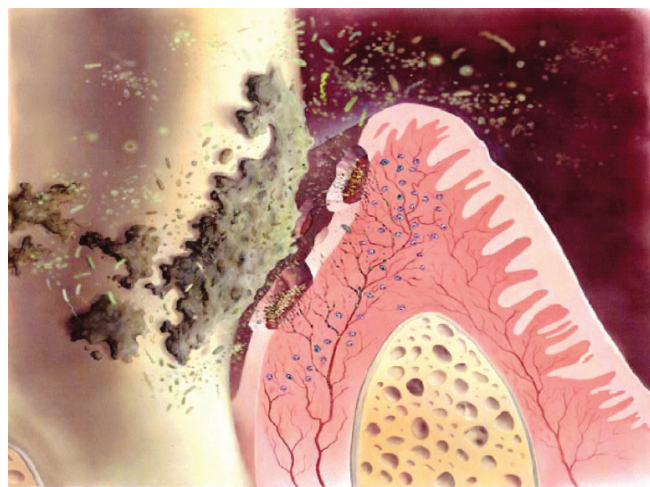


Figure 2. Plaque and debris at the tooth gingival interface

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with other risk factors such as low salivary flow presents opportunity for the rapid onset of oral disease. Professional oral health assessments help identify oral disease at its earliest stages when intervention can preserve teeth and gums. Timely, individualized care planning, oral care and therapy promote optimum oral health in patients.

Poor oral health is rampant, and gingivitis, or inflammation of the gum tissue (gingiva), and untreated dental caries are common human diseases.⁶⁻⁷ In North America, three-quarters of adults have some kind of periodontal disease.⁸⁻⁹ The gums of people with gingivitis are swollen, red and bleed easily when brushed. Bad breath or halitosis is often present. Eating may be painful. These are oral wounds that allow bacteria to directly access a person's bloodstream, spreading infection systemically.

The Role of Biofilm

To understand oral wounds, one must appreciate the role of biofilm in the environment of the mouth. Biofilm is commonly found in moist wounds. According to Wounds Canada's *Best Practice Recommendations for the Prevention and Management of Wounds*, "A biofilm consists of a complex network of bacteria and fungi embedded in a thick, slimy barrier of sugars and proteins that begin to form within minutes to hours of skin breakdown."¹⁰

Mouths are warm, wet and dark, with a constant food supply—the ideal environment for biofilms with their communities of bacteria. The slimy biofilm in one mouth can host more than 800 different types of bacteria. Everyone's mouth has its own particular microbiome, or mix of bacteria.¹¹ Potentially pathogenic bacteria and viruses such as COVID-19 can live in the oral cavity.¹²⁻¹³

The bacteria in biofilm are constantly looking for a place to stick to. Biofilm builds up daily in layers on the teeth (see Figure 3) and every other surface in the mouth. The first few layers feel slippery and smooth. As the bacteria colonies gain hold on the tooth and gums, the biofilm solidifies into dental plaques. These whitish plaques grow

at the gum/teeth interface as their resident bacteria feed on sugars.

The type of foods eaten affect oral health. Sugar and other carbohydrates contribute to oral wounds. Sugar makes the mouth more acidic. Acid attacks the tooth enamel and, along with the biofilm, creates cavities. Biofilm on the gums erodes the soft gingival tissue. Tooth plaque further irritates the gums, resulting in swelling, redness and bleeding. Leftover food debris in the mouth add to the gingival tissue inflammation. Hard, fibrous foods, however, stimulate salivary flow, which in turn helps clear oral debris and food that can pile up between the teeth. Studies show that seniors who have plenty of saliva generally have fewer oral problems.¹⁴

A diet high in starches and sugars increases the layers of biofilm and plaque. Liquid sugars such as juices, sodas and other sweetened beverages are the worst, because the sugar flows into pockets in the gums, papilla of the tongue and other hard-to-reach spots in the mouth. Worse still are hot sweetened coffee, tea and cocoa, all examples of liquid sugars. They flow around the teeth and penetrate areas such as the gingival crevices surrounding each tooth. In these periodontal pockets, sugars are easily broken down into acids by bacteria. This acidic environment results in the demineralization of tooth structures.

Cookies and carbohydrate-rich foods stick to the teeth, and easily convert to food supplies for the bacteria. Soft and sticky foods promote accumulation of food around teeth, which enables growth of biofilm. Of particular concern are the aged or those who have compromised oral health due to the presence of periodontitis, both of which involve loss of gingival attachment and the bone that supports the teeth, which in turn exposes the root structures of the teeth. These root structures do not have the dense, hard enamel protection present in the crown of the tooth; therefore, when roots are exposed to these acids as a result of the person consuming sugars and simple carbohydrates, the demin-





eralization process is rapid, resulting in swift progression of root decay. Often when a senior is eating even soft foods, a tooth will appear to “snap off.”

This can be the result of rapidly progressing root caries, which is exacerbated by xerostomia.⁶

By encouraging the practice of crushing medications and hiding them in sugary food such as applesauce, pudding and yogurt, health-care providers may inadvertently contribute to oral wounds, especially if the patient does not brush or rinse the oral cavity immediately afterward. Left overnight without oral care, residents’ mouths remain in a contaminated, acidic state that contributes to caries and gingivitis. If biofilm and debris are not removed with daily oral care, bacteria proliferate and release toxins, further damaging the gums.¹⁵

Nutrition and Oral Health

Poor nutritional intake exacerbates oral wounds. The tissue repair process is disrupted, the tissue’s ability to resist the negative effects of mature biofilm is decreased¹⁶ and the risk for rapid oral disease progression increases. Vitamin C deficiency can play a part in the decline of oral health, contribute to gingivitis and, if left unaddressed, lead to further breakdown of oral tissues (also known as periodontitis).¹⁷ A deficiency in the vitamin B complex is linked to angular cheilitis (cracking of the tissues at the corners of the mouth), cracked lips, inflammation of the tongue, ulcerative gingivitis, periodontitis (which includes bone loss and detachment of the fibres in the connective tissues supporting the teeth), burning sensations in the mouth, halitosis and painful ulcers in the mouth.¹⁶ Iron deficiencies are linked to salivary gland dysfunction, dysphagia, angular cheilitis and very red, painful tongue with burning sensation.¹⁷

The Importance of Oral Care

Proper daily oral care disrupts the biofilm build-up and prevents dental plaque growth. Without

oral care, that same biofilm continues to develop into colonies where pathogenic bacteria thrive, having very negative effects on the gum tissue and support structures of the teeth. Gingival inflammation-wounded gums (also known as gingivitis), when left unaddressed, can rapidly progress into periodontitis that no longer only affects the gum tissue. Periodontitis is a serious, irreversible condition that attacks the connective tissue and the supporting bones. The loss of tissue is permanent and, as a result of the breakdown of the support structures and loss of bone, teeth may be lost. This same biofilm has the ability to produce acids which, when left sitting on and around the teeth, break down the structures of the teeth, resulting in dental cavity formation (see Figure 3). Cavities left untreated become caverns where bacteria proliferate and affect not only the tooth but the surrounding gum tissues. Root caries, as mentioned earlier, progress rapidly and leave holes in the teeth where bacterial col-

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onies thrive. These holes are typically located next to or below the gum tissues. This causes a tissue response resulting in inflammation and leading to disease progression.

Poor oral care is a major problem. Lack of oral care in all health-care settings can cause periodontitis to worsen. Cleaning the oral cavity is more than just putting a toothbrush onto a resi-

dent's teeth. Thorough cleaning of the teeth and gums requires executive functions of the brain, skill, the right tools and, most importantly, time. The tongue can be covered with bacteria that contribute to oral disease if left unmanaged. A soft or extra-soft toothbrush allows for comfortable cleaning of the gum tissues along with the teeth. Medium bristled toothbrushes cause damage to the gum tissues and are very uncomfortable to those with frail tissues. The instruction to "brush your teeth" implies that the gum tissue is not important, but this is incorrect! Correct technique in brushing is key and must include strokes that clean both the gums and the teeth, keeping the critical gum/teeth interface the focal point. This is where all the action happens. Having the ability to maneuver around the mouth and reach the difficult areas is a skill, particularly when coupled with resistive behaviours. Brushing is not a 30 second job; it takes a minimum of two minutes. Inadequate or skipped oral care is a major contributor to oral wounds. The longer an area of the mouth is left unclean, the more the plaque biofilm will continue to mature and proliferate, increasing the disease-causing bacteria that break down the tissues that support the teeth.

The bridges, crowns and implants perfected by modern dentistry are becoming more common in LTC residents. Bridges and crowns are high-risk spots for oral wounds and infection, as they are difficult to clean, with ridges where biofilm collects. Bacteria and biofilm easily form around implants, contributing to gum pockets forming where food and bacteria collect. In crowns, the area where the crown meets the tooth structure is particularly prone to break down. Gingival inflammation due to a reaction to foreign objects like these, as well as dentures, is becoming much more common in older people. Without proper oral care, the surrounding structures are likely to develop oral disease.¹⁹⁻²⁰

The Impact of Medications on Oral Health

Many medications contribute to dryness of the mouth, termed *xerostomia*, which alters the

physical state and function of the mouth. The natural washing action of the saliva is lost, leaving foods, beverages and oral debris to ferment. The mouth loses its acid-buffering abilities. Bacteria proliferate and contribute to the progression of periodontitis, resulting in oral wounds that continue to develop/progress. These same bacteria feed off the food and oral debris, producing acids that rob the teeth of their minerals, resulting in cavities. This can result in oral discomfort or pain, tooth loss or dysphagia, and can contribute to systemic illness. In addition, it takes a toll on the social well-being of the person, as they may feel the need to avoid social interaction.²¹ While teeth

The practice of crushing medications and hiding them in sugary food such as applesauce, pudding and yogurt shows how health-care providers may inadvertently contribute to oral wounds, especially if the patient does not immediately afterward brush or rinse the oral cavity.

are hard and relatively tough when wet, they are more susceptible to disease and can easily fracture when dry. Older people have less saliva due to medications and chronic conditions. Residents with xerostomia are at high risk for oral problems, and clinicians should identify them.

The Mouth–Body Connection

The mouth has its own ecosystem, which directly connects with all the other parts of the body. Chronic oral inflammation and bleeding take their toll in older people. Aging and chronic health

conditions affect the mouth as well as the rest of the body. Periodontitis is particularly catastrophic in those with diabetes, heart disease and respiratory issues. The link between diabetes and periodontal disease is well established.²² Patients with diabetes are more likely to get periodontitis, which diabetes makes more difficult to control. Some people are genetically predisposed to periodontitis. There is some research that links chronic inflammation in the mouth to Alzheimer's disease and even poor external wound healing.⁷ Just as some patients have challenges with wound healing, some are predisposed to oral health problems.

Moving Forward: Expanding Skin and Wound Care to Encompass the Mouth

Wound care nurses and other members of the interdisciplinary team such as personal support

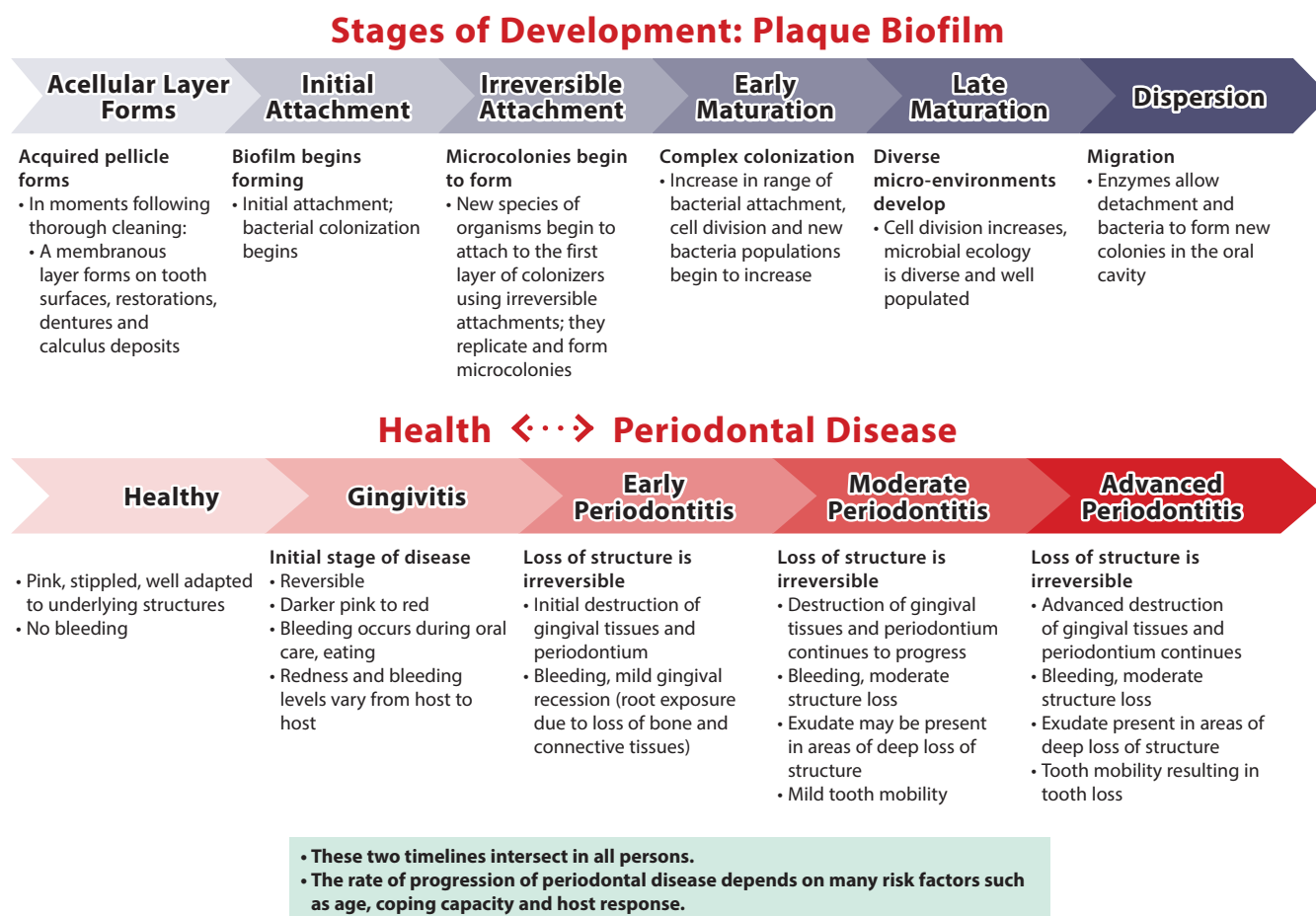
workers (PSWs), dietitians and speech-language pathologists are in an ideal position in health-care systems to help to identify, treat and prevent oral wounds in their patients. Their knowledge of skin and wound care for the skin on the outside the body is directly applicable to the oral cavity as well.

Oral problems should be identified early. Proper oral assessment requires knowledge and competency. It is easy to miss the early stages of gum disease, because there is no pain. Biofilm can cover sloughed tissue. When poor oral health is common it becomes hard to recognize early gum disease because there are no healthy comparisons. Figures 4a and 4b demonstrate the challenges of identifying oral wounds.

Clinicians working in long-term care should:

- Flag residents with bridges, implants or crowns, as they are at high risk for oral wounds

Figure 3. Continuum of Oral Care¹⁸



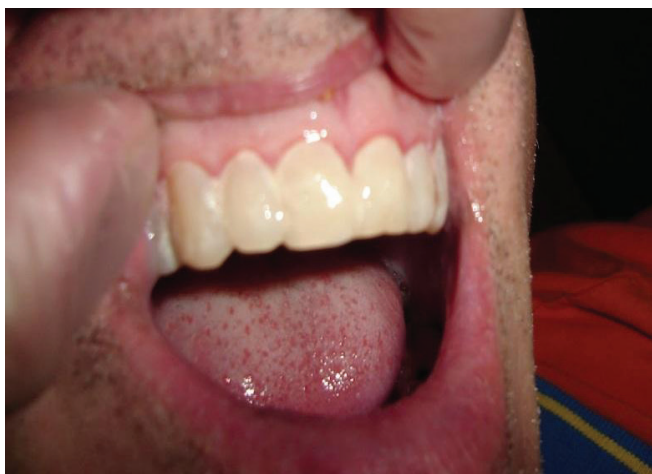


Figure 4a. On first glance, this looks like a healthy mouth, but the photo shows biofilm and sloughed tissue-dead cells in a resident who was tube-fed, so no food debris is present to contribute to the biofilm.



Figure 4b. After removal of sloughed tissue and biofilm by a dental hygienist, bleeding oral wounds at the crucial gum/tooth interface are revealed.

- Flag residents with xerostomia to consider a medication review and additional oral care that may include saliva substitutes
- Ensure that all residents receive proper oral assessments and adequate oral care
- Consider oral health status in residents with chronic systemic disease such as uncontrolled diabetes, heart disease and wounds
- Develop individualized oral care plans for all residents, taking into consideration all risk factors and existing systemic conditions

Prevention is key. Oral wounds are most easily treated at an early stage with twice daily oral care and a focus on controlling oral biofilm. Clinicians should:

- Pay special attention to the tooth–gum interface.
- Clean the entire mouth and tongue.
- Remove debris and other irritants with brushing.
- Change the microflora by using a mouthwash with chlorhexidine to rebalance the bacteria.
- Encourage non-sweetened beverage use and frequent drinking of water, especially after meals and snacks.

Improve policies and practice in your facility by doing the following:

- Include dental hygienists (RDH) in developing and implementing oral care regimens. Refer

any suspected oral wounds or dental issues to dental hygienists, dentists or denturists. Involve registered dietitians when poor nutrition is suspected or identified.

- Expand the mandate of your skin and wound committee to include prevention and treatment of oral wounds. Invite RDHs and dentists to become part of your skin and wound care team. Include RDHs as part of the circle of care, especially for high-risk residents.
- Implement the Registered Nurses' Association of Ontario (RNAO) *Oral Health: Supporting Adults Who Require Assistance Second Edition* best practice guideline. It offers a systematic approach to improve oral care practices in your organization.
- Expand skin and wound assessments to include the oral cavity.
- Provide education and training to build and maintain skills of staff and families with an aim to:
 - Improve oral assessment skills of all staff
 - Improve skills in oral hygiene in registered staff, PSWs and families
- Monitor and evaluate oral care to ensure follow-through. Regularly audit care. Review the point-of-care chart to identify patterns of refusal. Update policies to require an oral assessment after two days of missed oral care.
- Consider a fluoride program for residents to be implemented by an RDH

Summary

Wounds in the mouth are the same as wounds anywhere else. Oral wounds can indicate chronic inflammation and greatly increase risk for a systemic infection. Wounds in the oral cavity are associated with worsened heart disease and Alzheimer's disease. Wound care practitioners are ideally placed to address oral wounds and champion improved oral care in all health-care settings. Dental hygienists, dentists and denturists must be incorporated as essential health-care providers within the team. 🦷

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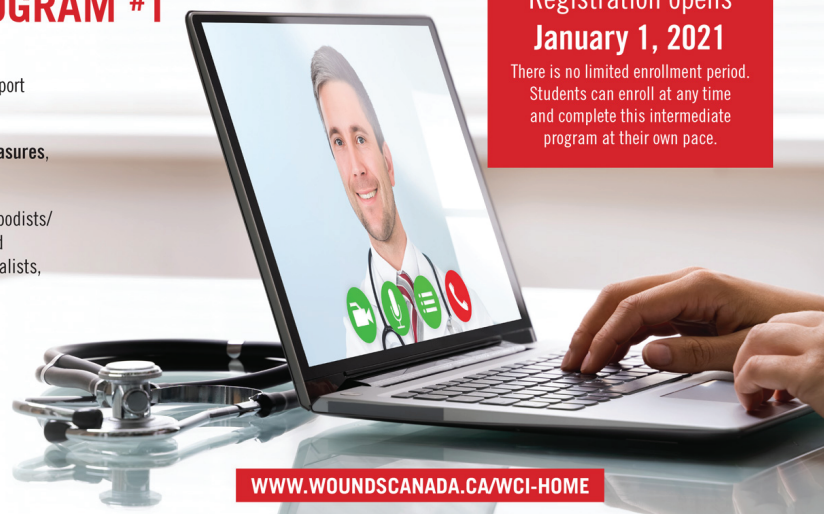
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