Increasing Collaboration between Dentistry and Medicine

Timothy G Donley¹, Kristopher S Pfirman²*, Mohammed Kazimuddin², Aniruddha Singh²

¹Bowling Green Institute for Periodontics and Implant Dentistry, Kentucky, United States
²Department of Cardiology, The Medical Center–Bowling Green Western Kentucky Heart, Lung, and Gastroenterology, United States

ABSTRACT
The most common form of periodontal disease is chronic inflammatory periodontal disease (CIPD). CIPD, a multifactorial disease, begins with a microbial infection on tooth surfaces, followed by a host mediated destruction of adjacent tissues. It is well accepted in medicine that inflammation plays a contributory role in cardiovascular disease (CVD). Interventional therapy to reduce CVD risk includes reducing sources that are contributing to the burden of systemic inflammation. Medical health care providers who care for patients with the systemic diseases potentially affected by oral inflammation, including those with known risk factors, must alter existing examination protocols to include realistic, time-efficient screening for oral inflammation and then appropriate referral to dental providers for definitive diagnosis and therapy. A system to screen patients for the potential for having oral inflammation may be the most realistic option to achieve the best overall wellness for our patients by integration and collaboration.

Condensed abstract: The most common form of periodontal disease is chronic inflammatory periodontal disease (CIPD). Medicine has long recognized that increased levels of systemic inflammation play a role in the development and progression of many of the chronic diseases. A medical screening medical/dental collaborative checklist should include the medical conditions that are potentially affected by oral inflammation. The two-way relationship between periodontal and systemic diseases suggests that there are distinct patient categories that would benefit from medical screening for potential oral inflammation.

Key words: Periodontal disease, Inflammation, Prevention, Acute coronary syndrome, Coronary artery disease, Cardiovascular disease


BULLET POINT HIGHLIGHTS

✓ Inflammation plays a contributory role in both chronic inflammatory periodontal disease and cardiovascular disease.
✓ Screening tools at bedside/chairside should be implemented to identify at risk individuals for referral.
✓ Collaboration between medical and dental professionals should be employed to reduce systemic inflammation burden.

ABBREVIATION LIST
CIPD=Chronic Inflammatory Periodontal Disease, CVD=Cardiovascular Disease, BOP=Bleeding on Probing, BMI=Body Mass Index, A1c=Hemoglobin A1c, COPD=Chronic Obstructive Pulmonary Disease.

INTRODUCTION
The most common form of periodontal disease is chronic inflammatory periodontal disease (CIPD). CIPD, a multifactorial disease, begins with a microbial infection on tooth surfaces, followed by a host mediated destruction of adjacent tissues. The current paradigm suggests that periodontitis represents a dysregulation of the host response to a dysbiotic microbiome which occurs is a large part of the global population. Cells that mediate inflammation generate cytokines, eicosanoids, and matrix metalloproteinases that cause...
clinically significant connective tissue and bone destruction [1,2]. Cytokine induced destruction of collagen leads to not only the loss of the investing bone, but also damage to the connective tissue supporting the lining epithelium approximating the tooth. In this typical periodontal lesion, the integrity of the lining epithelium is compromised allowing bacteria, bacterial by-products and the cytokines released in response to the initiating bacteria to penetrate regularly through the ulcerated epithelium into the bloodstream [3,4].

Medicine has long recognized that increased levels of systemic inflammation play a role in the development and progression of many of the chronic diseases of aging [5] and that controlling systemic inflammation can reduce the development and progression of many of the quality-of-life affecting chronic diseases of aging [6]. There is now undeniable evidence that the local inflammatory response to initiating periodontal biofilm spills into the circulatory system and contributes to the level of systemic inflammation [3,7]. Not surprisingly, emerging data continues to indicate that periodontal diseases may also be associated with a wide array of systemic diseases [8].

Despite overwhelming evidence that oral inflammation contributes to the systemic burden of inflammation, some in dentistry continue to suggest that any discussion of an oral-systemic link should be muted due to a lack of proof [9,10]. Establishing proof of causality between inflammation of oral origin and any of the associated inflammation-driven chronic diseases will continue to be challenging. To establish proof, it will be necessary to quantify the specific level of inflammation of oral origin that contributes to the systemic inflammatory burden. Currently, dentistry is reliant on bleeding upon gentle probing of the periodontal environment (BOP). While BOP is an excellent predictor of inflammation in the adjacent soft tissues, it is binary and indicates only the presence or absence of inflammation. Until clinical measurements of the quality and quantity of oral inflammation initiated by biofilm are available, evidence of proof of a link between oral and systemic diseases will remain elusive.

While the search for proof of causality continues, it may be more useful clinically, (and vitally important to patients who are susceptible to inflammatory-driven systemic diseases), to consider the potential for inflammation of oral origin to contribute to system disease risk.

It is well accepted in medicine that inflammation plays a contributory role in cardiovascular disease (CVD). Intervventional therapy to reduce CVD risk includes reducing sources that are contributing to the burden of systemic inflammation [11]. The consensus from a recent world workshop evaluating the relationship between periodontal and cardiovascular diseases included a recommendation that, “people with CVD must be aware that gum disease is a chronic condition, which may aggravate their CVD, and requires lifelong attention and professional care” [12].

It is reasonable to put oral inflammation on the list of contributing factors to the systemic burden of inflammation [13]. Periodontal therapy has the potential to reduce markers of systemic inflammation in a clinically significant manner [14-17]. Many of the risk factors for periodontal disease are also risk factors for other inflammatory-associated diseases [18,19]. Integration of dentistry and medicine is critical for best management of the diseases that both disciplines share. Successful integration requires the focus of dentistry and medicine to be expanded beyond traditional boundaries. Those boundaries need to change so that co-management of risk factors can enhance the level of wellness for every patient. Co-managing the riskfactors common to oral and systemic diseases can only improve the management of dental and medical diseases that have traditionally been managed separately.

Limiting the goal of dental therapy to simply helping patients keep their teeth is inadequate. The new goal of dentistry must be to help patients achieve and then maintain a functional and esthetic dentition that can be maintained relatively inflammation-free over their lifespan, not only for the oral health benefits but to reduce their overall level of systemic inflammation and therefore supporting overall wellness. Dental professionals must be consistently adequate in diagnosing and eliminating oral inflammation. Dental visits provide opportunities for dental providers to screen for the risk factors that are common to both periodontal and systemic diseases. With so many dental patients enrolled...
in regular visits during the maintenance phase of dentistry, dental practitioners can also assist medicine by educating, motivating and supporting patients in adopting the risk factor modifications necessary to reduce systemic as well as local inflammation.

Medicine must expand its oral diagnostic capabilities for the integration of medicine and dentistry to reach its potential. Medical health care providers who care for patients with the systemic diseases potentially affected by oral inflammation (or even patients simply with risk factors for these systemic diseases) must alter existing examination protocols to include realistic, time-efficient screening for oral inflammation and then appropriate referral to dental providers for definitive diagnosis and therapy. To date, no standard protocol for oral screening by non-dental personnel exists.

Medical personnel awareness of oral health and signs of oral diseases is limited [20]. Too often, the medical assessment of oral status is limited to a tongue-blade assisted cursory glance at the entrance to the oral cavity, or a question or two as to the oral hygiene habits of the patient. The typical components of a comprehensive dental evaluation, (full periodontal charting, review of radiographs, clinical examination, etc.) is not realistic in most medical settings. The healthcare integration challenge for dentistry is to provide medicine with a screening protocol that is effective, yet involves minimal time, equipment, and effort. Periodontal disease is a systemic disease with site specific presentation [21].

Diagnosis typically involves a combination of probing depth, attachment loss, bleeding upon probing radiographic evidence of bone loss and/or presence of detectible etiology [22], all of which are surrogate markers of inflammatory induced periodontal destruction. One of the ongoing difficulties in periodontal diagnosis is the lack of easily attainable and quantifiable measurements of both the pathogenic potential of the biofilm load and the resultant inflammatory response.

In the dental setting, bleeding following probing remains the most reliable indicator of subgingival inflammation albeit with only moderate sensitivity and higher specificity [23]. While the presence of bleeding following probing is not overly predictive of oral inflammation at that site, the absence of bleeding is more strongly correlated with an absence of inflammation. Thus, bleeding following probing is far from an ideal screening tool but may be more useful when determining therapeutic outcomes. It is binary and does not provide any quantitative assessment of oral inflammation. Bleeding on probing is also time-consuming and technique sensitive. The threshold number of sites with detected oral inflammation necessary to impact the systemic burden of inflammation has never been definitively determined [24].

What is needed is a screening tool that affords both medical and dental personnel an easy, reliable chairside analysis of patients’ oral inflammatory burden. Oral inflammation is commonly symptomless, rarely leads to spontaneous bleeding, and is often characterized by subtle clinical changes of which most patients are unaware and unable to recognize [25]. Screening visually for the subtle clinical signs of inflammation, questioning patients as to periodontal symptoms, or obtaining evidence of oral inflammation via probing is far from realistic in medical settings. However, indices have been developed for bleeding following interproximal stimulation with a properly sized interproximal brush. This could provide a reasonable alternative to actual periodontal probing [26]. Equipping medical health care settings with diagnostic interproximal brushes and education as to how to use the brush to screen for oral inflammation does seem feasible. A system to screen patients for the potential for having oral inflammation may be the most realistic option. The consequences of biofilm accumulation in a particular individual are influenced by various well-established risk factors for CIPD, which are also common to other systemic diseases, including genetic and epigenetic influences, tobacco use, obesity, nutrition, exercise, hypertension, dyslipidemia, psychosocial stress, depression, sleep disorders, excessive alcohol consumption, changes in bone metabolism, low socioeconomic status, poor oral hygiene, increased age, and Hispanic ethnicity [27]. It seems reasonable to design a protocol in which medical and dental providers can use a yes/no checklist to determine if their patients have any of these identifiable risk factors for periodontal disease. Those patients who do
have identifiable risk factors for periodontal disease should receive a more comprehensive oral evaluation, diagnosis, and treatment plan by a dental provider.

A medical screening checklist should also include the medical conditions that are potentially affected by oral inflammation. The two-way relationship between periodontal and systemic diseases suggests that there are distinct patient categories that would benefit from medical screening for potential oral inflammation. Current evidence suggests that patients being followed in medicine for cardiovascular disease \[28\], diabetes \[29\], rheumatoid arthritis \[30\], post-menopausal ramifications \[31\], respiratory ailments \[32\], solid organ transplantation \[33\], kidney diseases \[34\], gastric ulcers \[35\], dementia risk management, \[36\], artificial joint replacement \[37\], pre-natal care \[38\], and certain cancers \[39\], could benefit for identification and timely elimination of oral inflammation. At the very least, medical screening and then dental referral of patients in these categories seems prudent considering the potential benefits to patient outcomes. Evidence is emerging suggesting that eliminating oral inflammation in patients can result in significant long-term health care cost savings as well \[40\].

True assessment of the effect that inflammation of oral origin has on specific systemic conditions will require an objective measurement of the oral inflammatory burden present in an individual patient or of the pathogenic potential of the initiating oral bacterial accumulation. Until such screening methods are designed, a medical screening for oral inflammation checklist encompassing those patients with risk factors for periodontal disease and for those patients in whom oral inflammation has potential effects on systemic health is listed in Figure 1. Ideally, medical, and dental personnel, when evaluating patients presenting for care, would use this checklist. An affirmative answer to any question would signal the need for more comprehensive dental evaluation. Since any category on the list indicates a need for further evaluation, once an affirmative answer was noted and referral was suggested, the remainder of the form would not need to be completed \[41\].

Ideally, stakeholders in healthcare should strive to develop a reliable, quick, minimally invasive, and cost-effective test with acceptable sensitivity/specificity for either the pathogenic potential of the inflammation-initiating biofilm and/or to quantify the actual local inflammation response. For example, an easily obtained swab sample of oral fluid that could be analyzed chairside for pathogen or inflammatory mediator load would be an ideal solution to the challenge of medical personnel screening for oral inflammation.

The patient and healthcare cost benefits from co-management of diseases with medicine is compelling. The potential for including a developed screening tool/method into health

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**Figure 1: Medical/dental collaborative care checklist.**

<table>
<thead>
<tr>
<th>Patients with one or more of the factors should be referred for comprehensive dental evaluation to determine if oral inflammation is present. Dental providers should then partner with medicine in managing the common risk factors involved in these diseases.</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ CVD</td>
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<tr>
<td>□ Tobacco use</td>
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<tr>
<td>□ Hyperglycemia (A1c &gt;5.7)</td>
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<td>□ Overweight/Obese (BMI &gt;25)</td>
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<td>□ Post-menopausal</td>
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<td>□ COPD</td>
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<td>□ Sleep disorder</td>
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<td>□ Planning future pregnancy or currently pregnant</td>
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<td>□ Rheumatoid arthritis</td>
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<td>□ Artificial joint replacement</td>
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<td>□ Gastric ulcer</td>
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<td>□ Dementia diagnosis or elevated risk</td>
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<tr>
<td>□ Pre/Post organ transplantation</td>
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<td>□ Pre/Post chemotherapy</td>
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care facilities worldwide is enormous. Clearly, it is time for all of healthcare to usher in a new era of medical and dental collaboration to help patients achieve the highest possible levels of wellness.

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