

Oral Infections and the Link to Overall Health

Weslee Simpson

Department of Microbiology and Molecular Genetics, Oklahoma State University, Stillwater, OK 74078, USA

Key Words:

Focal infection, periodontal disease, gum infection

The theory of focal infection is one that has been studied and debated by others for years. Focal infection is best defined as a theory which regards small localized infections (such as oral infections) and how, with the help of microorganisms like bacteria, this small infection can spread to other parts of the body. This contributes to the main question this article focuses around, which is: does oral health have an effect on overall body health? In recent years, sufficient evidence has been provided from multiple recent studies that have been performed to gain insight on focal infection and to answer this question. This article will review the importance of good oral health as well as the outcome for people with good dental care versus the people who do not receive any dental care, and to how this can relate to overall health. This article also focuses on periodontal disease, a serious infection of the gums, and how this oral infection can consequently affect major parts of the body with infection. Periodontal disease, if not treated and handled properly, can consequently cause many impacting diseases throughout the body. This article will discuss and evaluate the relations this oral disease has to causing other diseases throughout different areas of the systemic body.

Introduction

Periodontal disease is an ongoing inflammation caused by toxin producing bacteria that live in plaque. Plaque is a sticky film that is always being formed on teeth and if not cleaned well can lead to irritation and inflamed gums.

Once the gums become inflamed they can pull away from the teeth and create spaces called pockets, which can then become infected by more bacteria. If left untreated, periodontal disease can cause major damaged to bone and tissues. This is where the theory of focal infection steps in. Bacteria play a major role in the health of an individual, and in the case of chronic periodontitis, they are the supreme cause. In the focal infection theory, bacteria (microorganisms from dental plaque) and their metabolic products may enter the blood stream, through the ulcerated epithelium of the periodontal pocket, and result in various systemic diseases. To bring awareness to the public, the American Academy of Periodontology launched an effort in July 1998 to educate people about oral infections and the link to other diseases in the body. (Pizzo & Guiglia)

Another factor of focal infection is caused by the relative amount of dental care a person receives. In the United States, there are numerous people today that have good oral health care and see a dentist regularly. However, unfortunately in America there are still millions of people that are lacking access to basic oral healthcare. Reasons for not having dental care could be because dental treatment cannot be afforded, persons live in rural areas where a dentist is not available, persons simply can't afford to take off work, or even are unable to find the transportation to a dentist. All of these reasons are problematic because without dental care, the person's health and overall well-being can become affected. Many people are uneducated about how impactful oral health can be on the rest of the body. Dental infection is a completely preventable problem. Yet many people do not realize that simple things such as a healthy diet, brushing, and flossing every day can help to prevent tooth decay and keep the microorganismal level of bacteria in the mouth at equilibrium. By preventing oral infection we can therefore prevent systemic infection (ADA).

Recent Progress

As we have seen, periodontal infection may influence systemic health by metastatic (spread of) infection, metastatic injury, and metastatic inflammation. Oral bacteria, poor oral hygiene, and periodontitis may initiate and affect the course of different systemic infections.

Cardiovascular Diseases and Atherosclerosis

Atherosclerosis, or hardening of the arteries, is the leading cause of all cardiovascular diseases. There are several factors that link periodontitis to cardiovascular disease. Inflammation from periodontitis has been known to increase the levels of inflammation throughout the body, such as through the vasculature. This can be measured by the C-reactive protein (CRP), which is an acute phase protein that has been shown to be associated with future cardiovascular events (Papapanou & Trevisan). Another factor that supports the link between periodontitis and cardiovascular disease is if there is continual exposure to oral bacteria and toxins, the vascular endothelium can become infected and cause inflammation, thereby accelerating the process of atherosclerosis. (Pizzo & Guiglia)

Pulmonary Infections

Oral bacteria, poor oral hygiene, and periodontitis have also been proven to affect pulmonary infections. This usually occurs in hospitalized patients where oral care is not as efficiently taken care of as it should be. It results when a buildup of oral bacteria and respiratory pathogens are aspirated into the lower respiratory tract and lungs and cause infections and even pneumonia. (Pizzo & Guiglia)

Adverse Pregnancy Outcomes

Currently there is insufficient evidence to link chronic periodontitis to specific adverse pregnancy outcomes. However there are some theories that suggest this link by periodontal pathogens migrating to intrauterine infection. Also, periodontal pathogens have to capability to evade cellular immune defense mechanisms. This could allow the activation of cell-mediated immunity responses, which would then lead to the release of maternal inflammatory mediators which could cause adverse pregnancy outcomes if they arrive at the fetal placental unit. (Pizzo & Guiglia)

Rheumatoid Arthritis

What's unique about the evidence of the link between periodontitis and rheumatoid arthritis is the fact that they are interchangeable, meaning either one could cause the other. Rheumatoid arthritis is characterized by the destruction of joint connective tissue. In the patients with rheumatoid arthritis, high levels of periodontal bacteria antibodies and pathogens have been found in the serum of the synovial fluid. On the reverse, rheumatoid arthritis could aid to the cause of chronic periodontitis by

damaging the upper extremities of the body and decreasing the usage of manual dexterity, making oral hygiene more difficult. (Pizzo & Guiglia)

Diabetes, Metabolic Syndrome, and Kidney Disease

Metabolic syndrome is a collection of circumstances such as obesity, hypertension, impaired glucose tolerance, hyperinsulinemia, and dyslipidemia which lead to an increased risk factor for heart disease and also diabetes. Diabetes is characterized as complications from long term elevation of blood glucose concentrations. This results in the formation of advanced glycation end products, which are associated with renal insufficiency as well as other problems. Systemic inflammation, caused by periodontitis, increases insulin resistance and makes it more difficult for patients to control blood glucose levels. (Pizzo & Guiglia)

Osteoporosis

For this category, there is a theory that states that osteoporosis could be a risk factor for the progression of chronic periodontitis. Osteoporosis is characterized as a systemic skeletal disease in which there is low bone mass and deterioration of bone tissue. Both osteoporosis and chronic periodontitis are both diseases with focus on the destruction of bone and which share common etiologic agents. (Pizzo & Guiglia)

*The relationship between chronic periodontitis and systemic diseases:

Confirmed Associations	Debated Associations
Cardiovascular Diseases	Rheumatoid Arthritis
Pulmonary Infections	Pancreatic Cancer
Diabetes	Metabolic Syndrome
	Chronic Kidney Disease
	Alzheimer Disease
	Adverse Pregnancy Outcomes
	Osteoporosis

Recent progress has also been made on the topic of access to oral healthcare to those in need. Today, there are thousands of dentists who provide free dental care to hundreds of thousands of people who are in need of dental healthcare. According to one survey, this care amounted to \$1.6 billion in a single year. Although much is being done by volunteerism, it is still not enough to solve the problem.

Discussion

Dental care is a major necessity in our society. In order to have good overall health, good oral health is a must. The public needs to be aware of the negative effects periodontal disease and other infections of the mouth can

have on systemic health if left untreated. With good oral health care and basic knowledge of how to prevent decay, we can finally stop the infection from spreading throughout the body and causing damage to other areas. There has been a definite link shown between periodontitis and cardiovascular diseases, pulmonary infections, and diabetes. Further debate is still going on for the link between periodontitis and rheumatoid arthritis, pancreatic cancer, metabolic syndrome, chronic kidney disease, Alzheimer disease, adverse pregnancy outcomes, and osteoporosis.

While we have many dentists that volunteer their time and skill to helping others in need, there are still countless numbers of people out there that are still suffering from oral infections. There are many dentists willing to care for people that are on state public health programs, but unfortunately these programs are weakly funded and put the dentist in a position where they aren't able to even cover the basic costs for providing the treatment. In spite of this, numerous dentists still provide the treatment to disadvantaged children and adults under Medicaid. Often times these dentists just write it off, rather than going through the difficult paperwork that is necessary to get paid. For years, the American Dental Association has been on a mission to raise awareness and develop solutions so more people are able to receive dental care. By teaching the public basic oral health care prevention techniques, such as brushing and flossing every day, as well as the importance of eating a healthy balanced diet, we can therefore start to prevent oral infection. Oral health care is extremely important in determining our overall health; therefore, we should make it a priority to help people suffering from oral infection, as well as educate the public on the simple ways that oral infection can be prevented.

References

- Pizzo, Giuseppe, Rosario Guiglia, Lucio Lo Russo, and Giuseppina Campisi. "Dentistry and Internal Medicine: From the Focal Infection Theory to the Periodontal Medicine Concept." *European Journal of Internal Medicine* (2010): n. pag. Print.
- Papapanou, Panos N., D.D.S, PhD, and Maurizio Trevisan, MD, MS. "The Journal of the American Dental Association." Periodontitis and Atherosclerotic Vascular Disease. American Dental Association, n.d. Web. 03 Sept. 2012. <<http://jada.ada.org/content/143/8/826.full.html?etoc>>.
- Crocombe, Leonard A., PhD, Jonathan M. Broadbent, PhD, Murray Thompson, PhD, David S. Brennan, PhD, and Richie Poulton, PhD. "Impact of Dental Visiting Trajectory Patterns on Clinical Oral Health and Oral Health-related Quality of Life." - Crocombe. *Journal of Public Health Dentistry*, 5 Aug. 2011. Web. 03 Oct. 2012. <<http://onlinelibrary.wiley.com/doi/10.1111/j.1752-7325.2011.00281.x/abstract>>.

"Oral Health Topics." Access to Dental Care/Oral Health Care. American Dental Association, n.d. Web. 03 Oct. 2012. <<http://www.ada.org/2574.aspx>>.