



Inflammation and Chronic Disease: Are Teeth the Root of the Problem?



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In medical school we learned the definition of inflammation. It is an appropriate response by the tissues in the body to an unwanted stimuli (injury or infection). Think of a splinter, a spider bite, a fractured ankle. Four basic features are characteristic: Dolor (pain), Rubor (redness), Tumor (swelling), and Calor (heat). This is how it was described by the Roman scholar Celsus in the first century AD. Recently fluor (secretions) has been added as pus or other fluids are often associated. The process starts quickly with damaged tissues releasing chemicals that call the immune system. The white blood cells of the innate immune system go to the source of irritation and, over a few days, attempt to clean up the situation. The infection or injury typically resolves or heals without much intervention and the inflammatory process ends.

Chronic inflammation involves similar processes but it goes on for a longer time. In this situation the immune system is continually "turned on". This may be caused by infections that don't go away, improper immune cell responses, and other conditions like obesity and aging. We used to think that atherosclerosis, Alzheimer's Disease, arthritis, cancer, and osteoporosis were conditions that were caused by certain genetic risks. While there are certainly genetic links to many diseases, we have come to appreciate that chronic inflammation causes the damage to vulnerable tissues creating the set-up for these chronic conditions. Too many immune cells continually looking for something to "clean up" creates damage to the blood vessel walls and sets the stage for the fatty plaque build-up of atherosclerosis. Too much "clean up" work in the

brain or the bones is associated with Alzheimer's Disease and osteoporosis respectively.

We are familiar with many of the lifestyle habits listed in the Side Bar, but how does our lifestyle contribute to pathogen colonization? We understand that a typical infectious disease causes massive, short term immune activation and body-wide symptoms (e.g, chicken pox and measles). But how do bacteria, viruses, and the like contribute to chronic inflammation? It occurs from an area of "focal infection" - a localized high concentration of pathogens that does not cause infectious disease per se, but "seeds" the blood with a constant low level of unwanted microorganisms - just enough to keep the immune system chronically turned on. The gastrointestinal tract (through diverticular disease, chronically infected appendix, gall bladder, oral cavity...) can harbor these focal infections. In the oral cavity the primary sources of infection are the teeth, gums, jawbone cavitations, tonsils, and sinuses. Poor dental hygiene, stress and clenching, inadequate nutrition, toxins, and medications can result in periodontal disease (inflammation of the gums from oral pathogens) or the need for root canal treatment (for a painful and technically dead tooth). These two common conditions create empty spaces in the tissues that can become cesspools of dead tissue, bacteria, viruses, fungi and mercury. This becomes the "focal infection" that seeds the blood with a constant low level of pathogens. The Surgeon General estimates that 80% of the adult population in the United States has some form of periodontal disease, and the presence of pathogenic oral bacteria that cause it increases with age.

A study published in Circulation (2013) described the association of dental infection and oral bacteria with the development of heart attack. 101 men having emergency stents placed during an acute heart attack were studied. Samples of blood from the blood clot causing the heart attack showed a much higher amount of bacterial DNA than was found in the circulating blood. 78.2 % of these blood clot

samples showed bacteria typical for root canal treated teeth and 34.7% showed bacteria typical for periodontal disease. Many other studies before and after this one have added to the conclusion that heart disease and oral infections are linked.

Another study showed pathogens typical for root canal treated teeth were found in the majority of ruptured brain aneurysms. Fusobacterium (a common bacteria in periodontal disease) is found in breast tissue of women with cancer at more elevated levels than in women without cancer. Fusobacterium has also been linked to colon cancer. Periodontal disease has been associated with esophageal, head and neck and oral cavity cancers. Subjects with periodontal disease are at a significantly increased risk of developing lung cancer. Periodontitis has been shown to be contributory to the onset and progression of Alzheimer's disease. Some research also links Parkinson's disease, Multiple Sclerosis and Huntington's disease to oral bacteria. Periodontal disease has been associated with the severity of seizures and is an independent risk factor for the development of depression. Research studies have shown an association of periodontitis with osteoporosis, diabetes, all kinds of arthritis, metabolic syndrome, COPD, hypertension, autoimmune conditions (lupus), Crohn's disease and Colitis, chronic kidney disease, erectile dysfunction, prostatitis, preeclampsia and other pregnancy complications. It is not known how causative the oral pathogens might be to these conditions. But it is believed that, because of the strong association of oral pathogens to so many chronic conditions and the recognition of their role in creating chronic inflammation, these pathogens at least exacerbate or sustain disease states.

So you must be ready to get your teeth checked by now. This is where it gets dicey. Periodontitis is common and a particularly common but advanced form, chronic apical periodontitis (CAP) is often asymptomatic. CAP is detected 30 - 50% more often when using 3D cone beam imaging vs standard 2D panoramic XRays. This 3D imaging

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Most of the leading causes of death in the United States have been linked with chronic inflammation including: heart disease, cancer, diabetes, stroke, Alzheimer's Disease, kidney disease and chronic respiratory conditions. So how does our immune system get continually "turned on" (inflammation)?

Chronic lifestyle habits that provoke the immune system:

- Smoking
- Alcohol
- Eating inflammatory foods like sugar, grains, trans fats, (possibly dairy and nightshades...)
- Exposure to toxins (ubiquitous but some people have higher exposures than others)
- Exposure to pathogens (areas of infectious colonization or contamination)

Physiologic mechanisms that guard against chronic inflammation:

- Normal (not increased) body fat
- Regular exercise
- Adequate nutrition and absorption of nutrients
- Adequate sleep
- Stress management



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can find some degree of CAP in 90% of root canal treated teeth. Some authorities argue that root canal treated teeth will always be a source of "focal infection". With the pulp removed, root canal treated teeth have lost access to the immune system and the nerves, which identify infection by eliciting pain. Some argue that a successfully treated, pain-free root canal is still a source of chronic infection. One study showed 100% of 5,000 examined root canal treated teeth were infected.

The ability for 3D imaging is not available in most dental practices. (I wonder why it is not available at Radiology Centers?) You can have 2D or 3D imaging as a screen for symptomatic or asymptomatic sources of infection. You can have some of these markers of inflammation checked (hsCRP, fibrinogen, LpPLA2, MPO, TNF-alpha, IL-B1, IL-6, IL-8) Elevated markers should drop after successful treatment and be monitored yearly. Treatment of symptomatic or asymptotically infected teeth (or sinuses, or tonsils, or jaw...)

requires a risk/benefit analysis among the options offered. There are many considerations but some authorities are preferring implants to root canals (though they are more expensive). Use of ozone is the key to clearing the pathogens from the procedure site followed by good dental hygiene.

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