Could Oral Health Play A Role in Alzheimer's Prevention?

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Introduction

Periodontal disease

Periodontitis is a complex infectious, multifactorial and chronic disease that affects an estimated 538 million of people and it is the eleventh most prevalent disease globally. It can appear in childhood or adolescence, but usually it debuts in early adulthood and occasionally a few years later [1,2].

Periodontal diseases encompass chronic inflammatory condition of the gum, bone and periodontal ligament. Periodontitis begins when gingivitis, which is the inflammation located of the gingiva, isn't treated. So, that inflammation progress and advance to the loss of gum, ligament and bone. In that moment, it appears periodontal pockets [3].

As a multifactorial disease, there are different kind of factor that may could help to the progress and advance of the pathology, such as environmental, genetic or lifestyle. Furthermore, the systemic inflammation could affect to the susceptibility of periodontitis [4].

Alzheimer's disease

Neurodegenerative diseases are characterized by the loss of selectively vulnerable populations of neurons. The most common form of dementia is Alzheimer's disease which usually occurs in older people. It presents as an insidious onset and a gradual loss of memory in association with other cognitive domains that leads to the loss of emotional independence [5,6].

Mechanisms of Association Between Periodontal Disease and Alzheimer's Disease

This link could be explained in a bidirectional way: on the one hand, progressive cognitive deterioration would limit oral hygiene habits, affecting oral health. On the other hand, the chronic immuno-inflammatory process and the systemic inflammation secondary to periodontitis could induce neuro-inflammatory phenomena that benefit Alzheimer's.

Periodontitis is due to chronic inflammation and/or dysbiosis, that is, an abrupt microbial imbalance that causes the dynamic alteration of cellular and molecular events, a fact that leads to the development of periodontal disease, inflammatory bowel disease, colitis and celiac disease, among other pathologies [7].

The chronic nature of periodontitis and its progression affects to the general health of the patient, therefore, according to recent evidence, the bacteria that cause this pathology induce extensive epigenetic modifications, activate pro-inflammatory pathways, and increase virulence. Hence, it can contribute to the overall inflammatory load of the body, causing the worsening of diseases such as diabetes mellitus, obesity or metabolic disease [2,3,7].

There are a few hypotheses about the link of both diseases. One possible could be the invasion of the brain tissue by periodontal bacteria, as Porphyromonas gingivalis, in the dental biofilm and their products. This invasion would accelerate neuroinflammation and it can occur through the blood stream or peripheral nerves. Cytokines derived from the periodontal tissue can also reach the brain systemically or neural via, thereby increasing levels of brain cytokines [8].

Periodontal Bacteria Implicated in Alzheimer's Disease

Periodontal bacteria are presumed to be involved in Alzheimer's disease onset or in its progression.

The major pathogens of periodontal disease are Porphyromonas gingivalis, Treponema denticola, and Tannerella forsithya [9].

It seems that P. gingivalis, which is the keystone pathogen that modulates the dysbiosis of its companion species of bacteria periodontal tissue, could be the link to both pathologies, considering that recent studies have identified lipopolysaccharide (LPS) and bacterial genomic DNA in the autopsy from the brains of people who had Alzheimer's disease [10,11]. LPS is an integral component of all bacteria and it acts as a virulence factor of periodontal bacteria that induce secretion of proinflammatory cytokine and nitric oxide [9,12]. High levels of LPS can provoke an elevated immune response [12].

Moreover, the diverse microbiome from a brain of a person with Alzheimer's disease could be a reflection of his procedence, his lifestyle, his diet, age and his oral function [11].

The microbiome of patients with Alzheimer's Disease may be composed of bacteria from associated dysbiotic microbiomes. Hence, P. gingivalis could be an early indication of dysbiosis in oral cavity which it is important to identify susceptibly hosts to suffer microbial infection that activates the inflammatory pathways [11].

Preventive Mesures

Ming et al. studied the oral health of patients with Alzheimer's disease and determined that patients with dementia had reduced ability to identify pain or symptoms associated with periodontitis. Furthermore, a high level of plaque was associated with people with decreased cognitive function among Alzheimer's disease patients [13].

Teng et al. highlighted that people with dementia are often limited by resources, oral hygiene capabilities, and receive less dental care than the general population [14].

Orr et al. identified people susceptible to Alzheimer's disease could make a difference because there is the potential for the dentist to develop disease-modifying treatments [15].

Ming et al. concluded that dentists should evaluate the oral health conditions of patients with Alzheimer's disease through subjective and objective examinations. In addition, they must manage the problems associated with insufficient chewing, since chewing efficiency may be more strongly related to cognitive decline than the number of teeth. In addition, health professionals should educate caregivers in their knowledge of oral health [13].

As a preventive measure, it would be important to carry out a thorough evaluation of their oral health in all patients with early symptoms of Alzheimer's disease. Oral health should be promoted in all adult populations with risk factors for neurodegenerative diseases.

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