TBIOMD 492- Abstract
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The Role of *Porphyromonas gingivalis* in Endothelial Dysfunction and Vascular Cognitive Impairment

Porphyromonas gingivalis is a major periodontal pathogen that has been increasingly associated with systemic diseases, including vascular and neurological disorders. Growing evidence suggests that chronic periodontal infection may contribute to vascular cognitive impairment through endothelial dysfunction, inflammation, and disruption of the blood-brain barrier. This review examines the effects of *P. gingivalis* on endothelial cells and vascular health, with emphasis on mechanisms such as oxidative stress, inflammatory cytokine production, mitochondrial dysfunction, and increased vascular permeability. Evidence from cellular and animal studies demonstrates that *P. gingivalis* and its virulence factors, including gingipains and lipopolysaccharide, can damage endothelial cells and weaken vascular barriers. This review also explores how blood-brain barrier dysfunction may provide a pathway through which bacterial products and inflammatory mediators contribute to neurodegenerative processes. In addition, clinical and experimental studies linking periodontal disease to cognitive decline are evaluated, including research showing the presence of *P. gingivalis* DNA and bacterial products in the brains of individuals with Alzheimer's disease. Human studies consistently report associations between periodontal disease, vascular dysfunction, and impaired cognitive performance, although most remain observational and cannot establish direct causation. Experimental evidence provides stronger support for biological mechanisms connecting periodontal infection to vascular and neurological damage. Overall, current evidence supports the guiding thesis that *P. gingivalis*-associated endothelial dysfunction and chronic inflammation may contribute to vascular cognitive impairment by promoting vascular injury, blood-brain barrier dysfunction, and neuroinflammatory processes, although additional longitudinal and intervention studies are needed to clarify causality.