

Porphyromonas gingivalis And Oral Squamous Cell Carcinoma- A Mini Review

Thematic area: Microbiology

Prasada Rao Namburi¹, Krishnan Mahalakshmi^{2*}
¹Prasada Rao Namburi

Research Scholar, Dept of Microbiology, Bharath Institute of Higher Education and Research, Chennai, India, Assistant professor, Department of microbiology, Fathima institute of medical sciences (FIMS) Ramarajupalli, Kadapa PIN 516003 Andhra Pradesh, India

*Email: raomcr@yahoo.com
ORCID ID: 0000-0002-2525-2242*

Corresponding Author

^{2*}Krishnan Mahalakshmi

Professor & Head, Department of microbiology, Research lab for Oral-systemic health, Sreebalaji dental college and hospital, Bharath Institute of Higher Education and Research, Chennai- 600100, Tamil Nadu, India

*Email: kmagvenkat@gmail.com
ORCID ID: 0000-0003-2753-9092
(M): +91 9444184403*

Abstract:

Oral squamous cell carcinoma (OSCC) is the common malignant tumor in the oral cavity causing morbidity & mortality. Many types of tumors are found to develop due to chronic inflammation. Periodontitis and the bacteria colonizing the periodontal tissue may be associated with progression of tumors. Studies have reported the increase of anaerobic bacteria on the lesions of OSCC. Among various anaerobes, Porphyromonas gingivalis is one of the most important types of microorganism in the oral cavity present in both healthy and non-healthy individuals and it is involved in causing periodontitis. Chronic periodontitis may thus lead to the development of oral squamous cell carcinoma. This article reviews the literature on the association between P.gingivalis and Oral squamous cell carcinoma and the pathogenesis mechanism.

Key words: anaerobe; Oral squamous cell carcinoma; periodontitis; Porphyromonas gingivalis;

INTRODUCTION:

Oral squamous cell carcinoma (OSCC) is present in the list of world's top 10 common cancers.^[1,2] The primary risk factors for OSCC are Tobacco, betel quid, and alcohol.^[3] Tobacco chewing with or without betel nut contribute to 74% of OSCC patients. About 74% of OSCC cases are caused by tobacco chewing with or without betel nut.^[4] Other than chemical irritants, dental prosthesis inflammation, human papillomavirus (HPV), and chronic periodontitis infections are also associated with oral cancer.^[3]

A link is established between periodontal disease and oral cancer very recently after many studies related periodontal disease to oral cancer.^[5] Oral squamous cell carcinoma presents symptoms of swelling, bleeding, tooth mobility, deep periodontal pockets, and bone destruction

which resembles chronic periodontal disease.^[6]Periodontitis is a common oral cavity disease characterized by the progressive degradation of supporting teeth structures due to chronic inflammatory changes due to the host response to periodontal pathogens. ^[7]

The red complex organisms which include *P.gingivalis*, *Tannerella forsythia* and *Treponemadenticola* are the key periodontal pathogens involved in the pathogenesis of chronic adult periodontitis. ^[8] Chronic or dysregulated inflammation has long been seen to lead to tumour growth, in part through tumor microenvironment modulation. ^[9,10] Association between periodontitis and periodontal pathogens in the progression of esophageal squamous cell carcinoma has been highlighted recently in few studies. ^[11-13] This study reviews the literature on association between periodontal pathogen, *P.gingivalis* and Oral squamous cell carcinoma and the pathogenesis mechanism

Pathogenesis Of *P. Gingivalis* In The Development Of OSCC

P.gingivalis is an anaerobic, gram-negative bacterium responsible for chronic periodontitis and reported to be observed in 85.75% of subgingival plaque samples of chronic periodontitis patients [11]. In patients with chronic periodontitis, it generates different virulence factors which can penetrate periodontal tissue to induce chronic inflammation and cause destruction of tissues [11]. The virulence factors produced are fimbriae, lipopolysaccharides, capsules, haemagglutinins, lipoteichoic acids, gingipains and outer membrane vesicles. These virulence factors are responsible for the development of chronic inflammation..

Studies On *P. Gingivalis* And Oral Squamous Cell Carcinoma:

Nagy *et al.* in 1998 [12] in his study found significant higher levels of *P. gingivalis* in the oral cancer lesions than adjacent normal mucosa of the same individual after cultivating the surface swab of oral cancer lesions.

Mager *et al.* in 2005 [13] analysed the salivary counts of 40 specific oral bacteria using checker board DNA-DNA hybridization and noticed higher levels of *P. gingivalis*, *Prevotellamelaninogenica* and *Streptococcus mitis* species in OSCC cases compared to normal controls

Katz *et al.* in 2011 [14] analyzed the parts of gingival squamous cell carcinoma immunohistochemically and observed the staining strength for *P. gingivalis* is more relative to the healthy gingival tissue, which suggests higher colonization in the cancer tissue. Joseph *et al.* in 2011 [15] by using Immunohistochemical staining reported higher levels of *P. gingivalis* in malignant oral epithelium which suggests association of *P. gingivalis* with OSCC.

Schmidt *et al.* in 2014 [16] studied the swabs from the OSCC lesion surface and contra lateral normal oral mucosa in 18 OSCC patients, eight pre-cases and nine normal controls using next generation sequence technology and found significantly higher levels of *P.gingivalis* in OSCC cases compared to the precancer cases and normal controls.

CONCLUSION:

This review highlights the higher prevalence of *P. gingivalis* in the oral cavity is associated with OSCC. *P.gingivalis* promotes the development of oral cancer at various stages including epithelial mesenchymal transformation, neoplastic proliferation, and invasion of malignant cells.

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