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Peri-Implant Oral Malignancies and Their Treatment Protocol

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Abstract

The widespread use of dental implant treatments in recent decades has resulted in inflammatory complications. Among these, significant issues have been reported, including malignant lesions near dental implants. Peri-implant squamous cell carcinoma, while rare, is one such pathological condition. In contrast, peri-implantitis is commonly observed in conjunction with dental implants. Both conditions present similarly, characterized by a loss of supporting soft and hard tissue around the implants, making careful differential diagnosis essential. This article aims to shed light on oral peri-implant malignancies and their treatment protocols.

Keywords: Dental implant, Peri-Implantitis, Squamous Cell Carcinoma, Risk Factor

Introduction

Oral cancer is the sixth most common malignancy globally, with over 90% of cases classified as squamous cell carcinoma (SCC) pathologically.[1]. Oral SCC generally develops via multistep carcinogenesis. The squamous epithelium goes into irreversible change, including epithelial dysplasia and oral intra epithelial neoplasia/carcinoma in-situ (OIN/CIS) [2], finally resulting in the development of invasive carcinoma through the accumulation of genetic abnormalities caused by persistent exposure to a carcinogen. Risk

factors for oral SCCs are smoking, tobacco and betel quid chewing habits, and heavy alcohol consumption.

Dental implants are widely recognized as the most effective treatment option for patients with partial tooth loss or complete edentulism. In fact, in some cases, they represent the only viable solution available. However, as the prevalence and acceptance of dental implants have grown dramatically over the past few decades, so too has the occurrence of various complications associated with their use. The most common of these complications are inflammatory conditions, such as peri-implantitis, which can significantly impact the health of the surrounding tissues. In addition to these inflammatory issues, the literature has increasingly documented other serious complications, including the emergence of malignant lesions in proximity to dental implants. This troubling trend has been reflected in a noticeable rise in reported cases in the scientific community in recent years.[3]

Virchow in 1863, was the first to describe the role of chronic inflammation in cancer.[4] Inflammation serves as a protective response of tissues to irritation or infections. However, in certain cases, it can lead to malignant transformation. Additionally, inflammation may be influenced and regulated by genetic predispositions or carcinogenic risk factors associated with lifestyle choices, such as tobacco and alcohol use, as well as mechanical irritants, such as repeated trauma from ill-fitting prostheses,[5-7] bacterial infections (periodontitis) [8] and even viral infections (HPV).[5-7] The inflammatory response plays a significant role in tumor progression by promoting the proliferation and survival of malignant cells, facilitating neoangiogenesis, and impairing antitumor immunity.[9,10]

Peri-implant inflammation first impacts the soft tissues around the implant, leading to mucositis. If this inflammation persists, it can turn chronic and result in bone loss around the implant.[11,12,13] Prolonged inflammation possesses the potential to promote cell proliferation and enhance cell survival by activating oncogenes while concurrently inhibiting tumour suppressor genes. This process may lead to genetic instability and an elevated risk of developing cancer.

The majority of implants are constructed from titanium or titanium alloys, which are remarkably resistant to corrosion because of the stability provided by the titanium dioxide (TiO2) layer they possess. [14,15,16] When this layer is damaged or taken away, such as during the mechanical removal of bacterial plaque, due to fluoride ions, from the rubbing of the implant against the supporting bone, or as a result of an acidic environment in the mouth caused by inflammation, titanium may experience corrosion.

Commercially pure titanium (CP-Ti) and Ti6Al4V alloys are susceptible to deterioration due to attachments from the surrounding medium, which may generate electrochemical or galvanic currents. This situation could potentially lead to a correlation between the release of corrosion products and SCC. This hypothesis is particularly pertinent in the context of failing or failed implants, which frequently occur in cases of peri-implantitis.[17]

Raiser et al. [3] reviewed 42 cases of oral malignancy in which dental implants were implicated, retrieved from a literature search of PubMed and Google Scholar. From the analysis, the affected individuals tend to be elderly adults (mean age, 68 years). The gender distribution shows a clear 1:1.5 female predominance as opposed to the characteristic male predominance of oral cancer in general. They also found that 45.3% of cases occurred in a population with recognized risk factors for oral cancer. It was also hypothesised that PIOM would be observed

relating to patients with multiple implants where the exposed surface area and incidence would be higher.

Buccal bone loss was commonly observed in the CT scans, though it may not be evident in the bone levels adjacent to the peri-implant fixtures, both on the distal and proximal sides. Additionally, it is suggested that PIOM is characterized by an exophytic growth pattern, which affects its clinical features. Among the differentiated tumors, well-differentiated SCC emerged as the most prevalent type, except for one case of melanoma. [18]

A thorough and meticulous oral cavity examination is crucial before initiating any implant treatment. It is equally important to manage and monitor the patient's risk factors associated with squamous cell carcinoma (SCC) through rigorous follow-up protocols. Patients identified with these risk factors should undergo consistent and regular checkups to ensure any changes are promptly addressed. In cases where questionable lesions are detected, histopathologic biopsy examinations should be conducted without delay to facilitate early diagnosis and intervention. This comprehensive approach is vital for safeguarding the patient's oral health and optimizing treatment outcomes.

Resective surgery, complemented by targeted cancer therapy, represents the traditional approach to treating this disease. However, an equally crucial aspect of prevention lies in providing comprehensive education to patients about maintaining oral hygiene. Patients must understand the significance of diligent follow-up care after dental implants are placed. Regular check-ups can help monitor progress and address any concerns early on.

In situations where visits to the clinic may not be feasible, encouraging patients to take photos of their dental implants can serve as a valuable alternative for monitoring. Furthermore, implantologists should recommend radiographs as needed to assess bone levels and identify any potential abnormalities. These imaging assessments are vital for ensuring timely intervention and the overall success of the treatment plan.

Conclusion

Dental implant treatment can still be done for patients with risk factors, but it's important to manage these risks thoroughly and to follow a stricter recall schedule. If lesions that suggest periimplantitis appear, it's important to distinguish them from oral squamous cell carcinoma (OSCC). In cases where new, hard or bone-developing lesions show up and do not respond to regular treatment or cause numbness, a biopsy is necessary. With the rising popularity of dental implants, it's crucial for dentists who treat these patients in the future to be aware of possible complications, including the chance of malignant lesions.

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