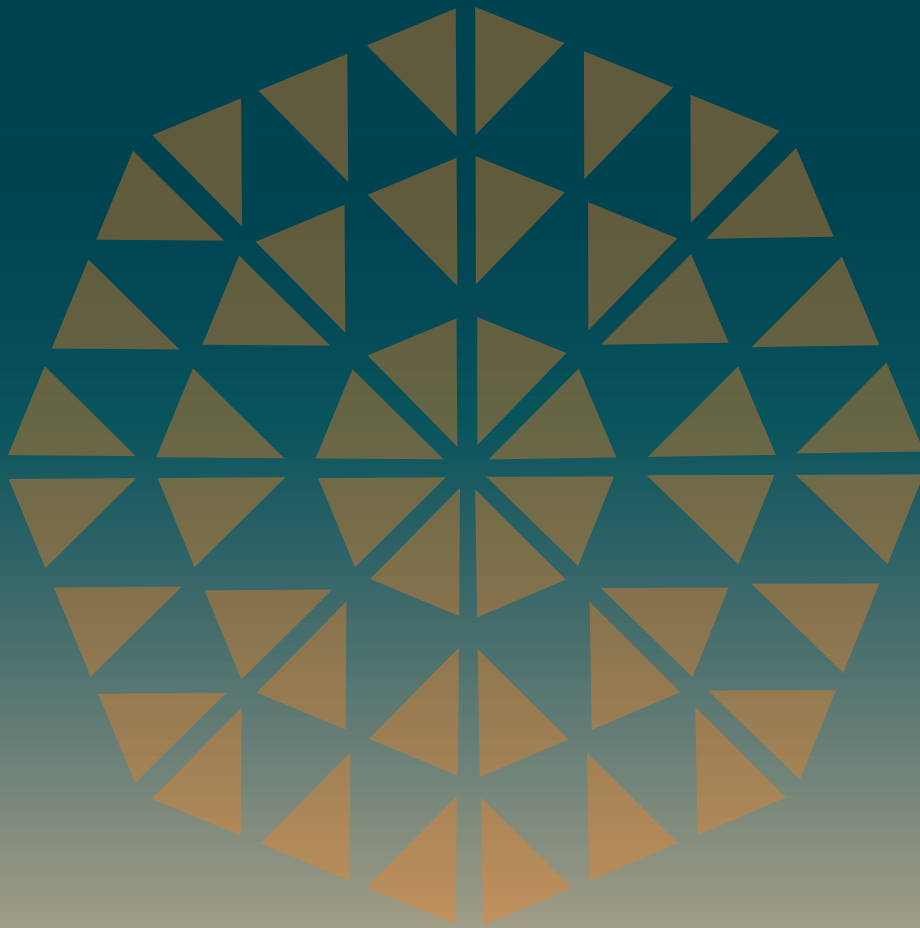


DENTAL BITES

Volume 10 Issue 4 | October - December 2023

**Periodontics, Public Health Dentistry
and Implantology**



a quarterly publication of



KMCT
DENTAL COLLEGE
Recognized Research Centre of KUHS

DENTAL BITES

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Dear Readers,

Embracing Innovation and Research in Dental Implants at KMCT Dental College

In the ever-evolving field of dentistry, the significance of innovation and research cannot be overstated. As we stand on the cusp of remarkable advancements, it is imperative for both our postgraduate students and esteemed faculty at KMCT Dental College to recognize and harness the transformative power of research, particularly in the realm of dental implants.

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For our postgraduate students, engaging in research is not merely an academic requirement; it is a pathway to becoming thought leaders in dentistry. It offers an opportunity to delve into uncharted territories, solve clinical challenges, and contribute to the collective knowledge of our profession. By participating in research, you cultivate critical thinking, problem-solving skills, and a deep understanding of scientific methodologies—attributes that are invaluable in any dental practice.

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At KMCT Dental College, we are committed to creating an environment that nurtures research and innovation. We encourage our students and faculty to take advantage of the resources available, including state-of-the-art laboratories, comprehensive libraries, and a network of knowledgeable mentors. Engage in interdisciplinary collaborations, attend conferences, publish your findings, and stay abreast of the latest developments in dental implant technology.

As we continue to push the boundaries of dental science, let us remember that every research endeavor, no matter how small, contributes to the greater good of our community and the advancement of oral healthcare worldwide. Your dedication to innovation and research in dental implants will pave the way for future breakthroughs, ultimately improving the quality of life for countless patients.

With warm regards,

Dr Manoj Kumar K.P
Principal

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Original Research

ORAL HEALTH STATUS OF CHILDREN WITH SPECIAL NEEDS IN KOZHIKODE DISTRICT, KERALA – A RETROSPECTIVE STUDY

*Aromal, **Dhanya Muralidharan, ***Arun Paul

Abstract:

Aim: To determine the oral health status of special care children of Kozhikode district, Kerala.

Methodology: A retrospective study was done using the data collected from special children during peripheral camps conducted during 2017 – 2023 period to determine the prevalence of dental diseases. The study was conducted in the month of July 2023. The analysis was done using SPSS version 20 setting the statistical significance as less than 0.05.

Results: The study found a prevalence of dental caries, periodontal disease and malocclusion among the special children. A prevalence of 84.17% of dental caries, 39.5% of gingivitis, 6.11% of periodontitis and 62.23% of malocclusion was observed among the study population.

Conclusion: A very high prevalence of dental diseases was seen among the children with special needs. Various school dental programs need to be implemented at the special schools so as to promote the importance of oral health among them as well as their caretakers. The burden of dental diseases can be reduced if the children are continuously monitored and the preventive measures are initiated at the earliest.

Keywords; *Special care, Special children, Disability, Oral health, Special needs*

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Senior Lecturer, **Professor and Head, * Reader, Department of Public Health Dentistry, KMCT Dental College, Kerala*

Introduction

Oral care is regarded as the top most unmet health need among children born with any disability.¹ As defined by the American Health Association, a child who is unable to coordinate his physical, social and mental capabilities is called as “disable”.² Oral health is an important part of the general health and importance should be given to it not only when there is a need such as pain, difficulty in speech and mastication but also during the early stages of the disease when the changes are reversible. Use of preventive measures in early stages can help to avoid complications of late dental care. In the case of special children, coordinative movements are difficult to perform which acts as a barrier to the maintenance of good oral hygiene.³

Among the oral diseases, dental caries, periodontal disease and malocclusion are seen to be more prevalent among special children.⁴ Due to their physical and mental impairment, specially challenged children are categorized to be a high risk group for dental diseases. Specially challenged children are neglected when compared to normal population, as their access to oral health care services are

minimal. Oral health of these children are often ignored by their caregivers as it is considered to be less important. The primary reason is due to the lack of awareness of the impact of oral diseases on the quality of life of specially challenged children. Thus, it is very much important to know the oral health burden among the special children in order to institute preventive and treatment modalities for improving their oral health.⁴

Assessment of oral health needs of such specially challenged individuals can provide the information required for planning both preventive and curative strategies needed for the oral health benefit of such individuals. Hence a retrospective study was framed to estimate the pattern of oral diseases among the special children of Kozhikode district, Kerala.

Materials & Methods

This retrospective study was conducted by retrieving the data from clinical records of peripheral camps conducted by the department of Public Health Dentistry at KMCT Dental College at special schools located in Kozhikode district from June 2017 to May 2023

period. The secondary analysis of the survey data was conducted within a duration of one month in July 2023. The peripheral camps organized by the department of Public Health Dentistry utilized a survey performa which records the Dental caries, Gingival and Periodontal health, Malocclusion and Oral lesion status.

The data regarding decay, missing and filled status was extracted from the survey records of the caries assessment. Care was taken to ensure that only those tooth which were missing and filled due to caries was included. Presence of oral lesions were categorized as per the criteria of World Health Organisation (WHO) basic oral health survey methods 1997.⁵ During the data collection, gingival bleeding within 30seconds of probing the sulcus with a periodontal probe was considered as “Gingivitis”. A Periodontal pocket measuring 6mm or more using a WHO/ CPI probe was considered as “Periodontitis”.

The extracted data was tabulated in Microsoft excel and later transferred to SPSS version 20 for data analysis. The quantitative variables were expressed as

mean and standard deviation while the qualitative data were summarized in percentages. The results were considered statistically significant if attained p value less than 0.05.

Results

The data of 556 subjects from 7 special schools in Kozhikode district, Kerala was collected during 2017-2023 time period. The mean age of the special population was 24.21 ± 13.81 . The study population comprised of 51.4% (N=286) males and 48.6% (N=270) females. (Figure 1). A high prevalence of oral diseases was observed among the special children in Kozhikode district, Kerala (Figure 2).

The study showed that among the 556 study participants, 468 of the study subjects had dental caries and 88 of them were caries free accounting for a prevalence of 84.17%. Out of the decayed teeth, 20.1% (N=112) were root stumps and 10.61% (N=59) were grossly decayed teeth. The study also observed 8.3% (N= 46) of the teeth to have chronic pulpitis. When assessing the treatments received for dental caries 1.3 % (N=7) of the special children had received restorations and 10.25%

(N=57) of the study subjects had extracted their teeth for caries (Table 1.1).

On assessing the periodontal health of the special children, 39.5% (N=220) had Chronic Generalized Gingivitis, 2.87% (N=16) had Localized Periodontitis and 3.23% (N=18) had Chronic Generalized Periodontitis (Table 1.2).

Assessment of malocclusion revealed that 62.23% (N=346) of the special children had some form of malocclusion. None of the special children had prevalence of oral lesions.

S. No	Caries status of the study population	n (%)
1	Decayed	468 (84.17%)
2	Missing	57 (10.25%)
3	Filling	7 (1.3%)

Table 1.1

Caries status of the study population

S. No	Periodontal status of the study population	n (%)
1	Chronic Generalised Gingivitis	220 (39.5%)
2	Localised Periodontitis	16 (2.87%)
3	Chronic Generalised Periodontitis	18 (3.23%)

Table 1.2: Periodontal status of the study

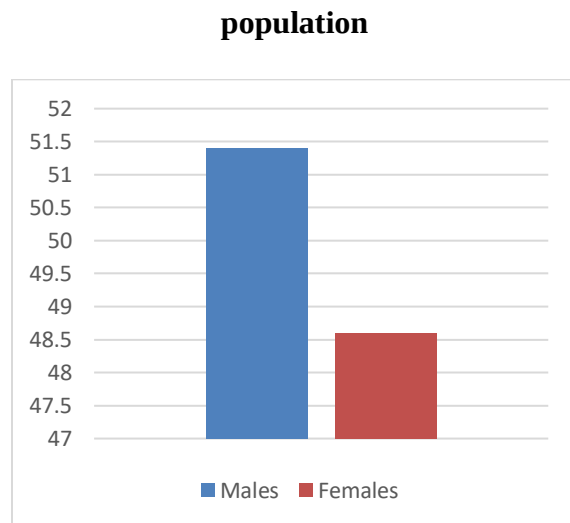


Figure 1: Gender distribution of the

Study Population

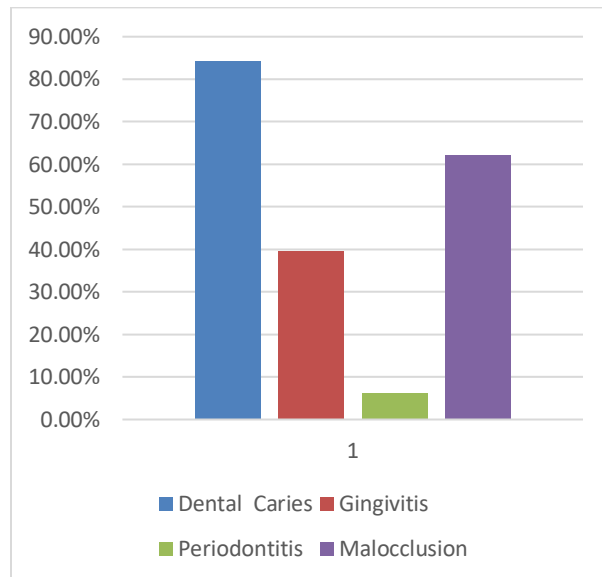


Figure2: Prevalence of oral diseases among the special children

Discussion

The present study was conducted to determine the prevalence of oral diseases among the special children of Kozhikode district, Kerala. The study was conducted as a secondary data analysis of various peripheral camps conducted at special schools in Kozhikode district, Kerala by the Department of Public Health Dentistry of KMCT Dental College.

The age of the study population was 24.2 ± 13.81 which signifies a percentage of

adult population among the special children. The factor age is not considered as a significant determinant among the special children because unlike normal individuals, the developmental age may not coincide with their intellectual age. Hence a diverse age range may be obtained among the children attending special schools.

The study revealed a high caries prevalence of 84.17% which signified that among the 556 study subjects, 468 had dental caries and the rest 88 subjects were only caries free. Our results were similar to the study by Juma Omran et al where, 85.2% of the special care children had dental caries and only 14.8% of the population were caries free.⁶ High prevalence of caries can be attributed due to, poor oral hygiene maintenance and intake of medicines containing sugars which act as caries initiators.⁷

The study observed that Chronic Generalised Gingivitis was prevalent among 39.5% of the study population and this finding was found to be similar to a study done in Pakistan, where 23.9% of the study subjects were observed to have bleeding on probing.⁸ Our study found

6.11% (N=34) prevalence of periodontal disease among the special children and our study findings were in accordance with the study done by Mangi et al in which only 8.2% of the special care population were found to have pockets more than 6mm.⁸

A similar study done by Ameer et al however concluded that the level of periodontal disease was higher among the visually impaired population.⁹ High prevalence of periodontal disease was attributed to improper brushing as well as lack of awareness regarding presence of plaque and bleeding gums. A low occurrence of periodontal conditions among our special population could be due to the dependence on their respective care takers for maintaining their oral health.

When analysing the treatment needs it was found that, 47.12% of study population needed endodontic treatment. This result was lower to the study conducted by Hsiao et al in which 61.78% of the study subjects required endodontic treatment due to their dental caries.¹⁰ Apart from endodontic treatment, 40% of our special population needed periodontal treatment and 26.43% of them had to

undergo tooth extractions.

Unlike other studies being conducted this study could not categorise the special children according to their degree of impairment due to lacunae in the data collected in majority of the dental camps except for one center. On analyzing the degree of impairment from the single center, among 103 special care children, 6.79% of them had learning difficulty, 5.82% of the study members had epileptic disorders. A very narrow proportion of 1.94% were autistic, had walking difficulty, hearing and speech impairment. In addition, the oral examination revealed fissured tongue, aphthous ulcers, cleft palate, and hypodontia among the study population.

Even though the data used to evaluate the oral health status of special care children was a secondary analysis of clinical records, the results can be generalised to other special children due to the large sample size obtained from the peripheral camps conducted. A probable bias could be introduced as the data collected for the study was done across a time frame from 2017 – 2023 during peripheral camps conducted which had

different examiners adding an element of inter examiner variability

Conclusion

Advancement in medical and dental technology is common and highly encouraged today. Various new contribution to the dental field has been put forward to prevent the progression of oral diseases. But special children always are found to be a neglected cohort in our society and the needed dental care is not provided to them. A high prevalence of dental diseases such as dental caries, gingivitis and malocclusion was observed among the specially challenged children of Kozhikode, district Kerala. It is recommended that, school oral health programmes should be implemented at special schools which includes preventive modalities such as pit and fissure sealants, fluoride application, oral hygiene development skills and awareness about the importance of oral health. It is important that the caretakers of the special children should also be given instructions as this vulnerable population are highly dependent on them. A continuous and closely monitored dental care can eventually tackle

the dental problems prevalent among the special care children.

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Review Article

OPTIMIZING ORAL WELLNESS: THE CRUCIAL CONNECTION BETWEEN DIET, NUTRITION, AND PERIODONTAL HEALTH

*Vishnu G , ** Harish Kumar V V , ***Navia George, **** Aparna TK

Abstract

This article explores the crucial link between nutrition and periodontal health. Examining how dietary choices impact oral tissues, it emphasizes the role of balanced nutrition in preventing periodontal diseases. Insights into nutrient deficiencies and their implications provide a foundation for promoting optimal oral wellness through dietary interventions.

Keywords: *Nutrition, Periodontium*

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Introduction

The intricate interplay between host nutrition and periodontal health underscores the significance of dietary habits in shaping the course of periodontal diseases.¹ Periodontal health, a critical aspect of overall well-being, is influenced by a myriad of factors, and nutritional choices stand out as a key determinant in this

complex relationship.² Periodontal diseases, encompassing gingivitis and periodontitis, are characterized by inflammation and subsequent tissue destruction surrounding the teeth.¹ This introduction sets the stage for a comprehensive exploration of the dynamic interaction between host nutrition and the periodontium, shedding light on the nuanced ways in which dietary components

contribute to the maintenance or deterioration of periodontal health.¹

Impact of Nutrients on Periodontal Tissues:

The maintenance of healthy periodontal tissues is intricately tied to the availability of essential nutrients, which contribute to their structural integrity and overall well-being.^{3,4} Key vitamins and minerals play a crucial role in supporting the health of the gingiva and periodontal ligament, contributing to the prevention of periodontal diseases.

Vitamins such as vitamin C are vital for collagen synthesis, a fundamental component of periodontal tissues. A deficiency in vitamin C has been associated with an increased risk of periodontal breakdown, emphasizing the importance of ensuring adequate intake to support periodontal tissue health.⁴ Similarly, the intake of fruits and vegetables, rich in antioxidants such as vitamins A and E, has been positively associated with periodontal healing after nonsurgical periodontal therapy.⁴ Moreover, studies have demonstrated that higher intakes of β -

carotene, vitamin C, and α -tocopherol, found in various fruits and vegetables, are positively associated with improved periodontal healing, particularly in nonsmokers undergoing nonsurgical periodontal therapy.⁴

Vitamin C and Collagen Synthesis:

Vitamin C, also known as ascorbic acid, is a crucial micronutrient that plays a pivotal role in collagen synthesis within the periodontium.⁵ Collagen is a major structural protein in connective tissues, including those found in the gingiva and periodontal ligament. Adequate levels of Vitamin C are essential for the hydroxylation of proline and lysine residues during collagen formation.⁵ Research has shown a direct correlation between Vitamin C deficiency and compromised collagen synthesis, leading to impaired periodontal health. A study by Dodington et al. demonstrated that higher intakes of Vitamin C were associated with improved periodontal healing following nonsurgical periodontal therapy.⁵

Furthermore, a review by Nishida et al. highlighted the critical role of Vitamin C in

preventing periodontal diseases by promoting collagen production and maintaining the structural integrity of periodontal tissues.⁵ The review emphasized that Vitamin C deficiency could lead to weakened gingival tissues and increased susceptibility to periodontal breakdown.

Omega-3 Fatty Acids and Inflammation:

Omega-3 fatty acids, notably eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), are essential components of a balanced diet and have gained attention for their potential anti-inflammatory properties. Several studies have investigated their role in modulating inflammation, including within the periodontium. A study by El-Sharkawy et al. explored the adjunctive treatment of chronic periodontitis with daily dietary supplementation of omega-3 fatty acids and low-dose aspirin.⁶ The research demonstrated that the inclusion of omega-3 fatty acids in the diet, known for their anti-inflammatory effects, contributed to improved periodontal parameters. The

study suggested that these fatty acids, in combination with low-dose aspirin, could be beneficial in managing chronic periodontitis by mitigating inflammatory responses.

Calcium and Alveolar Bone Integrity:

Calcium is a major component of the mineralized matrix in bone, providing strength and density to the alveolar bone surrounding the teeth.⁷ This mineral contributes to the formation and maintenance of hydroxyapatite crystals, the mineralized structure that gives bones their rigidity and stability.⁷

Several studies have highlighted the association between calcium intake and periodontal health. In a study by Nishida et al., it was found that a diet rich in calcium is inversely associated with the risk of periodontal disease.⁸ The research suggests that maintaining adequate levels of calcium through dietary sources or supplements may contribute to the prevention of bone loss in the periodontium.

Additionally, calcium is involved in various cellular processes within the bone,

including osteoblast and osteoclast activity, which are crucial for bone remodelling and maintaining the balance between bone formation and resorption⁸. Imbalances in these processes can lead to pathological changes in the alveolar bone, affecting its integrity and compromising periodontal support.

Vitamin D and Periodontal Immunity:

Vitamin D, a fat-soluble vitamin, has emerged as a significant player in modulating immune responses within the periodontium, showcasing its multifaceted role in oral health.⁹ Research suggests that it plays a crucial role in maintaining the delicate balance of the immune response in the periodontium. Adequate vitamin D levels have been associated with enhanced antimicrobial activity, promoting a defensive environment against periodontal pathogens.⁹ Moreover, vitamin D has been linked to the regulation of inflammatory mediators, such as interleukin-10 (IL-10) and tumor necrosis factor-alpha (TNF- α), contributing to the overall immune homeostasis in periodontal tissues.¹⁰

Deficiency in vitamin D has been implicated in an increased susceptibility to periodontal diseases. Studies have shown an inverse relationship between serum concentrations of 25-hydroxyvitamin D3 (25(OH)D3), the major circulating form of vitamin D, and the prevalence of periodontal disease.¹¹ Individuals with lower vitamin D levels may exhibit compromised immune responses, potentially leading to an exacerbated inflammatory state in the periodontium.

In the context of periodontal therapy, maintaining optimal vitamin D levels has been suggested to enhance the efficacy of treatment. Vitamin D supplementation, when coupled with nonsurgical periodontal therapy, has shown potential in improving clinical outcomes and reducing markers of inflammation.¹¹

Antioxidants in Periodontal Tissues:

Antioxidants, including vitamins E and A, are vital components that contribute to the defense mechanisms against oxidative stress in periodontal tissues¹². These compounds neutralize free radicals,

preventing cellular damage and inflammation.

Vitamin E, a potent antioxidant, has been associated with reduced oxidative stress in the periodontium.¹⁰ Its ability to quench reactive oxygen species contributes to maintaining a balanced environment conducive to periodontal health. Vitamin A plays a role in supporting periodontal tissue integrity by combating oxidative stress.¹² Its antioxidative properties contribute to mitigating the detrimental effects of reactive oxygen species on periodontal structures. Polyphenols, found in various plant-based foods, exhibit antioxidant properties and have been linked to anti-inflammatory effects in the periodontium.¹³ Their role in reducing oxidative stress contributes to a healthier periodontal environment. Enzymatic antioxidants, such as superoxide dismutase and catalase, are crucial for maintaining redox balance in the periodontium.¹³ Their enzymatic activities contribute to neutralizing reactive oxygen species and preventing oxidative damage.

Clinical studies have demonstrated the significance of antioxidants in mitigating

oxidative stress and improving periodontal parameters. Incorporating antioxidant-rich foods and supplements into the diet may have a positive impact on periodontal health.¹³

Conclusion:

In conclusion, the symbiotic relationship between nutrition and periodontium underscores the significance of dietary choices in maintaining optimal oral health. A balanced and nutrient-rich diet not only supports the immune system but also plays a pivotal role in preventing periodontal diseases. Vitamins and minerals contribute to tissue integrity, while antioxidants combat oxidative stress. Understanding this connection empowers individuals to make informed dietary decisions, promoting a resilient periodontium and reducing the risk of oral health complications. Embracing a holistic approach to nutrition emerges as a fundamental strategy for fostering a healthy smile and ensuring the longevity of periodontal well-being.

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Review Article

REVOLUTIONIZING PERIODONTAL CARE: THE TRANSFORMATIVE POWER OF LASER THERAPY

*Vachana R **Harish Kumar V V ***Anish Varkey ****Aparna T K

Abstract

Periodontal diseases pose a persistent challenge to global oral health, necessitating innovative approaches for effective and patient-friendly treatment. This article explores the paradigm shift in periodontal care through the lens of laser therapy, a cutting-edge technology that promises to redefine traditional treatment methods. We delve into the mechanisms, benefits, and clinical applications of lasers in periodontology, emphasizing their potential to enhance precision, reduce patient discomfort, and expedite the healing process. Drawing on key studies and clinical experiences, this article provides a comprehensive overview of the diverse roles lasers play in periodontal therapy, from bacterial reduction and gingival reshaping to their adjunctive use with conventional methods. Our exploration unveils the promising future of laser-assisted periodontal care, highlighting its transformative impact on patient experience and oral health outcomes.

Key Words; *Laser, Periodontics, Periodontology.*

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Introduction

In the ever-evolving landscape of dentistry, the quest for advanced and patient-friendly treatment modalities persists. Among the

remarkable innovations, laser technology has emerged as a beacon of hope, reshaping the landscape of periodontology. This article delves into the realm of laser-assisted periodontal therapy, exploring its

mechanisms, benefits, and transformative potential.

LASER is the acronym for “light stimulated by radiation emission” and was first introduced into Periodontology in the 1990s as a method of diagnosis and surgical treatment. This device emits light in a small and non-divergent intense beam, with enough energy to cut through both hard and soft tissues.¹

Periodontal diseases, encompassing conditions such as gingivitis and periodontitis, pose a significant global health challenge. Traditional treatment methods, including scaling and root planning, have long been the mainstay of periodontal care. However, the limitations of these approaches in terms of invasiveness, patient discomfort, and postoperative complications have fuelled the exploration of alternative solutions.

Laser therapy—a groundbreaking approach that holds promise in revolutionizing how we address periodontal diseases. This article aims to shed light on the multifaceted aspects of laser applications in periodontology, drawing on a body of research that underscores its efficacy and patient-centric advantages.

Dental lasers may contribute to the field of periodontology, where other types of therapy and protocols cannot achieve the best clinical outcome. Even though there is limited evidence supporting laser-mediated periodontal therapy over traditional treatment (Cobb 2006), there are reasons to include lasers in periodontal therapy as an adjunctive tool or as an alternative to conventional methods. Due to the benefits of lasers, such as ablation or vaporization of the inflamed tissues, haemostasis and bactericidal effects may improve the periodontal condition and clinical outcomes. Less treatment time, less vibration and noise, as well as less operative pain, reduce the physical and mental stress of the patient and dentist (Ishikawa and Sculean 2007). Certainly, disadvantages like the costs of the equipment and the thermal side effects in conjunction with high risk of tissue destruction have to be considered for clinical application in daily routine practice. There are two terms important for laser-assisted periodontal therapy:

- 1) Laser decontamination, which defines bacteria reduction within the inflamed periodontium, implant surfaces, and the beneficial effects in the biofilm and

2) Laser coagulation, which means sealing of the blood vessels, capillaries, and lymphatic vessels in the inflamed tissues after laser decontamination

Rocca JP (2008) and more recently Meleti et al (2015) divided lasers used in the oral surgery field into two categories according to the degree of wavelength absorption in soft and hard tissues

Lasers that can be used in soft tissues with good absorption in haemoglobin, oxyhaemoglobin and melanin with wavelengths ranging from 532nm-1064nm:

1. KTP laser
2. Diode laser with wavelength between 864 nm – 1064 nm
3. Nd: YAG laser with wavelength of 10654 nm

Lasers that can be used in hard tissues with good water and hydroxyapatite absorption having wavelengths between 2780 nm-10600 nm:

1. Er: YAG laser with wavelength of 2780 nm
2. Er, Cr: YSGG laser with wavelength of 2940 nm

3. CO₂ laser with wavelength of 9300 nm, 10600 nm²⁻⁴

Lasers in periodontics and peri-implant therapy

As a result of increase in the basic and clinical investigations related to Diode, CO₂, Nd: YAG, Er: YAG & Er, Cr: YSGG lasers, application of laser for periodontal and implant therapy have gradually expanded.⁵⁻⁶ Adjunctive use of lasers for initial periodontal therapy, not only to debride connective tissue & epithelium within pockets, but also to inactivate bacteria that invade the periodontal tissues can be carried out with the help of these wavelengths with moderate power output. In addition, Erbium lasers have been observed to achieve ablation of calculus with efficiency that can be compared with hand/ultrasonic instruments thus preserving the underneath root cementum.⁷

Precise & small procedures with minimal damage around the treated site can be performed by the practitioners with laser power delivered through a fine laser tip. Such a precise treatment modality is of great importance while performing minimally invasive periodontal treatments.⁸

Lasers in initial periodontal therapy scaling and root planning

Soft tissue lasers are a good choice in bacterial reduction and coagulation. The erbium group of lasers has shown significant bactericidal effect against *Porphyromonas gingivalis* and *Actinobacillus actinomycetemcomitans*.⁹ Reduction of interleukins and pocket depth was noted with laser therapy

Laser-assisted new attachment procedure (LANAP)

Initial reports suggest that LANAP can be associated with cementum-mediated new connective tissue attachment and apparent periodontal regeneration of diseased root surface in humans

Surgical procedures

Many studies showed an increased coagulation and a relatively dry surgical field and better visualization.¹⁰ Laser increases tissue surface sterilization which reduces bacteraemia, and decreases swelling, oedema, and scarring. Laser is effectively used to perform gingivectomies and gingivoplasties. Gingival depigmentation using laser ablation has been

recognized as an effective, pleasant, and a reliable technique. Finkbeiner in 1994 suggested the usefulness of argon laser in soft tissue welding and soldering compared to conventional tissue closure method. At present, lasers are employed for frenectomy, free gingival graft procedures, crown lengthening, operculectomy, and many more.¹¹

Laser and implants

Gingival enlargement is relatively common around implants when they are loaded with removable prosthesis. Lasers can be used for the hyperplasia removal as well as in the treatment for peri-implantitis. Er: YAG laser, due to its bactericidal and decontamination effect, can be used in the maintenance of implants. It has high bactericidal effect without heat generation around implants¹²

Minimally invasive flapless periopocket surgery

Laser therapy is well accepted by patients as a minimally invasive procedure that potentially reduces the necessity of subsequent periodontal flap surgery¹³

LANAP & LAIP

LANAP was developed by two dentists in California; Robert Gregg and Del Mc Carthy 1989, who were looking for alternatives to conventional periodontal surgery, especially for periodontally hopeless teeth. Through trial and error several evolutions and name changes from Laser ENAP to LPT to LANAP, the definitive LANAP protocol was established and patented.¹⁴ LANAP is a minimally invasive surgical procedure as indicated in systematic review of the AAP workshop by Kao et al (2015) and in a recent review by Aoki et al (2015)

Wound healing

Improved blood flow

- Laser therapy significantly increases the formation of new capillaries (tiny blood vessels) within damaged tissues.

Reduced formation of scar tissue

- Laser therapy reduces the formation of scar tissue (fibrous tissue) following tissue damage related to cuts, burns, and surgery.
- Laser therapy is able to reduce this formation by speeding up the healing process, improving the blood flow to the

injured area, and more effectively carrying away waste products.

- Faster healing always leads to less scar tissue formation¹⁵

Effects of Lasers on Periodontal Therapy

Pain relief

- Laser therapy blocks the pain signals transmitted from injured parts of the body to the brain. This decreases nerve sensitivity and significantly reduces the perception of pain¹⁶

Accelerated tissue repair and cell growth

- Photons of light emitted by therapeutic lasers penetrate deeply into the tissues of the body to stimulate the production centers of individual cells

Recent Advances

- Waterlase system is a revolutionary dental device that uses laser energized water to cut or ablate soft and hard tissue.
- Periowave™, a photodynamic disinfection system, utilizes nontoxic dye (photosensitizer) in combination with low intensity lasers enabling

singlet oxygen molecules to destroy bacteria (Thomas, 2006)¹⁷

Conclusion

In conclusion, the integration of lasers in periodontology represents a groundbreaking advancement that has revolutionized traditional dental treatments. The precision, efficiency, and minimally invasive nature of laser technology offer numerous benefits for both patients and practitioners.

Laser assisted periodontal procedures have demonstrated superior outcomes compared to conventional methods, showcasing reduced bleeding, swelling, and clinicians to address periodontal issues with unparalleled precision, preserving healthy tissue and promoting faster healing.

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Review Article

BACTERIAL BALANCE: PROBING THE ROLE OF PROBIOTICS IN PERIODONTAL HEALTH

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Abstract

This abstract explores the role of probiotics in periodontal health, examining their potential as adjunctive agents in preventing and managing periodontal diseases. The review encompasses studies on probiotic strains, their mechanisms of action, and clinical outcomes in periodontal patients. By analyzing existing research, it aims to contribute insights into the therapeutic implications of probiotics in periodontology, shedding light on their effectiveness and future prospects for improving oral health.

Key Words; *RME, Expansion, Mouth Breathing.*

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Introduction

In the intricate ecosystem of the oral cavity, maintaining a delicate balance between pathogenic and beneficial microorganisms is paramount for overall oral health. Periodontal diseases, characterised by inflammation and infection of the supporting structures of the teeth, pose a significant challenge to dental practitioners worldwide. Traditional approaches often involve antibiotics and

antimicrobial agents, but emerging research has turned the spotlight on a more nuanced strategy -the use of probiotics.

Probiotics, known for their positive influence on gut health, have recently garnered attention for their potential in realm of periodontology. These live microorganisms, primarily bacteria, when administered in adequate amounts, offer the prospect of modulating the oral microbiome to favourably impact periodontal health.

This article delves into the burgeoning field of probiotics in periodontology, exploring their mechanism of action, current research findings and the promising avenue they represent in the pursuit of effective and sustainable oral care.

Periodontal diseases, encompassing conditions such as gingivitis and periodontitis, disrupt the harmonious balance within the oral microbiome. Inflammation and infection of the supporting structures of the teeth characterize these conditions, leading to the progressive degradation of periodontal tissues. Conventional treatments have often targeted the elimination of pathogenic microorganisms using antibiotics, yet concerns regarding antibiotic resistance and the disturbance of the indigenous microbiota have prompted a quest for alternative approaches.

Probiotics, by definition, are live microorganisms that confer health benefits when administered in adequate amounts. The concept revolves around the strategic introduction of beneficial bacteria to restore balance and counteract the proliferation of pathogenic species.

Discussion

Probiotics in periodontal health

Probiotics are defined as living microorganisms, principally bacteria, that are safe for human consumption and, when ingested in sufficient quantities have beneficial effects on human health, beyond basic nutrition. Metchnikoff was the first to state that probiotics could provide a health benefit and proposed that Bulgarian people had a longer longevity due to fermented milk containing viable bacteria. “Probiotic” term, as opposed to “antibiotic”, was initially proposed by Lilley and Stillwell in 1965. First probiotic species to be introduced in research was *Lactobacillus acidophilus* by Hull et al. in 1984; followed by *Bifidobacterium bifidum* by Holcomb et al. in 1991.¹

Lactobacilli are gram positive, rod shaped, facultative anaerobes. Some of the most commonly known members that have been isolated and studied are *Lactobacillus acidophilus*, *L. reuteri*, *L. bulgaricus*, *L. rhamnosus*, *L. Salivarius* and *L. casei*. Bifidobacteria are gram positive, anaerobic bacteria, with some of the most commonly known members being *Bifidobacterium*

bifidum, B. breve, B. longum and B. infantis (Turrone et al, 2014).²

Probiotics fulfil many useful functions, thus having a major health impact. They produce lactic acid with antibacterial effect, hydrogen peroxide with antiseptic effect, and anti-viral and anti-fungal agents that suppress pathogens. Probiotics are important for immune system development and regulation, maintenance of a healthy lining of gastrointestinal tract, food digestion, synthesis of amino acids, proteins and different vitamins, absorption of calcium, iron and vitamin D (Ciorba, 2012; LeBlanc et al., 2012; Jonathan and David, 2013). In order to exert all these effects, probiotics need to be able to survive the gastrointestinal passage resisting acid and bile and to preserve their stability during manufacturing and storage (Meurman, 2015).²

Studies have shown that a combination of different probiotic species and/or strains (e.g. Lactobacillus rhamnosus GG and Bifidobacterium lactis Bb12) can enhance their effects in a synergistic manner (Juntunen et al., 2001; Toivainen et al., 2015).²

The effects of probiotics can originate from three local or systemic main modes of action (Gueimonde and Salminen, 2006; Shira and Gorbach, 2006; Devine and Marsh, 2009).²

1. Indirectly, probiotics compete with pathogens for essential nutrients; they can also restrict the pathogens' adhesion capabilities by changing the environmental pH.
2. Directly, probiotics are involved in the production of antimicrobial substances (lactic acid, hydrogen peroxide, bacteriocins) that can kill or inhibit the growth of periodontal pathogens.
3. Probiotics can act on the host by modulating the host's innate and adaptive immune response (reducing the production of pro-inflammatory cytokines: IL-6, IL-1 β , TNF α and increasing production of anti-inflammatory cytokines: IL-10) and by providing the intestinal barrier integrity (Ciorba and Stenson 2009)

There are fewer experimental studies exploring probiotic use in periodontal diseases, partly reflecting a poorer understanding of the precise etiology of the disease and of the conditions that promote health.

Grudinov et al studies the effect of probiotic tablets on gingivitis and different grades of periodontitis and observed that probiotic treatment resulted in better microbiota normalization than control group.³

The prevalence of lactobacilli particularly *L. gasseri* and *L. fermentum*, in the oral cavity was greater among healthy participants than among patients with chronic periodontitis. Various studies have reported the capacity of lactobacilli to inhibit the growth of periodontopathogens, including *P. gingivalis*, *Prevotella intermedia* and *A. actinomycetemcomitans*. These suggest that lactobacilli residing in oral cavity could play a role in oral ecological balance.⁴

In a study by Krasse et al., patients with moderate to severe gingivitis who were given either one of two *L. reuteri* formulations had reduced plaque and gingivitis scores compared to a placebo group.⁵

The study conducted by Vivekananda et al confirms the plaque inhibition, anti-inflammatory, and antimicrobial effects of *L.reuteri* Prodentis. *L.reuteri* Prodentis probiotic can be recommended during non-

surgical therapy and the maintenance phase of periodontal treatment. Considering the beneficial effects of probiotics, this therapy could serve as a useful adjunct or alternative to periodontal treatment when SRP might be contraindicated.⁶

Riccia and colleagues studied the anti-inflammatory effects of *Lactobacillus brevis* in a group of patients with chronic periodontitis. A significant reduction in salivary levels of prostaglandin E2 (PGE2) and matrix metalloproteinases (MMPs) was observed. The beneficial anti-inflammatory effects of *L. brevis* could be attributed to its capacity to prevent the production of nitric oxide and consequently the release of PGE2 and the activation of MMPs induced by the nitric oxide.⁷

Shimauchi et al reports that regular intake of tablets containing *Lactobacillus salivarius* resulted in benefits in terms of pocket probing depth and plaque index in individuals at high risk of periodontal disease(smokers) compared to placebo control group.⁸

L.reuteri lozenges were also used for 12 weeks in a randomised, placebo -controlled clinical trial in 30 adults with moderate to severe previously untreated chronic

periodontitis (Teughels et al.,2013). The group found that there was more pocket depth reduction and attachment gain, together with reduction and attachment gain, together with reduction in Porphyromonas gingivalis numbers in the probiotic group when compared with controls.⁹

Two strains of L. reuteri tablets were used for 30 days in a double-blind, placebo-controlled, randomised clinical trial in non-smoking patients with initial to moderate chronic periodontitis (Vicario et al., 2013). The probiotics used significantly improved short term clinical outcomes (bleeding on probing, plaque index, periodontal pocket depth). No statistically significant changes could be shown in the control group.¹⁰

“Replacement therapy “is also known as “probiotic therapy”. The concept of bacterial replacement therapy in periodontics was first introduced by Teughels et al in 2007.They reported that the subgingival application of a bacterial mixture including streptococcus sanguis, S. salivarius, and streptococcus mitis after scaling and root planing significantly suppressed the recolonization of Porphyromonas gulae and P. intermedia in a beagle dog model.¹¹

Nackaerts observed that the subgingival application of beneficial oral bacteria (i.e. streptococcus sanguinis, streptococcus salivarius and S. mitis) delays recolonization by periodontal pathogens, reduce inflammation and improve bone density and bone levels in a beagle dog model. This guided pocket recolonization approach may provide a valuable addition or alternative to the armamentarium of treatment options for periodontitis.¹²

Conclusion

In conclusion, the role of probiotics in periodontology shows promise in promoting oral health by influencing the balance of the oral microbiota. While more research is needed to fully understand the specific mechanisms and optimal strains for periodontal health, current evidence suggests that incorporating probiotics may offer a complementary approach to traditional periodontal care. As our understanding deepens, the integrating probiotics into periodontal management could contribute to improved preventive and therapeutic strategies of periodontal diseases.

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Review Article

ROLE OF NEUTROPHILS LINKING PERIODONTITIS AND ATHEROSCLEROTIC CARDIOVASCULAR DISEASES

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Abstract

Inflammation plays a crucial role in the onset and development of atherosclerosis. Periodontitis is a common chronic disease linked to other chronic inflammatory diseases such as atherosclerotic cardiovascular disease (ASCVD). This critical review aims at discuss the role of neutrophils in mediating the relationship between periodontitis and ASCVD.

Systemic inflammation triggered by periodontitis could lead to adaptations in hematopoietic stem and progenitor cells (HSPCs) resulting in trained granulopoiesis in the bone marrow, thereby increasing the production of neutrophils and driving the hyperresponsiveness of these abundant innate-immune cells.

Key Words; *Periodontitis, Periodontal disease, atherosclerosis, atherosclerotic cardiovascular disease*

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Introduction

Atherosclerotic cardiovascular disease (ASCVD) encompasses a range of conditions affecting the heart and blood vessels, such as coronary heart disease,

cerebrovascular disease, and peripheral vascular disease.¹

Periodontitis, a prevalent chronic inflammatory condition resulting from oral microbial dysbiosis, is characterized by the gradual degradation of supportive structures

for teeth, including the periodontal ligament and alveolar bone. While the connection between periodontitis and systemic diseases has traditionally focused on the physical dissemination of periodontal bacteria and endotoxins through the bloodstream, it is crucial to recognize that periodontitis also instigates systemic inflammation. This is evident through elevated levels of inflammatory markers such as C-reactive protein (CRP), TNF- α , IL-1 β , and IL-6 in the serum of affected individuals, further linking periodontitis to ASCVD.²

Neutrophils, the most abundant inflammatory cells in humans and primary defenders against infections in the innate immune system, are derived from the myeloid differentiation lineage of hematopoietic stem cells (HSCs) in the bone marrow. The recent consensus between the European Federation of Periodontology and the World Heart Federation incorporates neutrophil hyper-responsiveness as one of the mechanisms explaining the epidemiological association between periodontitis and ASCVD.²

The link between periodontitis and ASCVD

The impact of the treatment of periodontitis on cardiovascular outcomes and surrogate markers of ASCVD has been extensively explored. Patients with periodontitis exhibit an increased risk of coronary and cerebrovascular events compared with periodontally healthy individuals. Treatment of periodontitis may influence the progression of ASCVD.

A possible mechanism by which local periodontal treatment improves endothelial function in periodontitis patients is endothelial nitric oxide synthase/nitric oxide (eNOS/NO) activation. NO is mainly produced by eNOS in endothelial cells and induces the relaxation of smooth muscle cells. Meanwhile, IL-6, TNF α , IL-1 β , and CRP directly reduced eNOS at both mRNA and protein levels in human endothelial cell. As a result, NO bioavailability in the serum is reduced, leading to endothelial dysfunction and periodontitis is associated with this surrogate marker of ASCVD. Patients with periodontitis exhibit an elevated level of systemic pro-inflammatory mediators, which include CRP, TNF α , IL-

1 β , IL-6, as well as increased neutrophil numbers in the blood.³

Periodontitis as a trigger of systemic inflammation

Patients with periodontitis exhibit an elevated level of systemic pro-inflammatory mediators, which include CRP, TNF α , IL-1 β , IL-6, as well as increased neutrophil numbers in the blood.³

Systemic inflammation triggered by periodontitis potentially occurs because of bacterial dissemination or periodontal tissue derived inflammatory mediator leakage into the blood circulation. The ulceration of the epithelium owing to local periodontal inflammation along with the support of its rich vascularization may provide greater access for bacteria and their endotoxins such as lipopolysaccharides (LPS) to the circulation, leading to bacteremia.⁵

Inflammation and neutrophils: implications for atherosclerosis

Atherosclerosis is a cause of myocardial infarction, ischemic cardiomyopathy, and ischemic stroke that contribute to most deaths in the population worldwide⁴. The onset of atherosclerosis is characterized by endothelial dysfunction,

which induces neutrophil recruitment to the endothelium.

During the early stage of atherosclerosis, upregulation of E-selectin, P-selectin, and ICAM-1 induces neutrophil recruitment. Platelet-derived CCL5 activates neutrophils to release cathepsin G, leading to the firm adhesion to and accumulation of neutrophils in the endothelium. ROS and proteases secreted by neutrophils activate and dysregulate the endothelial cell layer and degrade the underlying extracellular matrix, resulting in monocyte infiltration and LDL extravasation. Neutrophils secrete MPO that mediates LDL oxidation and promotes foam cell formation. Cathelicidin- and α defensin-derived neutrophils activate macrophages towards pro-inflammatory state, while NETs stimulate macrophage to release IL-6 and IL-1 β that promote Th17 differentiation followed by the amplification of neutrophil recruitment.⁶

At the late stage of atherosclerosis, activated VSMCs induce neutrophil chemotaxis and release CCL7 to stimulate NETs. Histone H4-derived from NETs induces VSMC lysis and the secretion of proteases by neutrophils degrades collagen and lyses VSMCs, leading to the plaque

instability. Neutrophils contribute to plaque erosion through NET release as well as colocalization with TLR2 of endothelial cells to induce endothelial cell stress and apoptosis. NETs contribute to thrombus growth, thereby increasing stroke volume. Neutrophils also promote neuronal cell death that is likely mediated by NETs.⁶

Modulation of HSPCs in the Bone Marrow: A Key Role for Periodontitis-Induced Systemic Inflammation

HSPCs can directly sense pathogen associated molecular patterns (PAMPs), such as LPS, via their pattern recognition receptors (PRRs), such as toll-like receptors (for example, TLR-4 for sensing LPS). IL-1 β promotes myeloid differentiation and self-renewal of HSPCs as chronic administration of this cytokine elevates the number of myeloid-bias HSPCs. The increased level of IL-6 in the bone marrow niche promotes myelopoiesis, indicated by an elevated number of multipotent progenitors (MPPs) and common myeloid progenitors (CMPs).

Granulocyte colony-stimulating factor (G-CSF) is a key growth factor that drives granulopoiesis. Specifically, G-CSF

produced by monocytes in the bone marrow niche is responsible for HSPC mobilization from the bone marrow to the circulation. Systemic inflammation, indicated by elevated levels of TNF α , IL-1 β , IL-6 in the serum.

Alteration of Circulating Neutrophils in Periodontitis and its Putative Effect on Atherosclerosis

An elevated number of neutrophils in peripheral blood may increase the risk of ASCVD in periodontitis patients because neutrophil counts from peripheral blood are positively correlated with ASCVD risk.⁷

Hyper-responsiveness of neutrophils characterized by excessive production of neutrophil elastase and ROS in periodontitis patients could also contribute to the late stage of atherosclerosis as both hyper-reactive features induce endothelial apoptosis, resulting in endothelial desquamation (plaque erosion), fibrous cap thinning and plaque ruptures.

Finally, whereas the production of NETs by circulating neutrophils has been shown to be comparable between patients with periodontitis and healthy controls, plasma NET degradation was lower in

patients with periodontitis than in controls, suggesting an impaired NET degradation process in the plasma of periodontitis patients.

Impact of periodontitis treatment on neutrophils

A reduction of several serum inflammatory markers that is expected to reduce the risk of ASCVD is not observed in serum IFN γ and IL-10 because both markers remain unchanged following periodontal treatment. The hyper-responsiveness of these myeloid cells persisted as the levels of cytokines produced by the cells in response to pathogen or LPS stimulation were comparable between neutrophils from patients before and after periodontal treatment

Targeting neutrophils as a novel therapeutic approach: dual benefit on periodontitis and ASCVD.

The oral administration of colchicine in patients with a recent myocardial infarction significantly reduces the risk of ischemic cardiovascular events. A neutrophil granule protein, cathepsin G promotes myeloid cell adhesion to only arterial but not microvascular tissue.⁸ A

neutrophil granule protein, cathepsin G promotes myeloid cell adhesion to only arterial but not microvascular tissue⁸.

Important roles of NETs in both atherosclerosis progression (atherogenesis, plaque destabilization and erosion) and complication (atherothrombosis) stand out as a potential therapeutic target to manipulate cardiovascular inflammation. Peptidyl arginine deiminase 4 (PAD4) citrullinates histone to disrupt electrostatic bonds in nucleosomes, decondensing chromatin that leads to NET release with neutrophil capacity during host defense.⁹

Recent studies revealed that the use of antibodies to inhibit NET derived histones reduced the amplification of NET-induced inflammation rather than completely blocking NETosis or inflammation.¹¹ Additionally, another report exhibited lipid based nanoparticles that were successfully incorporated with identified peptides that interact with the neutrophil-specific surface marker, CD177. Specifically, intravenous administration of metoprolol reduced infarct size and improved cardiac function in patients with acute myocardial infarction.^{13,14}

The pharmacological blockade of the central complement component, C3, inhibits downstream activation of the anaphylatoxin C3a and C5a receptors (C3aR and C5aR, respectively), which induce inflammatory bone loss in a preclinical model¹⁵. Significantly reduced the gingival crevicular levels of MMP-8 and MMP-9, which are the major neutrophil-derived proteases and are considered biomarkers of periodontal tissue destruction.¹⁶

Conclusion

Although clinical intervention studies suggest that periodontal therapy improves surrogate markers of ASCVD, the long-term effects of this oral treatment to maintain such improvement and convincing evidence that successful periodontitis treatment can reduce the risk or incidence of ASCVD are yet to be investigated.

Meanwhile, targeting neutrophils is warranted to improve local periodontal therapy, eliminate periodontitis effectively, that can reduce periodontitis-triggered systemic inflammation and reverse the periodontitis-induced neutrophil changes. Such targeted approaches can be harnessed as a direct treatment for ASCVD and indirect intervention of the disease through

the reduction of heightened systemic inflammation triggered by periodontitis.

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Review Article

DECODING GUIDED IMPLANT SURGERY: UNDERSTANDING TECHNIQUES, BENEFITS AND APPLICATIONS

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Abstract

Guided implant surgery refers to the process of digital planning, custom-guide fabrication, and implant placement using the custom guide and an implant system-specific guided surgery kit. It includes numerous steps beyond the initial prosthetic diagnosis and treatment planning and fabrication of prosthetic radiographic guide: patient scanning, conversion of digital imaging files and importation into a software program, completion of virtual implant treatment planning, integration of a virtual model of the teeth (derived from an intraoral surface scan or an extraoral scan of stone casts) with the cone beam computed tomography model, selection and fabrication of surgical guide, and implant placement using the fabricated surgical guide. Digital planning and placing of dental implants in the correct position keep escalating to a higher achievement level than a classical freehand approach.

Key Words; *Guided implant surgery, guiding implant stents.*

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Introduction

Ideal implant placement favors good esthetic and prosthetic outcomes with optimal occlusion and maintaining the

health of peri-implant tissues with good oral hygiene and proper implant loading.¹ Many computer programs are available to help with three-dimensional (3D) implant positioning. Nowadays, the surgical guide

performs an important role in transferring the premapped idea to the site of implant placement at their designated positions (angulation and depth).²

The surgical template is defined as a “guide to assist proper surgical placement and angulation of dental implants.” The guided implant surgery provides the following: (i) accuracy and precision for placement of implants, (ii) minimally invasive approach to surgery with reduced patient morbidity and avoiding damage to critical anatomic structures, (iii) second-stage implant surgery can be avoided, (iv) use of surgical stents has made immediate loading of implant possible by correct positioning and achieving its primary stability, and (v) less treatment time is needed for the procedure.³

Types of guide-assisted implant surgery

Guided implant surgery protocols are of two types: (1) static- and (2) dynamic-guided approach. The first system uses a surgical template, obtained from computerized tomographic images. However, the implant position cannot be altered intraoperatively. Using specially designed drilling machines, the implant location is usually transferred to the surgical template. The second approach

uses virtual implant positioning from the computerized tomographic images and also provides a “real effect for positioning of implant intraoperatively.”⁴

Treatment protocol for computer-assisted implant surgery

The treatment protocol for computer assisted implant surgery follows the fundamental steps:

1. Cone-beam computed tomography (CBCT) scanning
2. Software program execution
3. Fabrication of surgical drilling guides
4. Surgical procedure.

Step 1: Cone-beam computed tomography scanning

3D images are taken preoperatively via cone-beam computed tomography. It analyzes (1) available bone volume for implant placement, (2) mucosal thickness, (3) adjacent teeth structures, (4) maxillary sinus position, and (5) identifying the position of mandibular canal, incisive canal, and mental foramen.

Step 2: Software program execution

Software programs such as EasyGuide,

Biohorizons, Nobel Biocare, InVivo5, and Simplant are available for planning and guided implant surgery. The 3D images are transformed into Digital Imaging and Communications in Medicine (DICOM) format. After reformatting the images, proper size of the implants is chosen at the site level of placing implant. This provides a virtual environment mimicking surgical procedure, exhibiting the coronal and apical location of the implant in an imported 3D image model of the jaw bone. This is performed in a transactional view to visualize cortical and trabecular bone. Other planes are also checked for ideal placing implants.⁵

Step 3: Fabrication of surgical drilling guides

Upper and lower impressions are taken and bite is registered. Later, the impressions need to be articulated as the poured models on an articulator. The surgical guides are prepared manually or using computer-assisted methods after planning preoperatively. It provides precise implant placement and speedy treatment time.⁵

The steps needed to fabricate the surgical guide are as follows.

Guide supporting surfaces: The surgical guide designs are prepared on the type of supporting surfaces. They are (1) tooth-supported, (2) mucosa-supported, (3) bone-supported, and (4) special-supported surgical guides.



Figure 1: Types of guide supporting surfaces.³

In the first type, the remaining teeth are used for supporting the surgical guide. The second type uses mucosa as used in complete edentulous patients. The third type uses bone support after raising mucoperiosteal flap and has a higher chance of inaccuracy. The fourth type called special-supported guides uses mini implants or pins for supporting the surgical guide placement during implant surgery. After planning the supporting tissues, the surgical guide can be fabricated through computer-assisted guidance.

Reverse treatment planning: Ideal prosthetic treatment plan has to be assessed initially. It is done using one-scan or double-scan procedures. The first procedure includes prosthesis in the patient's mouth using radiopaque resin. The second procedure is a double-step scanning.

Primary scanning includes the patient wearing the denture and secondary scanning allows only prosthesis imaging. After the scanning process, according to individual system protocol, DICOM images are imported from software programs such as Simplant, Nobel guide, and EasyGuide. Then, the fusion of scan prosthesis and the surgical site with an optimal implant position are made by using fiducial markers such as gutta-percha. There are different companies such as keystone (EasyGuide), Compu Guide (Biohorizons), Anatomage, and SurgiGuide (Materialise) to fabricate surgical guides for universal implant system, except Nobel Biocare, for its own implant system.

Method of guide fabrication:

1) Model-based (rapid prototyping technique) guides are fabricated manually or using computerized technology by milling or laser printing.⁵

2) Stereolithographic or rapid prototyping technology provides digital-based data by intraoral scanning for guide preparation. The guides are fabricated by various implant providers using photopolymerization techniques.⁶

Design of surgical guide: The design of the surgical guides contains either metallic sleeves or without metallic sleeves or customised open sleeves.

Step 4: Surgical procedure

For static computer-assisted approach: Before procedure, the surgical guide is fitted in the mouth. A flap or flapless approach is followed. In fully guided system, osteotomy preparation with implant placement using surgical guides or templates. In partially guided system, only osteotomy preparation has been done using surgical templates and implants placed in a freehand manner.

For dynamic navigation approach: The dynamic navigation approach requires precise and continuous coordination of the patient, the image data, and the surgical instrumentation. The navigation system consists of stereovision with natural light cameras. It uses either passive or active arrays of optical technologies.⁷ The arrays use reflected light emitted from a light

source, tracking to the stereo cameras for imaging the surgical procedure. The fiducial markers are used as an index for a surgical guide and implant placement. The surgical site is recorded using cameras, with arrays positioned extraorally.⁸ During surgery, the surgical guide is attached. An open flap or flapless approach may follow depending on the thickness of keratinized tissue.⁹ The conventional drilling sequence is used for osteotomy preparation.⁸ Once the drilling bur accords with the planned implant position, the procedure is carried out and implant placed. The whole surgery involves direct vision on the computer screen, thereby controlling the direction and depth of implant placement. This provides real motion tracking effect of the surgery.

Advantages and disadvantages of guided implant surgery:

The most important advantage is the involvement of all dental care providers from the beginning, thus ensuring comprehensive diagnosis and treatment planning and better outcomes. Reduced operating time, especially in complex cases with numerous implants, resulting in better patient-centered outcomes (eg, less postoperative discomfort), allows for

flapless implant placement, which may reduce crestal bone resorption associated with flap elevation, offers faster and more accessible record keeping and filing.¹⁰

The most important disadvantages are increased preoperative treatment planning time and the additional cost of guide fabrication for each case, requires an additional initial cost for the purchase of adequate computer hardware and software and special instruments and drills.¹¹

Conclusion

Guided implant surgery provides precise, effective, and efficient implant placement compared to freehand implant surgery without damaging the critical anatomic dental structures. The major advantage of the dynamic design is the ability to intraoperatively adjust the planned implant positioning. Computer-assisted surgery still retains the superiority in terms of proper implant positioning and taking into concern the prosthetic outcomes and survival rate using surgical guides.

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Review Article

OCTENIDINE MOUTH WASH: A REPLACEMENT FOR CHLORHEXIDINE A REVIEW

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Abstract

In dental practice, antiseptic mouthwashes are either used as an adjunct to improve the efficacy of mechanical oral hygiene or as the only measure of plaque control. Even though Chlorhexidine is the most widely used mouthwash for plaque control and gingival health due to its efficacy and safety verified by a multitude of clinical studies its long-term use induces several side effects. Octenidine dihydrochloride is an antimicrobial cationic surfactant compound which is a promising replacement for Chlorhexidine. In this article different clinical trials involving octenidine as mouthwash are reviewed.

Keyword ; Octenidine dihydrochloride, Antiseptic, Mouth rinse, Bacterial counts

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Introduction

Periodontal disease and dental caries are widespread oral disorders that afflict approximately 3.58 billion people globally, while being commonly ignored. Tooth brushing and flossing are mechanical techniques of controlling plaque, and while they can help maintain oral hygiene, they are not enough to completely remove plaque,

especially in areas of the oral cavity that are difficult to reach. It is advised to use an antibacterial mouthwash daily, especially for those who are susceptible to periodontitis.¹

Currently, chlorhexidine (CHX) is regarded as the gold standard of antiplaque agents. Its adverse effects like tooth discoloration, taste disturbance, and in rare occasions allergic

reactions led to the search for an equivalent alternative. Octenidine dihydrochloride (OCT), a bispyridinamine, developed in the 1980s licensed as an antiseptic agent in 20 European countries since 1995. Like CHX, it binds to negatively charged sites of bacterial cell walls as well as to all soft and hard tissue surfaces of the oral cavity due to its cationic nature. Binding to bacteria subsequently results in autolysis and cell death.

Review:

Vishakha Grover et al. ¹ systematically reviewed the Effect of octenidine mouthwash on plaque, gingivitis, and oral microbial growth. The review was conducted per PRISMA guidelines. Only randomized controlled trials and observational studies comparing octenidine with placebo or other mouthwashes in healthy subjects with or without periodontal disease, were considered for their review. Ten randomized controlled and six observational studies were selected for their review. Reduction in plaque index (PI), gingival index (GI), absolute reduction in the mean number of colony-forming units were summarized. Twice or thrice daily rinsing with 0.1% octenidine for 30–60 s

produced significant reduction in plaque, gingivitis and oral microbial growth. 0.1% OCT was found to be an effective antiplaque agent. Octenidine inhibited plaque formation upto 93% and gingivitis upto 68% versus placebo and was either superior or comparable to chlorhexidine.

Katrin Lorenz et al. ² conducted Impact of different concentrations of an octenidine dihydrochloride mouthwash on salivary bacterial counts. Rinses of 0.10, 0.15, and 0.20%OCT were compared to a saline placebo rinse regarding the reduction of salivary bacterial counts (SBCs) in 90 gingivitis patients over 4 days. Changes in plaque (PI) and gingival index (GI), taste perception, and safety issues were evaluated. SBC reduction between baseline and day 4 was significantly higher in OCT 0.15 and 0.20% groups compared to OCT 0.10% and placebo. Considering antibacterial efficacy, frequency of adverse events, and user acceptance, 0.10% OCT was identified as the preferred concentration.

M Rzycky et al. ³ tested the electrostatic selectivity of Octenidine and Chlorhexidine on charged lipids. Employing a variety of techniques such as molecular dynamics, z potential with dynamic light scattering,

vesicle fluctuation spectroscopy, carboxy fluorescein leakage measurement, and fluorescence trimethylammonium-diphenylhexatriene- and diphenyl hexatriene based studies for determination of OCT and CHX membrane location, we performed experimental studies using two model membrane systems—zwitterionic PC and negatively charged PG. Although OCT does disrupt the membrane, their results suggest that its primary selectivity was more linked to mechanical properties of the membrane. On the other hand, CHX did not disrupt membranes as a primary activity, nor did it show any sign of electrostatic selectivity toward negatively charged membranes at any stage of interactions.

Ralf Smeets et al.⁴ studied the Impact of Oral Rinsing with Octenidine Based Solution on SARS-CoV-2 Loads in Saliva of Infected Patients. In this study, the in-vivo effect of an antiseptic mouth rinse with Octenisept plus phenoxyethanol (OCT + PE) on the oral SARS-CoV-2 load was investigated. In eight COVID-19 patients, saliva samples were obtained before mouth rinsing and at five time points post rinsing with OCT + PE. SARS-CoV-2 RNA was detected and quantified by RT-qPCR and

virus isolation in cell culture was performed to assess for infectivity. This study highlights that saliva samples from COVID-19 patients are infectious and demonstrates that mouth rinsing with OCT + PE temporarily leads to a significant reduction of the SARS-CoV-2 load in saliva.

Luisa A Denkel et al.⁵ assessed the phenotypic susceptibility of bacterial isolates from clinical samples to chlorhexidine and octenidine collected from intensive care units (ICU) that routinely used 2% chlorhexidine-impregnated wash cloths or 0.08% octenidine wash mitts (intervention) or water and soap (control) for daily patient care. They found no evidence for reduced phenotypic susceptibilities of bacterial isolates from clinical samples to chlorhexidine or octenidine in ICUs 12 months after implementation of routine antiseptic bathing with the respective substances.

Dogan et al.⁶ determined the absolute and relative antibacterial activity of octenidine dihydrochloride (OCT) against total and cariogenic bacteria in saliva samples of patients with fixed orthodontic appliances during 5 days of usage. The study group consisted of 5 male and 13 female subjects

who were selected from patients in the Clinic of Orthodontics. Each patient was given physiologic saline (PS), chlorhexidine gluconate (CHX), polyvinylpyrrolidone-iodine complex (PVP-I), and OCT every morning for 5 days, each separated by a 2-week interval. Total and cariogenic bacteria in saliva samples of orthodontically treated patients with fixed appliances were collected during 5 days of usage. Unstimulated saliva was collected as a baseline sample. Saliva samples were collected at 15 minutes, and on the second, third, and fifth day after rinsing the mouth with any of the solutions for 30 seconds, and bacterial counts were detected. OCT showed an ultimate reduction of total viable oral bacteria, *Lactobacillus* species, and *Streptococcus mutans* in vivo. OCT also had a significantly greater inhibitory effect than 0.2% CHX and 7.5% PVP-I, from the beginning of the study until the fifth day after the orthodontic appliances were bonded.

Paula Zwicker et al.⁷ compared hypochlorite-based mouth rinse with Octenidine based mouth rinse in radiation- or chemotherapy induced mucositis. The study was conducted as monocentric, controlled, randomized, blind cross over

comparative study on 20 volunteers. The efficacy was determined as reduction of colony forming units (cfu) on buccal mucosa as well as in saliva. After mouth rinsing for 30 s, samples were taken after 1 min, 15 min, 30 and 60 min. The lg-reduction was calculated as difference between lg-values of cfu pre- and post-treatment. Both antiseptic mouth rinses induced a significant reduction of cfu on buccal mucosa and in saliva 1 min after mouth rinsing. The effect persisted up to 60 min. The octenidine based rinse was significantly superior to the hypochlorite-based rinse up to the last sample 60 min after rinsing. However, the known cytotoxicity of octenidine argues against its application.

Conclusion:

In most of the studies OCT was either superior or comparable to CHX-based mouthwashes in controlling dental plaque. The use of 0.1% OCT mouthwash resulted in complete elimination of atypical oral microbe species, even at 1 month after therapy. OCT was found to be safe and an effective alternative to CHX and other contemporary antibacterial mouthwashes. Further studies on long term effect of OCT based mouthwash are required.

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Review Article

ENDO PERIO LESIONS: CLASSIFICATION AND MANAGEMENT

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Abstract

The interrelationship between periodontal and endodontic disease has aroused confusion, queries and controversy. Differentiating between periodontal and endodontic problems can be difficult. A symptomatic tooth may have pain of periodontal and/or pulpal origin. The nature of that pain is often the first clue in determining the etiology of such a problem. Radiographic and clinical evaluation can help clarify the nature of the problem. In some cases, the influence of pulpal pathology may create periodontal involvement. In others, periodontal pathology may create pulpal pathology. This review article discusses the various clinical aspects to be considered for accurately diagnosing and treating endo-perio lesions.

Key words: *Periodontal Lesions, Endodontic Lesions*

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Introduction

The periodontium and the pulp are closely related, they have embryonic, anatomic and functional interrelationships. In 1919 Turner and Drew first described the effect of periodontal disease on the pulp. The relationship between periodontal and pulpal

disease was first described by Simring and Goldberg in 1964. Pulpal and periodontal problems are estimated to cause 50% of tooth mortality.¹ Though endo periodontal lesions are encountered occasionally they may pose difficulty to the clinician in

diagnosis and complicate the treatment.¹

Pulpal-Periodontal communications: The dental pulp communicates with the periodontal ligament through the various routes that are described as follows.

a. **Dentinal tubules:** As many as 15,000 dentinal tubules per square millimetre are present on the root surface at the cervical area.⁵ Periodontal disease, scaling, root planning, surgical procedures, developmental grooves, gap joint at the cemento enamel junction may lead to exposed dentine.⁶ The pulp chamber can thus communicate with the external root surface in case of denuded cementum through these dentinal tubules. Cervical dentinal hypersensitivity is an example of this phenomenon.

b. **Lateral canals and accessory canals:** Lateral and accessory canals can be present anywhere along the root, but are mainly seen in the apical third of the root.⁵ De Deus studied 1,140 teeth for accessory canals and found 27.4% exhibited accessory canals.⁹ Gutmann evaluated 102 teeth for the presence of accessory canals and found 25.5% of the studied sample demonstrated accessory canals in furcation area alone (furcal canals).¹⁰ A large number of

accessory canals exist in human teeth, the presence of patent accessory canals is a potential pathway for the spread of bacteria and toxic substances resulting in a direct inflammatory process in the periodontal ligament.²

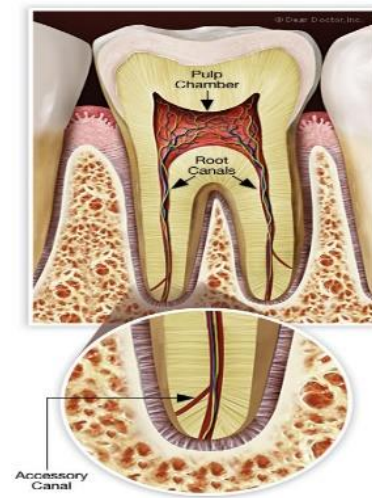


Figure 1: Anatomy of Pulp.²

c. **Apical foramen:** Apical foramen is the prime and most precise route of communication between the pulp and the periodontium. The bacteria, bacterial toxins their other by products and inflammatory mediators can exit easily through the apical foramen causing periapical pathosis and in case of deep periodontal pockets the vice versa may occur.⁵

d. Palatogingival groove: It is a development groove, a common anomaly in maxillary lateral incisors. It begins in the central fossa or across the cingulum, extends varying distances apically.¹³ It is located in the midpalatal or mesial or distal regions of the tooth palatally or even buccally.⁶ It provides funnel like areas for plaque retention. Periodontal probing is advised for patients with palatogingival grooves. Palatogingival grooves are associated with deep isolated tubular-shaped periodontal pockets with intrabony defects. They may bleed and suppurate.¹³ On radiographs they appear as a tear drop shaped area and dark lines parallel or imposed on the root canal can be noticed. These lines are termed as Para pulpal lines (dark vertical line). They are related to the incidence of localized periodontitis with or without pulpal pathosis, depending on the depth, extent, and complexity of the groove.²

e. Root perforations: Perforations of root are undesirable clinical complications that open up a communication between the root canal system and the periodontal ligament/oral cavity and may lead to treatment failure. They occur due to extensive carious lesion, internal and external resorption, over

instrumentation (iatrogenic) and post preparation (iatrogenic).⁴

f. Vertical root fractures: A vertical root fracture is defined as a fracture of the root that is longitudinally oriented at a more or less oblique angle towards the long axis of the tooth.⁴ Root fractures occur accidentally and may involve cementum, dentine and pulp. Mobility of the involved teeth, Pain on biting, pain on selective loading of the cusps, discomfort, periodontal defect, radiographic bone destruction, abscess formation and a narrow sinus tract-type of probing defect may at instances be present on one side in the line of fracture are all seen.

Pulpal diseases and the periodontium: Pulpal pathosis involves inflammatory changes. With necrosis of the pulp there is inflammatory response by the periodontal ligament at the apical foramen and at the opening of the accessory canals.⁵ Necrosis of the pulp, can result in rapid and wide spread destruction of periodontium, the production of radiolucency at the apex of the tooth, in the furcation or at various points along the root. It has been shown that periodontal treatment of teeth with pulpal necrosis and periapical radiolucency

resulted in retarded or impaired periodontal healing.⁶ Retrograde periodontitis caused by pulpal disease is a common cause of severe, localised destruction of periodontal tissues. Its signs and symptoms include periodontal pocket formation, purulent inflammatory exudates, angular bone loss, swelling and bleeding of the gingival tissues and increased tooth mobility.⁵

Periodontal diseases and the pulp: Controversies and conflicts surround the studies done to examine the effects of periodontal inflammation on the pulp. Greater incidence of pulpal inflammation and degeneration has been reported in periodontally involved teeth than in teeth with no periodontal disease.⁹ It has been suggested that periodontal disease has no effect on the pulp till it involves the apex or the periodontal breakdown has exposed an accessory canal to the oral environment.¹⁰ Hence theoretically a deleterious effect of periodontal disease on the pulp can occur and produce pulpitis and is often referred as retrograde pulpitis.⁵

Etiology: Microbiology: Bacteria: Actinobacillus actinomycetemcomitans, bacteroides forsythus, Eikenella corrodens,

Fusobacterium nucleatum, Porphyromonas gingivalis, Prevotella intermedia and Treponema denticola are present in both endodontic sample as well as in teeth with chronic apical periodontitis and chronic adult periodontitis. Fungi: Various fungal species especially Candida albicans are prevalent both in endodontic infections as well as in sub gingivally in many cases of adult periodontitis.⁸ Viruses: Recent data suggests that a number of common types of viruses such as Cytomegalovirus, Epstein-Barr virus, herpes virus may be involved in pathogenesis of periodontal and endodontic disease ranging from an increase in periodontal pathogens in periodontal pockets to involvement in pulpal and periapical pathologies.¹⁰

CLASSIFICATION OF ENDO-PERIO LESIONS:

1. BASED ON POSSIBLE PATHOLOGIC RELATIONSHIPS (Guldener and Langeland):

a. Endodontic – periodontal lesions: In endodontic-periodontal lesions, pulpal necrosis precedes periodontal changes. A periapical lesion originating in pulpal infection and necrosis may drain to the oral

cavity through the periodontal ligament and adjacent alveolar bone. This may present clinically as a localised, deep, periodontal pocket extending to the apex of the tooth. Pulpal infection also may drain through accessory canals, especially in the area of the furcation & may lead to furcal involvement through loss of clinical attachment and alveolar bone.¹¹

b. Periodontal – endodontic lesions: In periodontal-endodontic lesions, bacterial infection from a periodontal pocket associated with loss of attachment & root exposure may spread through accessory canals to the pulp, resulting in pulpal necrosis.¹⁰ In the case of advanced periodontal disease, the infection may reach the pulp through the apical foramen. Scaling & root planning removes cementum & underlying dentin and may lead to chronic pulpitis through bacterial penetration of dentinal tubules.

c. Combined lesions: Combined lesions occur when pulpal necrosis and a periapical lesion occur on a tooth that also is periodontally involved Combined lesions could display interesting correlations

between specific microbiota of endodontic lesion and periodontal pockets.

2. BASED ON ETIOLOGY, DIAGNOSIS, PROGNOSIS AND TREATMENT

{Simon's Classification}

1.Primary endodontic lesion: Necrotic pulp draining coronally through the periodontal.

2.Primary periodontal lesion: It is chronic periodontitis progressing apically along the root surface. It is characterized with wide periodontal pocket along with presence of local factors, a vital pulp, minimal or no pain, periodontal pockets in multiple teeth. Periodontal therapy is the available treatment option. Root canal therapy must not be carried as the pulp is vital. Only Periodontal therapy should be carried out.¹²Prognosis is related to the amount of attachment loss, the effectiveness of the periodontal treatment accomplished and the patient response.

3. Primary endodontic with secondary periodontal involvement: Primary endodontic lesion with a draining abscess through the periodontium if left untreated over a period of time may lead to local factors accumulating in the sinus tract and a

creation of secondary periodontal problem. It may also be caused due to root fractures, iatrogenic perforations by improper placement of pins and post.¹¹ Evidence of both pulpal and periodontal disease can be seen in radiographs. Root canal therapy is carried out and certain time is allowed for periodontal tissues to heal. After this evaluation period of 2-3 months periodontal therapy is carried out if required. Prognosis depends on the amount of attachment loss and severity of periodontal disease.

4. Primary periodontal with secondary endodontic involvement: Retrograde pulpitis can occur when the periodontal disease exposes lateral canal to oral environment or involves the apical canal. In such a case primary periodontal lesion with secondary endodontic involvement can be observed. Patients reports with severe pain, signs of pulpal disease concomitant with deep pocketing and history of extensive periodontal disease. Microbiota of the root canal shows strong correlation with that of periodontal pockets.¹¹ Radiographically these lesions are similar to primary endodontic lesions with secondary periodontal involvement. Both periodontal and endodontic therapies are required.

prognosis depends on the severity of the periodontal disease and periodontal response to treatment.

5. True combined lesions: Pulpal pathosis progressing coronally and periodontal pathoses progressing apically may develop independently around the same tooth and concomitantly unite. They are relatively infrequent and when occur may have significant periodontal involvement with considerable attachment loss. Clinically necrotic pulp or failing endodontic treatment with presence of local factors (plaque and calculus), deep pockets and periodontitis are present in varying degrees. Radiographically these lesions appear similar to that of the tooth with vertical fractures.⁶ Immediate sealing of root perforations, root canal therapy, advanced endodontic surgery, periodontal therapy with procedures such as hemi section, root resection may be required treatment options.⁶ Prognosis is guarded and depends on the amount of destruction caused by periodontal disease.

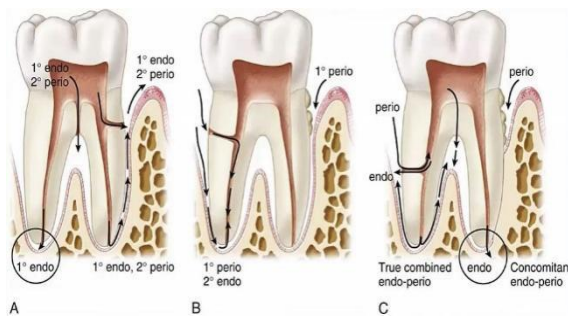


Figure 2: Endo Perio lesions ⁴.

6. Concomitant pulpal and periodontal lesions: This additional group of lesions was proposed by Belk and Guntmann Pulpal and periodontal diseases can co-exist with different aetiologies. Thus, the lesions will consist of an endodontic lesion and a non-communicating periodontal lesion. In this situation both the diseases should be treated individually.¹²

3. BASED ON THERAPY {Grossman's Classification}:

- a. Teeth that require endodontic therapy alone.
- b. Teeth that require periodontal therapy alone.
- c. Teeth that require endodontic as well as periodontal therapy.

4. BASED ON ENDODONTIC THERAPY

{Rateitschak et al):

Type I: It is primarily of endodontic origin and the pulp is usually dead.

Type II: It is basically periodontal disease periodontal disease, which sometimes affects the pulp, and the pulp is usually normal or sometimes damaged by ascending pulpitis.

Type III: It is a combined case of a root canal problem and periodontal disease, and the pulp is usually dead.⁶

MANAGEMENT

In general, when primary disease of one tissue, i.e. pulp or periodontium, is present and secondary disease is just starting, treat the primary disease.⁵ When secondary disease is established and chronic, both primary and secondary diseases must be treated. By and large, endodontic therapy precedes periodontal therapy. Periodontal therapy may or may not be required, depending on disease status. The complete healing of destroyed periodontal support can be expected following the treatment of pulpal pathology. The resolution of extensive destruction following the

treatment of chronic periodontitis is less predictable. It is important to realize that it is clinically not possible to determine the extent to which one or the other of the two disorders (endodontic or periodontal) has affected the supporting tissues. Therefore, the treatment strategy must be first to focus on the pulpal infection and to perform debridement and disinfection of the root canal system. The second phase includes a period of observation, whereby the extent of periodontal healing resulting from the endodontic treatment is followed. Reduced probing depth can usually be expected within a couple of weeks while bone regeneration may require several months before it can be radiographically detected. Thus, periodontal therapy, including deep scaling with and without periodontal surgery, should be postponed until the result of the endodontic treatment can be properly evaluated.

Sequencing treatment for endo-perio lesions: In acute cases, it is of paramount importance to diagnose the source of the pain and/or swelling and delineate it to be and endodontic or periodontal. This problem

should be treated first as a priority. Follow soon after with other treatment.

The debate on which treatment should be initiated first has vexed dentists for long.

Periodontal treatment:

It is a known fact that root canal infection significantly affects periodontal healing. Pocket depth reduction is significantly lesser in the presence of canal infection.¹¹ There is more marginal epithelium over cemental defects if the canals are infected. Removal of cementum will expose dentinal tubules, which means that if there are bacteria in the canal, it could promote inflammatory resorption.¹² It may also expose periodontal tissues to toxic medicaments if used in canal. This is not so critical in areas with recession.

Endodontic treatment:

Early initiation of endodontic treatment ensures that the cementum layer is kept intact until root canal infection is eliminated. Because there would be no exposed dentine on the root surface, there is reduced chance of root resorption and improved periodontal healing. On the other hand, if the root canal filling does not have a good seal then the

filled canals may be reinfected from periodontal bacteria.¹³

The risk of infection is heightened if periodontal treatment is delayed, especially when a “combined lesion with communication” exists between the two sites. Sterility is more likely while there is a medicated dressing like calcium hydroxide in the canal. Hence, in some cases, it might be prudent to delay the root filling until the periodontal infection has been eliminated.¹⁴

Treating both lesions concurrently:

This would be required when both endodontic and periodontal infection are present simultaneously. Combined endo-perio lesions that exist separately on the same tooth (meaning that they are not physically merged) have recently gained a lot of attention. The true combined endodontic and periodontic lesion requires an accurate diagnosis.¹⁴ This is often a difficult diagnosis and therefore requires revaluation after either the periodontal or endodontic problems are treated. In such cases, if there is no communication, then complete the endodontic therapy first and initiate periodontal treatment soon after.

When lesions communicate, it makes sense to commence endodontic treatment first and medicate canals until prognosis is known.

Abbott, in a detailed analysis on treatment considerations, recommends the following protocol.

Initial management

- Remove existing restorations and caries
- Chemo mechanically prepares canals
- Medicate canals (depends on symptoms)

Follow-up management

- Change intracanal dressing after 3-4 weeks
- Provide initial periodontal treatment
- Review healing after 3 months
- Reassess need for further periodontal treatment

If more periodontal treatment (e.g., surgery) is required,

- Change intracanal medication again

If healing response is favourable,

- Complete root canal filling

Longer-term management

- Defer root filling until after
- Need for periodontal surgery assessed
- Surgery completed with satisfactory outcome

Overall prognosis has been assessed to be adequate enough to justify further endodontic and restorative treatment and their costs ¹³

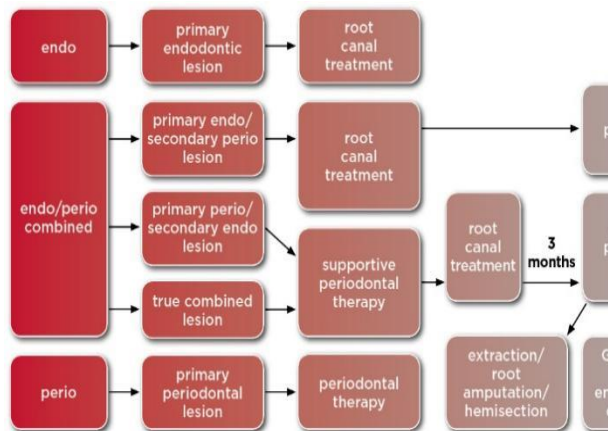


Figure 4: Management of Endo-Perio lesions.⁸

Conclusion

Treatment of combined endodontic and periodontal lesions does not differ from the treatment given when the two disorders occur separately. The part of the lesion sustained by the root canal infection can usually be expected to resolve after proper endodontic treatment. The part of the lesion caused by the plaque infection may also heal following periodontal therapy, although little or no regeneration of the attachment apparatus can be expected. This suggests that the larger the part of the lesion caused by the root canal infection, the more favourable the prognosis is for regeneration of the attachment.

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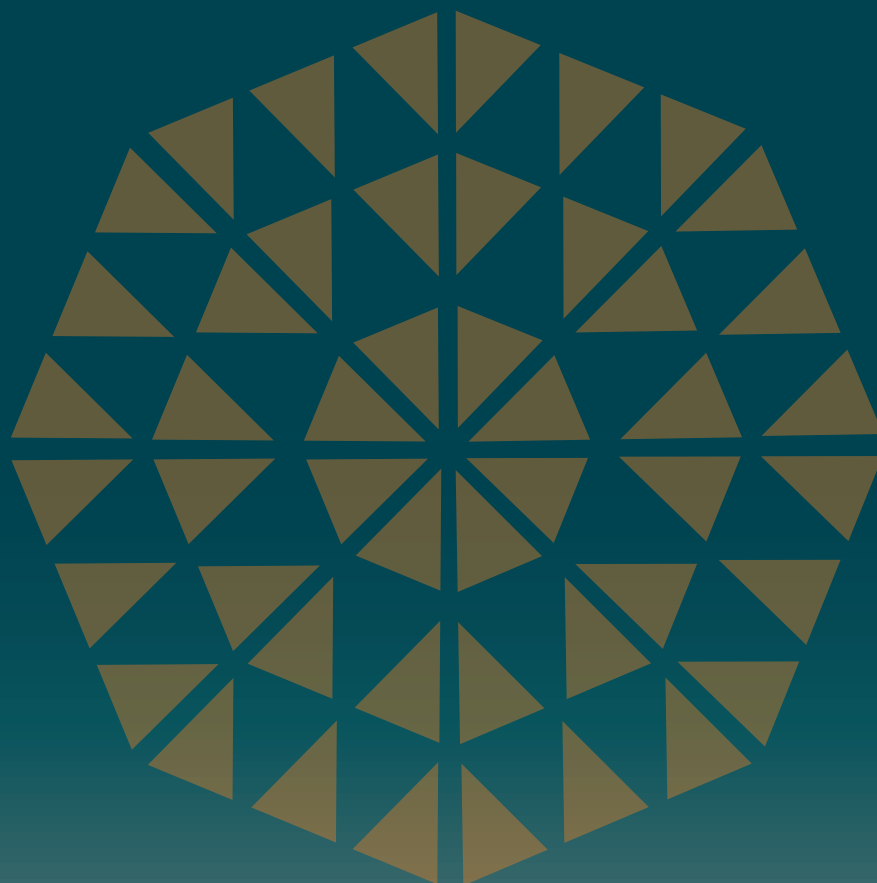
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