DYNAMICS OF THE ORAL MICROBIOME AND LOCAL IMMUNOLOGICAL STATUS IN EDENTULOUS PATIENTS FOLLOWING COMPLETE DENTURE PROSTHODONTICS

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Background

The oral ecosystem is a complex environment where the presence of natural dentition, whether complete or partial, acts as a cornerstone for ecological stability [1]. Specific anatomical sites, such as dental fissures, carious lesions, endodontic canals, gingival sulci, and organized dental plaque, serve as specialized habitats that facilitate microbial proliferation and metabolic activity. The total or partial loss of teeth, followed by the subsequent introduction of removable dental prostheses, induces a profound reorganization of these environmental circumstances. Such transitions lead to significant modifications in the oral microbiota's composition and the physiological conditions of the mucosal surfaces [2].

Aim of the Study

The primary objective of this clinical investigation is to perform a comparative analysis of the oral microbiota and local immune markers in edentulous patients, evaluating their status both prior to prosthetic intervention and at a six-month follow-up after the successful implantation of complete removable dentures.

Materials and Methods

The study involved a qualitative and quantitative assessment of the oral microflora in a cohort of edentulous individuals. The subjects were divided into two phases: 12 patients

were evaluated before prosthodontic therapy, and 14 patients were assessed six months after the insertion of full dentures. The average age of the participants was 71.6 \pm 5.2 years. A separate control group consisting of 13 age-matched healthy volunteers was utilized for baseline comparisons.

The research protocol included several diagnostic layers:

- **Biochemical and Hygiene Metrics:** Prior to specimen collection, the pH of mixed saliva was meticulously measured. To determine the standard of oral hygiene, the **Ambjørnsen index** was applied to evaluate plaque accumulation across various denture surfaces.
- **Microbial Identification:** Microorganisms were initially analyzed via light microscopy following mucosal swabbing. The density of the microbiota was categorized as sparse, significant, or abundant based on standardized visual field analysis [3].
- **Molecular Analysis:** Quantitative data were obtained using **Polymerase Chain Reaction (PCR)**.
- Results were interpreted as follows: <10^2 CFU/mL (sparse), 10^2–10^3 CFU/mL (significant), and >10^5 CFU/mL (abundant).
- **Immunological Assessment:** Local immune activity was quantified through the observation of **NETosis** (the formation of Neutrophil Extracellular Traps). The biomaterial underwent the **Feulgen reaction** with Schiff reagent for DNA detection and was fixed with a 95% ethanol solution to verify the structural presence of NETs.
- **Statistical Processing:** Data analysis was performed using **IBM SPSS Statistics v.27.0**, employing the **Mann-Whitney U-test** to determine variances, with a significance threshold of $p < 0.05$.

Results and Discussion

The transition to total edentulism did not result in a significant disruption of the oral acid-base balance; the pH remained relatively steady at 7.2 \pm 0.6, compared to 7.3 \pm 0.4 in the control group. Initially, both healthy participants and edentulous patients exhibited substantial levels of coccal, fungal, and mixed flora. However, the edentulous state was characterized by a specific expansion of rod-shaped flora, notably

Enterobacteriaceae and *Eubacterium spp.*, while fungal populations simultaneously declined to scanty levels.

Six months after the placement of complete dentures, a notable shift in the microbial landscape was observed:

1. **Fungal Resurgence:** Fungal colonies demonstrated a statistically significant increase in concentration.

2. **Microbial Succession:** *Eubacterium spp.* decreased to scarce levels, whereas *Leptotrichia spp.* and *Fusobacterium spp.* rose to substantial concentrations. Furthermore, a discernible trend toward the proliferation of *Peptostreptococcus spp.* was identified.

Regarding local immunity, the mucosal surfaces of edentulous patients originally showed dispersed neutrophils actively undergoing **NETosis**. However, at the six-month mark of denture wear, these neutrophils were notably absent from the mucosal surface. This suggests that the orthopedic prosthesis functions as a **mechanical barrier** that physically restricts the migration of neutrophils to the mucosa. This obstruction dampens the NETosis process and compromises localized immunological surveillance. As a result, the efficient elimination of damaged mucosal cells and the clearance of bacterial triggers may be significantly impaired.

Conclusions

- Total edentulism alters the microbial profile by increasing the prevalence of rod-shaped flora and reducing fungal abundance, although it does not significantly shift the oral pH.
- Six months of complete denture utilization facilitates a resurgence of fungal colonies and leads to a more complex mixed microbiota, while reducing the dominance of certain rod-shaped species.
- While the edentulous state initially triggers a local immune response via NETosis, the long-term presence of a removable prosthesis appears to suppress these protective mechanisms on the supporting mucosal tissues by creating a physical barrier to neutrophil activity.

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