

# Aerobic Microflora of Subgingival Regions in Prosthodontic Patients with Dental Implants

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## Summary

*Prosthodontic therapy on dental implants is one of the solutions for partially and totally edentulous patients. The long-term success directly depends on static and microbiota around implants. The purpose of this study was to determine the difference in subgingival aerobic microflora in patients with or without implants as well as evaluate their sensitivity to antibiotics. The investigation consisted of 41 patients. Nineteen patients had inserted implants and twenty-two natural teeth as abutments for fixed bridges. Five different genera of bacteria and one fungus were isolated by smear method from the subgingival areas. The periodont and periimplant area showed great similarity in the genera of microorganisms, despite which Branhamella spp. was found only in patients with implants and Streptococcus spp. and Candida albicans around the teeth.*

**Key words:** dental implant, microflora, abutment.

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## Introduction

One of the solutions for partially or totally edentulous patients are dental implants, which are supports for crowns, bridges or dentures. The long-term success depends on biomechanical factors and possible infection of periimplant tissues (1). The microbiota of healthy periimplant tissue is similar to the microbiota of the same healthy tissue around the teeth (2-5). It is characterized by a small number of

gram-positive facultative cocci and rods (1, 6, 7). The risk for implant therapy failure is high when patients have a high plaque index and the number of rods and spirochetes increases (6, 8). Bacterial plaque forms not only on dental tissues but also on surfaces of artificial materials in the oral cavity (9). The type and shape of the surface of materials used for dental implants have an influence on bacterial colonization (10). Partially edentulous patients have a higher risk for implant failure than totally edentulous patients,

because the implants can be colonized by microbiota from periodontal pockets (8, 11-14). Failure of the implants due to bacterial contamination could also be from an endodontic lesion (12). Prosthodontic suprastructures have a minor role in the microbiota around implants. However, a mean gap of less than 4µm between the implant abutment and screw-retained crown is not a barrier for some oral microorganisms (11, 15, 16). For patients with diagnosed periimplantitis, bacterial findings are crucial for therapy selection and implant success (17).

The aim of this preliminary study was to evaluate the qualitative differences in structure of subgingival aerobic microbiota in patients with and without implants. Sensitivity of isolated bacteria to some antibiotics was also checked.

### Materials and Methods

Subgingival bacterial samples were collected by smear method in 41 patients. Nineteen of them, aged between 20 and 76 years (mean = 46.8 years), had implants inserted 7 months and 3 years earlier (mean = 1.56 years). They had metal-ceramics suprastructures. Most of the implants were "ASTRA" type (10), followed by "IMPLA"(4), "SEMADOS"(3) and "ITI"(2) types. A control group consisted of 22 patients, aged between 23 and 74 years (mean = 51.1 years), with fixed bridges on natural teeth. Bridges were made of Ag-Pd (13 patients) and Au-alloy (9 patients). Durability function of those bridges was between 3 and 10 years (mean = 5.5 years). Thirty patients were female and eleven male.

Samples were taken with sterile paper points (ABSORBENT PAPER POINTS, ISO COLOR-CODED, REF A 022R) by smear method. They were taken from subgingival sulcus around implants and teeth, placed in a tube containing a nutritive liquid medium (T.G.Y-BOUILLION) and incubated for 24 hours at 37°C. The samples were then inoculated on a solid medium (TRYPTIC GLUCOSE YEAST AGAR (Biolife, Italy) in a Petri dish by "quadrate method". Incubation period was 24 hours at 37°C. Colonies of microorganisms were separated and inoculated, in sterile conditions, on a nutritive medium (T. G. Y. AGAR). They were isolated as pure (single) culture of microorganisms. Inoculation was again 24 hours at 37°C.

Characterization of the separate pure cultures consisted of: Gram stain, capsule stain, catalase test, utilization of lactose, saccharose and glucose, O-F (Hugh-Leifson) test and with production of indol and H<sub>2</sub>S. Sensitivity to antibiotics (Extencilin, Geomycin and Urfamycin) was checked by the disc method (disc diameter was 6 mm) and marked with + (diameter around disc 0 mm), ++ (7-8 mm) and +++ (9 mm<).

### Results

The results are shown in Figure 1. Aerobic microbiota was found in all patients, and determined by its morphological characterization and biochemical activity. Five different genera of bacteria (*Branhamella*, *Staphylococcus*, *Micrococcus*, *Streptococcus* and *Bacillus*) and one fungus (*Candida albicans*) were isolated. Genus *Branhamella* was present in three patients with implants. The most present in equal rates was genus *Staphylococcus* in both tested groups, followed by *Micrococcus* spp. with a similar rate but less presence. Genus *Bacillus* was present in both groups. *Streptococcus* spp. and *Candida albicans* were present only in patients with fixed reconstructions cemented on natural teeth. Sensitivity to antibiotics was satisfactory and strong (all of them were marked with ++, except *Micrococcus* spp. with +++).

### Discussion

Literature data describe great similarity between subgingival microbiota around implants and natural teeth (4, 18, 13). The major role in bacterial colonization of the periimplant is the periodontal pockets, which serve as a bacterial reservoir. For this reason Steenberghe et al. pointed out that for durability function of the implant, supported reconstruction is necessary to keep the periodont healthy with regard to proper hygiene and regular check-ups (8). Apart from these factors Keller et al. (16) and Besimo et al. (11, 15) came to conclusion that there is a possibility of infection during implant insertion and also that the gap (mean= 4µm) between implants and screw-retained prefabricated crowns couldnot be a barrier for bacterial infiltration and

making a bacterial reservoir. However these factors have a minor role in implant failure. None of the patients with implants showed clinical signs of inflammation although they were not checked regularly. Most likely it depends on the patient's motivation. In patients with dentures on natural teeth hygiene was of a lower quality. The same findings were determined by Tanner et al. (2). Capsularity of certain genus tends to show adhesion to the surface of teeth or implants. Drake et al. (19) studied the ability of *Streptococcus* spp. to colonize on the surface of implants in terms of wettability, roughness, and mode of sterilization. They proved adhesion and quantitative differences between different types of implants. On the contrary, we did not find streptococcus in our patients with implants. Our findings indicate characteristic microflora for primary invasion of bacteria (13) and healthy or successfully treated infection of the periimplant region. However, in literature data there is the question of what is normal oral microflora, because in disturbed biological equilibrium it may become pathogenic. There are some studies which showed that in periimplant areas *Staphylococcus* spp., *Streptococcus* spp. and *Candida* spp. were found almost as frequently as periopathogens (*Actinobacillus actino-*

*mycetemcomitans*, *Bacteroides gingivalis*, *Bacteroides intermedius* etc.) indicating differences compared to the microbiota of periodontitis (overcome periopathogens) affected teeth (3).

Literature data shows that isolated species established genera are a part of oral microbiota (20).

### Conclusion

1. Our results indicate the presence of bacteria characteristic for aerobic oral microbiota.
2. Forty different species of bacteria and one fungus were isolated around implants and teeth.
3. Genus *Branhamella* was present only in patients with implants.
4. *Streptococcus* spp. and *Candida albicans* were present only in patients with natural teeth.
5. *Staphylococcus* spp., *Micrococcus* spp. and *Bacillus* spp. had similar rates in both tested groups.
6. Strong sensitivity to antibiotics (Extencilin, Geomycycin and Urfamycin) was found for all tested bacteria, especially *Micrococcus* spp.