

Anaerobic microflora under class I and class II composite and amalgam fillings

Language: English

Authors: Annegret Heinrich*, Olaf Bernhardt, Christian Splieth, Georg Meyer
University of Greifswald, Department of Restorative Dentistry, Periodontology and Pediatric Dentistry

Date/Event/Venue:
11.05.2000-13.05.2000
CONSEURO 2000
Bologna

Poster Award
Best poster

Introduction

The determination of the microflora beneath restorations is of special interest, because the impermeability of a restoration to bacteria has a decisive influence on the survival time of this restoration. During the past years, tooth-colored resinous filling materials have been increasingly used for premolars and molars. It has been proven that these materials do not bear the load of chewing pressure in the posterior-tooth region as well as amalgam fillings and inlays or onlays do. During function, cracking and microleakage of the composites may occur and microbes may penetrate into the filled cavity. Furthermore, composites – in contrast to amalgam – do not have any antibacterial effects.

The aerobic and microaerobic bacterial spectrum of carious dentine and under fillings is well known.

The aim of the present study was to determine the anaerobic microbial spectrum under composite fillings compared to that found under amalgam fillings.

Material and Methods

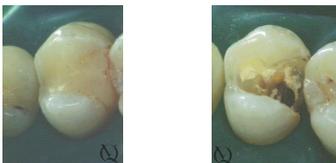
10 composite and 5 amalgam fillings of 15 patients were chosen for removal using rotating diamond instruments with rubber-dam in place, then using sterile hand instruments.

The fillings were evaluated for occlusal loss of material, marginal gaps, and secondary caries. The clinical examination was conducted with a dental probe and magnifying lenses (2X).

A sample of carious dentine just below the filling was taken under sterile conditions with a second hand instrument, stored in 1 ml prerduced transport medium for anaerobes, and immediately transferred to a laboratory for microbial diagnosis and then incubated in an anaerobic chamber.

The cultures were incubated in a glove box at 37° C for 2-4 days using Wilkens Chalgren blood agar plates (Difco) and a selective Wilkens Chalgren blood agar plate (Oxoid) for gram-negative and non-spore-forming rods.

The quantities of different colony types were estimated. Gram staining, growth in air, sensitivity to antibiotics, fermentation of carbohydrates, and production of indole and nitrate were investigated for a group diagnosis. For a further classification of the anaerobic gram-negative bacteria, the computer-guided ANI- Identification Card System (bio Merieux Vitek) was used.



First upper premolar before and after the removal of a composite filling

Results I (Clinical examination)

Occlusal loss of material:

Half of all composite fillings and 3 of 5 amalgam fillings showed a loss of material.

Marginal gaps:

None of the restorations exhibited a perfect margin (degree 0) or marginal caries (degree 3).

Seven composite and 4 amalgam fillings had a marginal gap within the enamel (degree 1); 3 composite fillings and 1 amalgam showed a marginal gap detectable with a probe (degree 2).

Secondary caries:

In 9 cases, secondary caries was found under composite restorations, and in 3 amalgam-filled teeth, secondary caries was diagnosed.

The condition of the pulp:

After caries removal was completed in one composite case, a direct capping with calcium hydroxide was necessary. One other composite-filled tooth had already been endodontically treated.

Results II (Microbial diagnostics)

17. Stiebe, B., Poethe, I., Bernhardt, H.: Die Bakteriologie der normalen Wundheilung nach Zahnextraktion unter besonderer Berücksichtigung der Anaerobierdiagnostik Zahn-, Mund-, Kieferheilkd. 78, 247-251, 1990
 18. Weiger, R., Löst, C.: Mikrobielle Infektion des Endodonts Endodontie 1, 15-23, 1993

This Poster was submitted on 26.07.00 by Dr. Annegret Heinrich.

Correspondence address:

Dr. Annegret Heinrich

Zentrum für Zahn-, Mund- und Kieferheilkunde Greifswald

Rotgeberstr. 8

D - 17487 Greifswald

Poster Faksimile:

Anaerobic Microflora under Class I and Class II Composite and Amalgam Fillings

A. Heinrich*, O. Bernhardt, Ch. Splieth, G. Meyer

University of Greifswald, Department of Restorative Dentistry, Periodontology and Pediatric Dentistry

Introduction

The determination of the microflora beneath restorations is of special interest, because the impermeability of a restoration to bacteria has a decisive influence on the survival time of this restoration. During the past years, tooth-colored resinous filling materials have been increasingly used for premolars and molars. It has been proven that these materials do not bear the load of chewing pressure in the posterior-tooth region as well as amalgam fillings and inlays or onlays do. During funelin, cracking and microleakage of the composites may occur and microbes may penetrate into the filled cavity. Furthermore, composites – in contrast to amalgam – do not have any antibacterial effects.

The aerobic and microaerobic bacterial spectrum of carious dentine and under fillings is well known. The aim of the present study was to determine the anaerobic microbial spectrum under composite fillings compared to that found under amalgam fillings.

Materials and Methods

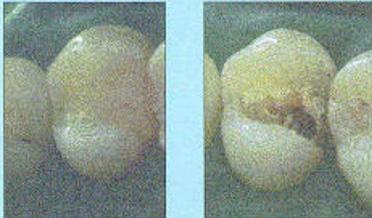
10 composite and 5 amalgam fillings of 15 patients were chosen for removal using rotating diamond instruments with rubber-ken in place, then using sterile hand instruments.

The fillings were evaluated for occlusal loss of material, marginal gaps, and secondary caries. The clinical examination was conducted with a dental probe and magnifying lenses (2x).

A sample of carious dentine just below the filling was taken under sterile conditions with a second hand instrument, stored in 1 ml pre-reduced transport medium for anaerobes, and immediately transferred to a laboratory for microbial diagnosis and then inoculated in an anaerobic chamber.

The cultures were incubated in a glove box at 37°C for 24 days using Wilkens-Chalgren blood agar plates (Difco) and a selective Wilkens-Chalgren blood agar plate (Coccol) for gram-negative and non-spore-forming rods.

The quantities of different colony types were estimated. Gram staining, growth in air, sensitivity to antibiotics, fermentation of carbohydrates, and production of indole and nitrate were investigated for a group diagnosis. For a further classification of the anaerobic gram-negative bacteria, the computer-guided ANI- Identification Card System (Bio-Mérieux Vittek) was used.



First upper premolar before and after the removal of a composite filling

Results I (Clinical Examination)

Occlusal loss of material:

Half of all composite fillings and 3 of 5 amalgam fillings showed a loss of material.

Marginal gaps:

None of the restorations exhibited a perfect margin (degree 0) or marginal caries (degree 3).

Seven composite and 4 amalgam fillings had a marginal gap within the enamel (degree 1); 3 composite fillings and 1 amalgam showed a marginal gap detectable with a probe (degree 2).

Secondary caries:

In 9 cases, secondary caries was found under composite restorations, and in 3 amalgam-filled teeth, secondary caries was diagnosed.

The condition of the pulp:

After caries removal was completed in one composite case, a direct capping with calcium hydroxide was necessary. One other composite-filled tooth had already been endodontically treated.

Results II (Microbial Diagnostics)

All castings included, a total of 83 different bacterial species were isolated, of which 70 were found in composite-filled teeth and 13 in amalgam-filled teeth. The ratios of aerobic to anaerobic flora were comparable: under composite 11.4%:88.6%, under amalgam 15.4%:84.5%. Anaerobic species dominated.

The microbial variety under composite fillings was much greater compared to amalgam (34 strains of strictly anaerobic non-spore-forming gram-negative rods, 17 strains of anaerobic or facultatively anaerobic non-spore-forming gram-positive rods, 9 strains of anaerobic gram-positive cocci, and 2 strains of anaerobic gram-negative cocci). Beneath amalgam, we found 1 strain of strictly anaerobic non-spore-forming gram-negative rods, 7 strains anaerobic or facultatively anaerobic non-spore-forming gram-positive rods, and 3 strains of anaerobic gram-positive cocci.

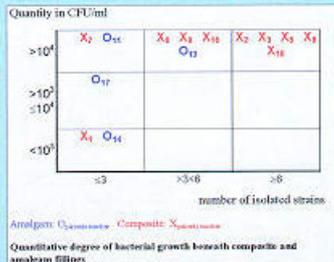
Quantitatively, there were up to 8 times more microorganisms under composite fillings. Beneath amalgam, we found microbes similar to the flora of carious dentine and carious plaque, with anaerobic and facultatively anaerobic gram-positive rods dominating.



Bacterial sample on selective blood agar typical for a composite filling



Bacterial sample on selective blood agar typical for an amalgam filling



Discussion

The microflora that we found under composite restorations had a great variety of anaerobes. This spectrum is similar to the microflora of infected root canals. The shift from a dental-plaque-like flora to an anaerobic microbial spectrum may be attributable not only to the age of the composite fillings – because amalgam fillings showed a quite different spectrum with streptococci, Lactobacilli and Actinomyces – but also to the composition of the composite material itself.

Hence, under certain circumstances, inadequate composite fillings resulting in secondary caries can promote pulpal infection with obligate anaerobes. Although the low number of cases does not allow generalization, our results do suggest that the kind of filling material used has a determining influence on the composition of the remaining or penetrating microflora under restorations.