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## PSEUDO-DISCOLORATION OF PLASTIC FILLINGS

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The purpose of the present work was to demonstrate whether marginal discoloration of plastic fillings may cause an apparent discoloration of the whole filling. The synthetic resins used in the investigation were Addent XV and Sevrion Simplified. Cavities were cut in teflon and plexiglas. Marginal discoloration was produced either by painting the unfilled cavities with a colored varnish or by intermittent vacuum-treatment in Indian ink of hardened, polished fillings. Fillings discolored only at the margin showed a marked apparent discoloration of the whole filling. On removal from their respective cavities, these fillings reverted to a color indistinguishable from that of the control fillings.

Marginal discoloration can occur only where there are marginal gaps. Good adaptation between filling material and tooth is thus of great importance for the esthetic properties of the restoration.

It is a clinical fact that plastic fillings often discolor after a period of time in the patient's mouth. In these cases a distinction can be drawn between marginal discoloration and discoloration of the whole restoration. Marginal discoloration is the result of poor adaptation between the filling material and the tooth. A marginal gap permits the penetration of coloring matter, which appears as a colored line around the filling. Discoloration of the body of a plastic filling of an originally impeccable appearance may be due to one of a number of causes: 1. The surface of the filling is able to adsorb coloring matter. If such a filling is polished, the discoloration can generally be removed. 2. Sub-surface porosities with connecting passages to the surface of the filling can in time fill up with dissolved coloring. Inspection of the restoration will often reveal whether this is the cause of discoloration. 3. The remains of an unstable catalyst system under the influence of light (or other factors) can be

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converted to colored compounds. Modern resin restorative materials are seldom discolored by this means as can be checked by submitting the materials to the A.D.A. specification no. 13 test for color stability.

The purpose of the present work is to demonstrate that yet the marginal discoloration of a filling can give the impression that the entire filling is discolored.

#### MATERIALS AND METHODS

Two plastic filling materials were employed in the experiments: the composite Addent XV (3 M Company, Minnesota, U.S.A.) and the non-composite Sevriton Simplified (De Trey Frères, S.A., Zurich, Switzerland). Both materials were used in accordance with the manufacturers' instructions. Cylindrical cavities with a depth and diameter of 2.5 mm were made (a) in a sheet of opaque, white plexiglas, and (b) at one end of cylinders (diameter and height 11 mm) of teflon.

In the case of the fillings made by Addent XV marginal discoloration was produced by painting the unfilled cavity with a colored varnish. The varnish was made by emulsifying a brown metal-oxide powder (Super Ebelit Universal coloring, burnt umber 1435) in a clear polyurethane lacquer (Plus-protector, Vivadent, Schaan, Liechtenstein). The varnish was allowed to harden for 24 hours before the cavities were filled. Tests showed that the hardened film of varnish did not dissolve in Addent XV monomer. After the filling material had set the excess material was removed by polishing, and the marginal discoloration was revealed as a brown line around the filling.

The polyurethane varnish (and other varnishes tested) dissolves easily in Sevriton Simplified monomer. Marginal discoloration in fillings of this material was therefore achieved by a different technic: set fillings were polished until the excess resin had been removed, and were then placed in a strongly colored solution comprising equal parts of Indian ink and demineralised water. By means of an intermittent vacuum treatment the air was drawn out of the shrinkage gaps surrounding the fillings and replaced by the colored fluid, resulting in an unmistakable marginal discoloration.

Four Addent XV fillings were made in cavities in plexiglas. Of these no. 1 cavity was varnished both on the bottom and walls, no. 2 on the bottom only, no. 3 on the walls only, and no. 4 was the control filling and was not varnished. Addent XV was also used for filling four cavities in teflon which were lined in the same manner.

Sevriton Simplified was filled only into teflon cavities. Four fillings were made, two of which were subjected to vacuum in Indian ink.

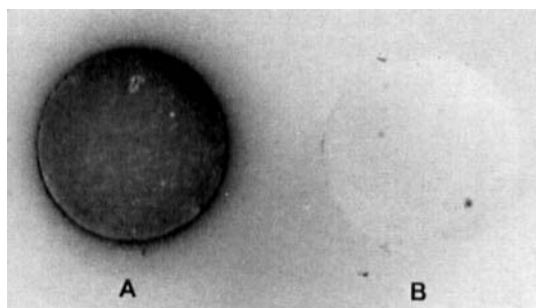


Fig. 1. A: Plastic filling in marginally discolored cavity. The whole filling appears to be discolored compared to B: Plastic filling with no marginal discoloration. Approx.  $15 \times$  natural size.

After an inspection of the finished fillings these were removed intact from the cavities and inspected for discoloration.

#### RESULTS

Comparison between marginally discolored fillings and the control fillings showed that fillings with marginal discoloration also gave the observer the impression that the whole filling was discolored (Fig. 1). In the case of the Addent XV fillings discoloration of the entire filling was apparent from the moment the fluid resin made contact with the coloring in the cavity. The body of the filling was severely discolored in restorations with varnished cavity walls, whereas there was no general discoloration of the filling when only the bottom of the cavity was varnished. The same results were recorded with cavities of plexiglas and of teflon.

Inspection of fillings removed from the respective cavities revealed no difference in color between fillings from cavities with colored walls and fillings from cavities which had not been colored. The apparent discoloration of the filling was therefore exclusively due to the presence of discoloration in the gap between filling and cavity walls.

#### DISCUSSION

It is apparent from the above investigation that marginal discoloration of plastic fillings is seen as a discoloration of the whole filling. The reason for

this phenomenon must be that some of the rays of light which hit the colored zone between the filling material and the cavity material are reflected diffusely through the filling, giving it the appearance of being colored. The phenomenon is also experienced in plastic fillings which have no marginal discoloration but which assume the color of the surrounding tooth substance.

The conclusion must be that good adaptation between filling material and tooth is of great importance for the esthetic properties of the restoration.

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