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DECLARATION

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**AN EXPERIMENTAL STUDY OF  
POSTERIOR COMPOSITE RESTORATIONS  
DURING OCCLUSAL STRESSES**

28.3.1998

DATE

28.3.1998  
DONA INDRANI AMARATUNGA

**A thesis submitted in conformity with the  
requirements for the degree of**

**MASTER OF PHILOSOPHY**

LABORATORY WORK

in

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## SUMMARY

An in vitro study of posterior composite restorations was carried out in order to study the behavior of composite restorations in posterior teeth and to find out the best cavity preparation design for posterior composite restorations. One hundred and thirty five human upper premolar teeth extracted for orthodontic purposes were used to prepare 4 different types of cavities. The first cavity type was prepared using the Black's method. The second type preparation comprised of a interproximal box preparation similar to that of Black's technique with the exception of the occlusal dovetail being prepared within enamel. Third type of cavity was prepared according to the Elderton's method, while, the new suggested cavity preparation which is the fourth was designed to a cylindrical shape without an occlusal preparation.

Tooth samples from each cavity type were filled using TPH (a hybrid composite material) and Tetric (a microhybrid composite restorative material). In addition, amalgam was used only for cavities prepared using Black's method for the purpose of comparison.

All the restorations were subjected to occlusal force of 70 Newton at a frequency of 70-120 cycles per minute. Samples were examined for changes and failures after each 25,000 cycles up to maximum of 250,000 cycles. Four types of failures, namely, Loss of Material, Surface Failure, Crevice Formation and Crack Initiation were studied. Scanning electron microscopic pictures were taken from certain selected samples for the confirmation of the above failures detected using the magnifying glass and explorer.

As the data were characterized by binary (binomial) distribution, the linear logistic model was fitted for these data to estimate the proportion of failure ( $\hat{p}$ ) at different number of stress cycles.

Data collected from the study shows better overall performances of the restorations carried out using the suggested cylindrical cavity preparation and the Elderton's method i.e. cavities prepared without an occlusal dovetail, than the cavities with an occlusal dovetail, when composite is used as a restorative material. Amalgam restorations however, performed well in Black's cavities prepared with an occlusal dovetail. Although the Loss of Material and Surface Failure were commonly seen in composite restorations, Crevice

Formation and Crack Initiation were more in amalgam restorations.

There was no significant difference of the performances between

Tetric and TPH composite materials.

As such the newly suggested Cylindrical cavity design could be

recommended for class II composite restorations. Black's cavity

preparation design should not be used when composite restorations

are carried out for class II cavities.

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