

Brief Review

A Brief Review on the Relationship between Gap Size of Composite Restoration and Secondary Caries

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Objective

To evaluate the influence of gap size between tooth-composite interface in developing secondary carious lesion.

Introduction

Nowadays, dental resin composite restoration is becoming more popular than traditional materials such as amalgam due to improved aesthetics, tooth sparing preparation, lack of corrosion and etc. However, the inherent polymerization shrinkage of composites can produce a gap formation at the tooth-restoration interface [1]. Micro leakage has been strongly associated with marginal gap and *in vitro* studies have associated the presence of secondary caries with micro leakage [2]. This gap formation may develop into secondary caries.

Methods

Articles identified through an electronic search on MEDLINE®/Pub med were limited to January 2000 to May 2015. The keywords "Gap Size" and "Secondary Caries or Caries" were selected and reviewed as per objectives. Only articles that referred composite material for experiments were included. After applying the inclusion criteria, the search yielded twelve publications. These studies either studied gap size or secondary caries around restoration using Tooth-resin composite specimens or occlusal splints containing human dentin samples. The sample size analyzed ranged from 0µm -1.025µm.

Results

Majority of studies concluded that gap size is not relevant in the development of secondary decay as long as caries risk is low and there is on fluoride release. When caries risk is high, even a gap size 68µm can lead to development of secondary caries. How-

ever, there was a consensus that large enamel gap size ranging from 100µm-500µm could lead to the development of dentin wall at the Tooth-resin composite interface.

Discussion

Secondary caries is the main reason to replace both resin composite and amalgam restorations. One of the possible etiologic factors for secondary caries development around resin composite restoration is microleakage, caused by a small gap between tooth-restoration interfaces. However, Jorgensen and Wakumoto [3] found that secondary caries does not occur if gap size at the tooth-restoration interface is limited to 35-50µm; hence microleakage would not lead to secondary caries.

Other studies [4,5] concluded that even larger gaps, ranging 250-400µm, have no influence on the initiation of secondary caries.

On the other hand, a clear relationship of gap size and secondary caries has been shown in [6]. A study from Nassar and Gonzalez-Cabezas [7], found that as long as the gap size is small (35µm), there is no positive correlation between gap size and secondary caries development; however, larger gaps of approximately 500µm, could lead to development of secondary caries irrespective of micro leakage; however, larger gap size of approximately 500µm show a positive correlation between gap size and secondary caries.

Kuper, et al. [8], claimed that the gap size may not be relevant as long as the caries risk is low, however, when the caries risk is high, even a gap size of 68µm may cause secondary caries to develop. This may imply that minimal gap size for developing secondary caries can be lower than what previously indicated in literature (>250 µm; [5]). The *in situ* study carried out by [9], showed that gap width affects secondary caries formation at the cavity prepara-

ration and restoration, but only in the absence of fluoride release. Since caries is a multi-factorial disease, there are other important factors to be considered in the development of secondary caries. For example, oral hygiene, use of fluoride, frequency of sugar consumption, and cariogenic biofilm control will play an important role in developing recurrent caries. Kuper, et al.[10], inferred that clinically, caries susceptibility of the patient may override the effect of gap size on secondary caries development. However, along with other important factors, it is clearly shown that the effect of gap formation between the tooth and the resin composite provides a favorable environment in developing secondary caries.

From the studies mentioned in this literature review, an exact threshold for developing secondary caries could not be achieved at this present time, but there is a trend that shows an increased likelihood of developing secondary caries as the gap size increases.

Conclusion

Our literature review concluded that the wider the gap between tooth and resin composite restoration material, the more likely secondary caries will develop unless caries risk is low, without absence of fluoride use. There is no consensus on the exact threshold of gap size to develop possible decay. Therefore, further studies will be needed in the future.

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