

***Bond Performance and Nanoleakage
of Resin/Dentin Interface under
Different Intrapulpal Pressures***

Thesis

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By

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

"إِنَّ اللَّهَ وَمَلَائِكَتَهُ يُصَلُّونَ عَلَى النَّبِيِّ يَا
أَيُّهَا الَّذِينَ آمَنُوا صَلُّوا عَلَيْهِ وَسَلِّمُوا تَسْلِيمًا"

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Dedicated to:

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Introduction

The advent of adhesives has caused a dramatic change in restorative dentistry and the use of direct resin-based composite materials has become an active part of contemporary operative dentistry.

As dentin is made thinner during cavity preparations, the tubules become shorter and their hydraulic conductance increases, together with, the complete removal of the smear layer and the smear plugs with the acidic conditioners used in etch-and-rinse adhesives allow outflow of dentinal fluid into dentinal floor due to the physiological intrapulpal pressure. Furthermore, due to the effect of caries process, cavity preparation, acid etching and material cytotoxicity the intrapulpal pressure might increase leading to increased fluid outflow (**Murray et al 2001**). This fluid wets the dentin surface and can affect adhesion of resin to the dentin by diluting the bonding agent and blocking the microporosities into which the resin otherwise would have penetrated (**Pereira et al., 1999**).

Wet bonding creates thicker hybrid layer due to more resin uptake into etched surfaces than did dry bonding. However, the ability of acetone or ethanol to “chase” water out of the wet collagen fibril meshwork is often incomplete; leading to the formation of resin globules and poor resin tag formation (**Gwinnett et al., 1993**).

Following acid-etching and water rinsing, the mineral phase of dentin is removed and all that is left of the original dentin is the collagenous matrix. The solubilized mineral phase of dentin has been extracted, and replaced by resin during resin-infiltration. The new surface is neither dentin nor resin, but was a hybrid of both. The hybrid layer is very strong and tough when properly formed, and affords enormous micromechanical retention for resin composites (**Nakabayashi, 1982 and Nakabayashi and Pashley, 1998**).

The durability and stability of resin bonded interfaces created by some bonding systems remain questionable. Immediate dentin bond strength values