Effects of Eugenol Concentration in ZOE

Laura Rickert, an OHSU second-year dental student, received one of the very first grants from the Oregon Clinical and Translational Research Institute that enabled her to design and implement a research project under the mentorship of Drs. Jack Ferracane, Ph.D., and Tom Hilton, D.M.D., M.S. She was enthusiastically assisted in her study by the Practice-based Research in Oral Health (PROH) network.



Objectives: The literature is contradictory regarding the effects of eugenol on dentin bonding. This study 1) evaluated effects of eugenol concentration in ZOE provisionals on dentin bond strength of composite and 2) assessed dentists' opinion of potential ZOE effects before and after seeing study results.

Methods Part 1: This portion of the project was a laboratory study that examined to what extent altering the ratios of zinc-oxide powder to eugenol liquid would have on shear bond strength of a resin dentin adhesive. Eighteen molars divided into six groups had occlusal enamel removed exposing dentin. A layer of ZOE (IRM/Caulk) was applied to dentin at the manufacturers P: L ratio 6:1 by weight, or with greater eugenol amounts (P: L of 6:1.5, 6:2, 6:2.5 and 6:3). The control group had no ZOE. After storing in 100% humidity at 37C for seven days, ZOE was removed by hand instrument and a water-pumice slurry (10s). Optibond FL (Kerr) dentin adhesive was applied, and resin composite (Premise) was built up in 2x2mm increments. Teeth were stored overnight, and then cut into 1x1mm sticks for microtensile testing (1mm/min).

Results Part 1: Results were analyzed using ANOVA/Tukey's (p=0.05). The results are presented in the table below. The groups with the same letter showed no difference in the laboratory results. The results of the testing showed that the bond strength was not affected by prior exposure of dentin to ZOE, even when eugenol concentration was three times that recommended by the manufacturer.

Conclusion Part 1: Exposure to ZOE had little effect on adhesive bond strength to dentin.

| Powder: Liquid (P:L) | Mean ± s.d. | N |
|----------------------|-----------------|----|
| 6:1.0 | 28.93±9.65 a, b | 18 |
| 6:1.5 | 23.17±10.66 b | 29 |
| 6:2.0 | 23.16±4.60 b | 29 |
| 6:2.5 | 31.63±10.19 a | 25 |
| 6:3.0 | 25.43±7.69 a, b | 28 |
| Control | 28.78±6.15 a, b | 26 |

Methods Part 2: The second part of the study consisted of a web-based survey of PROH network dentists before and after the results of the study laboratory component were available. The questionnaire surveyed PROH dentists about their knowledge of materials that contain zinc-oxide-eugenol cements and the use of restorative methods in their practices. After the lab experiments were completed, the participating dentists received the results, the related analyses, and a follow-up survey.

Results Part 2: Ninety-three percent of dentists (n=30) pre-surveyed were aware of potential adverse effects of

eugenol on bonding and 83% expected this study to support that. After seeing the results and being presented with a supporting literature review, 82% said they would be less concerned about using eugenol prior to dentin bonding.

Conclusion Part 2: Dentists presented with laboratory evidence and supporting literature changed their opinion about usage of a dental material.

Results Part 2:

Pre-survey: Respondent expectations of eugenol exposure on bond strength (percentage of respondents)

Post-survey: Respondent opinion regarding use of a eugenol containing product after seeing research results (percentage of respondents)

Post-survey: Respondent level of concern with the effect of eugenol ratio on bond strength for resin composites after viewing research results (percentage of





