

Reply to “Letter to the Editor: Coronal Microleakage of Resilon and Gutta-Percha Obturation Materials with Epiphany SE Sealer: An In-vitro Study”

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Dear Editor,

We would like to respond to the points raised by Balasubramanian and Sivakumar in their “Letter to the Editor: Coronal Microleakage of Resilon and Gutta-Percha Obturation Materials with Epiphany Self-etch (SE) Sealer: An in-vitro study”, which was published in your esteemed journal (J Clin Diagn Res. 2016 Dec;10(12):ZL01) [1]. We are the authors of the article titled “Coronal Microleakage of Resilon and Gutta-percha Obturation Materials with Epiphany SE Sealer: An in-vitro study” [2].

Comment 1: “The results of this study indicated that a complete seal was not obtained with any of the tested specimens. One of the reasons attributed to this leakage was incomplete infiltration of resin into the demineralised dentin, as a result of difficulty in achieving the ideal ratio between the degree of dentin demineralisation and the ability of resin infiltration [3] which has been mentioned by the authors in the discussion. However, this could have been explained further by addressing the fact that the chelating agent {17% Ethylenediaminetetraacetic Acid (EDTA)} employed in this study might have led to the collapse of demineralised collagen matrices left in the root canal walls, impeding sealer infiltration. This is in accordance with Garcia-Godoy F et al., who reported that both EDTA and Mixture of Tetracycline, Acid, Detergent (MTAD) caused a collapse of the dentin matrix structure, preventing sealer infiltration and interfering with the formation of high-quality hybrid layer bonding [3].”

Response:

We appreciate the effort to provide an additional explanation for the incomplete sealing between obturation materials and canal walls in our study. Achieving a complete seal between obturation materials and canal walls remains a challenge, as no current obturation material or technique can achieve an absolute seal or prevent leakage [4-6]. Similar studies investigating Resilon and gutta-percha have also reported a lack of complete seal [6-8], which confirms our results. While we mentioned the “incomplete infiltration of resin into the demineralised dentin, as a result of difficulty in achieving the ideal ratio between the degree of dentin demineralisation and the ability of resin infiltration” as one of the possible explanations for the incomplete sealing in the discussion section, we do not believe that it can be solely attributed as one of the reasons. This is because similar methodological studies employing a “smear-layer removal technique” have shown extensive resin infiltrations into dentinal tubules [9,10]. In addition, 17% EDTA is a commonly recommended chelating agent for removing smear layer in root canals [11,12]. Garcia-Godoy F et al., reported that the collapse of the dentin matrix occurs when EDTA is used as a final irrigation with a 5-minute exposure [3]. In our study, EDTA was not used as a final irrigation and the exposure time was no more than 2 minutes. Garcia-Godoy F et al., also reported that the effects of EDTA and

MTAD on dentin structure can be mitigated by a rinse of sodium hypochlorite (NaOCl) followed by water, which was conducted in our study (EDTA followed by NaOCl irrigation and finally distilled water) [3]. Therefore, we believe that the further explanation provided by the authors cannot be a possible reason for incomplete sealing in our study.

Comment 2: “In addition, the raw material of Resilon i.e., polycaprolactone is biodegradable under microbial attack [13]. An enzyme lipase is released by these microorganisms, which is capable of cleaving the ester bonds of polycaprolactone, making it more susceptible to alkaline and enzymatic hydrolysis [14]. These factors are also to be taken into account while employing Resilon/ Epiphany (SE) sealer in clinical practice where the human oral cavity is comprised of a wide variety of microbial flora.”

Response:

We thank the authors for raising this point. In our study, the incubation period was seven days with methylene blue, the dye used, which has been reported to have antimicrobial activity [15-17] and is considered a disinfectant [18,19] that might inhibit microbial growth and the production of lipase enzyme by microorganisms. Additionally, all procedures were conducted with sterilised instruments and materials under aseptic conditions to mimic clinical situations. Furthermore, our study was an in-vitro study and saliva, which is “comprised of a wide variety of microbial flora,” was not used. Therefore, it is highly unlikely that hydrolysis by microbial enzymes or attack is one of the possible explanations for the incomplete sealing in our study.

Comment 3: “Also, this study employed dye penetration methodology for the assessment of coronal microleakage. However, the validity of dye leakage studies has been questioned because of the possible effect of entrapped air on the ingress of the dye solution [20]. Spangberg LS et al., demonstrated that dyes such as methylene blue and crystal violet could not penetrate an entire artificial void by passive diffusion alone and also reported that the voids could be filled with dye by applying a vacuum during this method, thereby inferring that dye leakage studies can be conducted under vacuum pressure [21].”

Response:

It has been reported that entrapped air may interfere with the penetration of the dye tracer, and consequently it is recommended to conduct dye studies under vacuum pressure [21]. However, other studies have reported no significant difference in the dye penetration of 2% methylene blue dye in filled root canals between vacuum and passive methods [22,23]. Additionally, it has been noted that air elimination in root canal fillings may result in either overestimation of leakage [24] or complete dye penetration along the root canal surface [25], which may be suitable for tooth and canal anatomy studies rather than leakage studies. Consequently, the use of vacuum with dye penetration studies is controversial for leakage assessment.

We appreciate the authors' concerns and acknowledge the limitations of dye leakage studies. However, it is important to note that dye penetration studies, including the methodology employed in our study, are widely used and provide valuable information on the sealing ability of obturation materials. Further research and standardisation of methodologies are necessary to address the limitations and improve the accuracy of leakage assessment.

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