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Resin Root Canal Fillings: Fact or Fiction

In 2005 the first new, non gutta percha (GP), root filling material in 50 years was launched. The manufacturers of Resilon, a synthetic resin root filling material, claimed to have significantly better sealing ability than gutta percha. The concept behind Resilon was the desirability of bonding the resin point to a resin sealer which in turn could be bonded to the dentin walls creating a gapless "monoblock".

A Google search of 10 studies comparing the apical leakage of GP to Resilon (R) found essentially no difference between the two materials (R leakage > GP, Hashem '04, Pasqualini '08; GP leakage > R, Shipper '04, Bodrumlu '06, Wedding '07; GP leakage = R, Pitout '06, Saleh '07, Ishimura '07, Munoz '07, Baumgartner '07).

Apparently the literature does not support the superior sealing ability of Resilon, contrary to manufacturer's claims. Something must be happening to disrupt the "monoblock" in the critical apical third of the canal.

To get the most effective dentin bond, the smear layer needs to be removed from the dentin walls created during the cleaning and shaping process. Removing the smear layer exposes and opens the dentinal tubules making them available to the resin sealer. In endodontics, this is accomplished with an EDTA rinse after cleaning and shaping is complete. Teixeira *et al*, IEJ, May '05, found EDTA rinses of up to 3 minutes were unpredictable in removing the smear layer (5 of 12 showing complete smear layer removal).

Mjor *et al*, IEJ, July '01, used scanning electron microscopy (SEM) to look at the dentin structure in the apical third. He found the apical dentinal tubules were "irregular in direction and density" with some "areas devoid of dentinal tubules" and concluded that "obturation techniques based on the penetration of adhesives into dentinal tubules are unlikely to be successful".

In the August 2005 edition of JOE, Tay *et al*, evaluated the effect of C-factor on dentin adhesion in the apical third. C-factor is the ratio of bonded to unbonded surface area - the higher the C-factor, the greater the amount of shrinkage and gap formation. Shrinkage stresses created during polymerization of the low-filled, low-viscosity resin root canal sealers such as Epiphany, are much higher when compared with highly filled composite restorative fillings. The cone shape geometry in the apical third of the root canal system creates C-factors in the 1000 range, with limited unbonded surface area to relieve shrinkage stress. Tay concluded that "bonding of adhesive root filling materials to root canals is highly unfavourable".

So while the "monoblock" theory is exceptionally appealing to the endo junkies and the manufacturers give us beautiful, gapless, resin filling-dentin SEM interfaces, the available literature to date just does not support the claims that resin root canal fillings are any more effective than our tried and true GP/ZOE sealer fillings. Paucity of dentinal tubules, unpredictability of smear layer removal in the apical third, and high shrinkage stresses create resin point/sealer/dentin gaps resulting in leakage. Until I see more conclusive evidence I'm sticking with good, old gutta percha.

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