Bonding ability of experimental light-curing resin-cements to water/ethanol wet root-dentin

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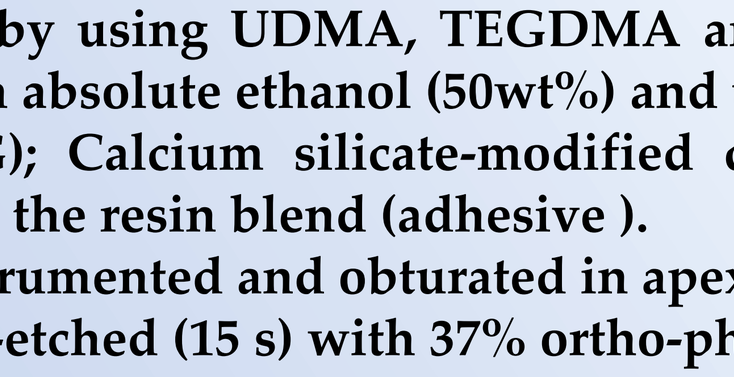
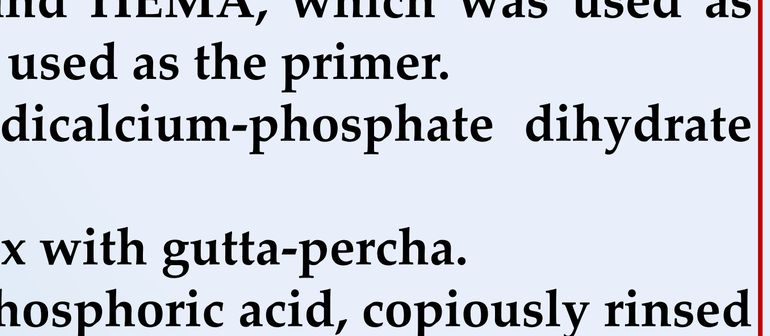
OBJECTIVES: This study aimed at evaluating the bonding ability of two experimental light-curing resin-cements doped with different ion-releasing micro-fillers applied onto coronal/middle root canal dentin using the water-wet or ethanol-wet bonding technique

- **METHODOLOGY:**
- **A filler-free resin blend was prepared by using UDMA, TEGDMA and HEMA, which was used as control adhesive (CTRL) or solvated with absolute ethanol (50wt%) and used as the primer.**
- **Two micro-fillers [Bioglass 45S5 (BAG); Calcium silicate-modified dicalcium-phosphate dihydrate (DCPD)] were incorporated (40wt%) into the resin blend (adhesive).**
- **The root canals were endodontically instrumented and obturated in apex with gutta-percha.**
- **The middle and coronal dentin was acid-etched (15 s) with 37% ortho-phosphoric acid, copiously rinsed (20 s) and gently dried with paper points (water-wet bonding).**
- **The ethanol wet-bonding substrate was achieved using absolute ethanol (5 min).**
- **The primer/resin systems were applied and light-cured (60 s) and then a dual-cure resin was light-cured (60 s).**
- **The specimens were sectioned into 1-mm slab and the cement-root dentin bond strength was assayed by micro-push-out bond test.**
- **SEM fractography and confocal microscopy interfacial analysis were also performed as well as ATR/FTIR vibrational characterization of the microfillers.**
- **Three-way ANOVA and Student-Newman-Keuls post-hoc statistical analysis (P<0.05) were performed.**

CORONAL ROOT DENTINE	Water Bonding	Ethanol Bonding
Res.BAG	8.1 ± 2.5 ^{A1} [5/30/65]	8.4 ± 2.3 ^{A1} [0/15/85]
Res.DCPD	7.4 ± 2.2 ^{A1} [10/50/40]	7.6 ± 1.8 ^{A1} [0/20/80]
Res.CTRL	6.9 ± 1.4 ^{A1} [30/65/5]	7.6 ± 1.1 ^{A1} [15/75/10]

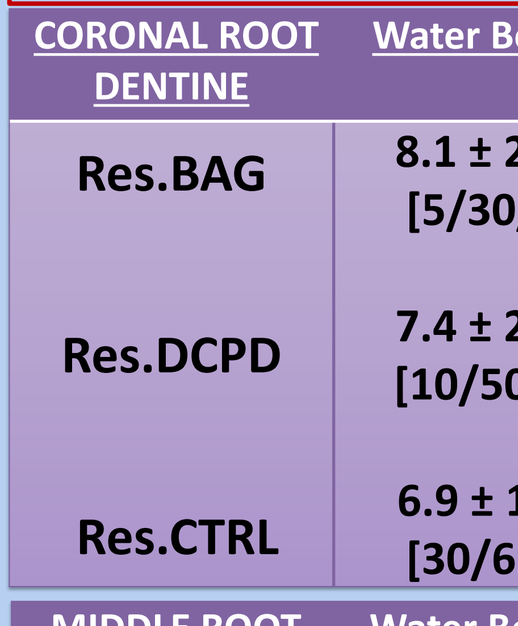
MIDDLE ROOT DENTINE	Water Bonding	Ethanol Bonding
Res.BAG	7.4 ±2.6 A1 [10/35/55]	7.8 ± 2.4 A1 [5/20/75]
Res.DCPD	7.1 ±2.4 A1 [20/50/30]	7.2 ± 2.1 A1 [10/40/50]
Res.CTRL	4.8±1.5 A2 [60/40/0]	7.0 ± 1.8 B1 [25/70/5]



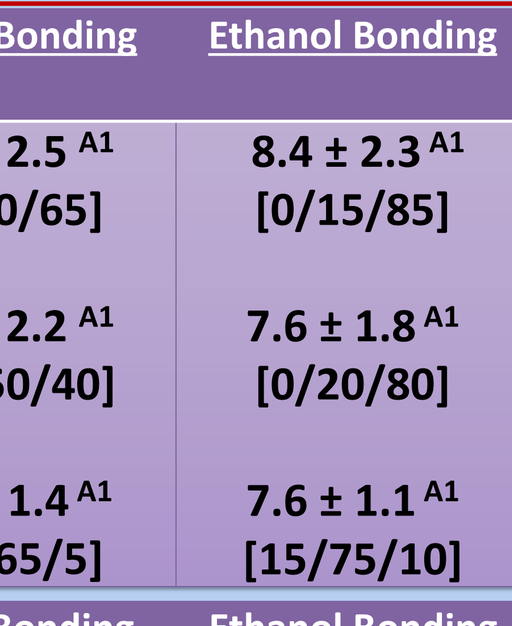


RESULTS

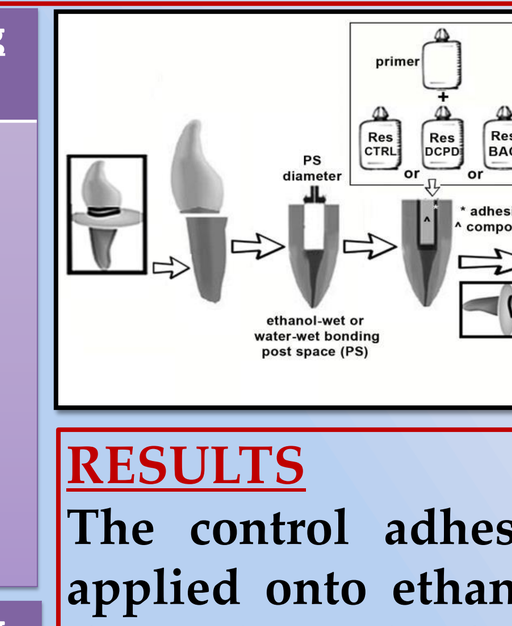
The control adhesive showed higher bond strength when applied onto ethanol-wet then when applied onto water-wet dentin (p<0.05). The incorporation of the fillers had no negative influence on the bond strength, but it increased the bond strength when used with the water-wet strategy compared to the filler-free resin (p<0.05). The resin-cements containing the BAG and DCPD microfiller induced mineral deposition and tubular occlusion especially when used in combination with the ethanol-wet bonding. A lack of resin infiltration was observed (confocal microscopy) only when the filler-free resin was applied onto water-wet root-dentin.



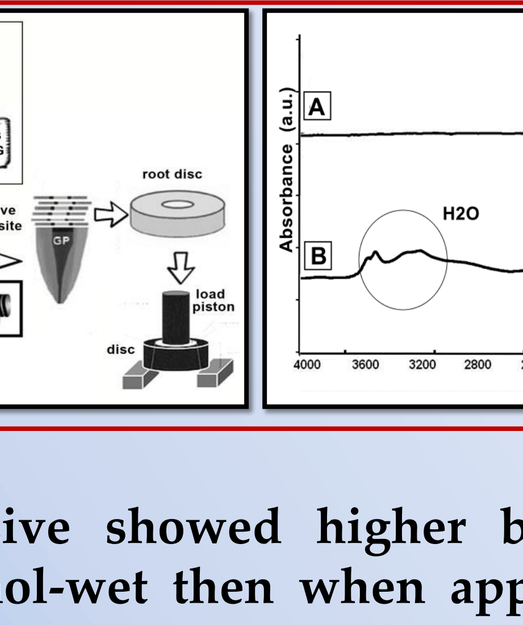
Res.DCPD in Water-Wet Middle Dentine



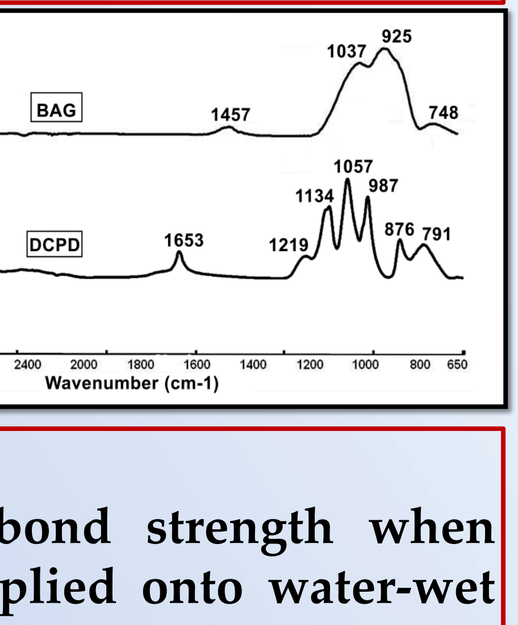
Res.CRTL in Ethanol-Wet Middle Dentine



Res.CTRL in Water-Wet Middle Dentine



Res.BAG in Water-Wet Middle Dentine



Res.CTRL in Water-Wet Coronal-Dentine

CONCLUSION

Resin-cements formulated with the use of bioactive glasses or calcium-phosphate microfillers present improved bonding ability both to coronal and middle root-canal dentin compared to traditional etch-and-rinse adhesives, in particular when applied with the ethanol-wet bonding technique.