

BACKGROUND

The composite resin used to bond the orthodontic bracket to the tooth enamel surface should possess antibacterial effect in order to prevent demineralization of the teeth around the bracket. Researchers around the globe are trying to alter the traditional orthodontic composite resin by incorporating different antibacterial agents, the latest being nanoparticles like gold, silver and titanium dioxide.

AIM

The present study aimed to evaluate the efficacy of Yttrium Fluoride (YF3) nanoparticles incorporated into traditional orthodontic composite resin for use in orthodontic bonding. To determine the efficacy of this blend, adhesion strength and anti-bacterial effect of the blended resin were determined.

METHODOLOGY

Yttrium Fluoride (YF3) nanoparticles (NP) were added at 1%, 2% and 3% (w/w) to the conventional orthodontic composite resin (Transbond XT). The blended composite resin was labeled as NP1, NP2 and NP3 respectively according to w/w of NP's. A total of 60 extracted human premolars were randomly allocated into four groups of 15 (n=15). Orthodontic brackets were bonded using the conventional (control) and experimental composite resin (NP1, NP2 and NP3). The adhesion strength of the composite resin was determined by a universal testing machine. The antibacterial effect of Yttrium Fluoride (YF3) nanoparticles against *Streptococcus mutans* was assessed by viable cell counting method in brain heart infusion agar medium. For the same, a total of 40 composite discs specimen were prepared using the control and experimental composite resin (n=10). The data was analyzed by One-way ANOVA and Tukey's post hoc analysis. In all the tests, the significance level was determined to be 0.05.

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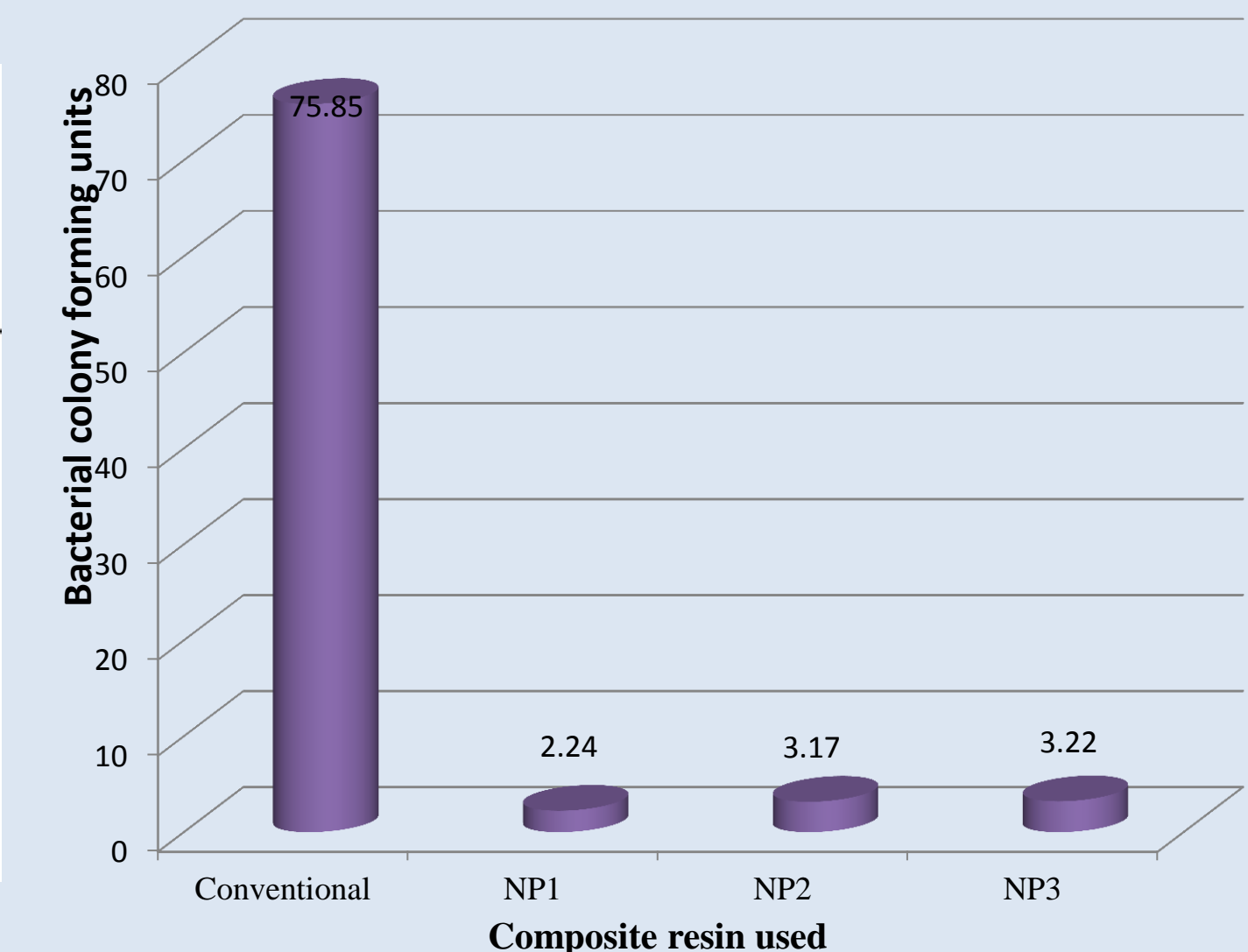
RESULTS

The control group presented with the highest values (11.61+ 0.23) and NP3 (10.49+0.17) with lowest values. Among the experimental groups, significant difference was observed between NP1 and NP2 groups; NP1 and NP3 groups but no significant difference between NP2 and NP3 groups (P=0.736)(Table 1). The highest bacterial colony forming units (CFU) were found in control group (75.85+1.15) and the least CFU was found with NP1 group (2.24+1.14). Significant difference in the mean CFU of the conventional and experimental composite groups was observed (P<0.05) (Figure 1).

Table I: Comparison of adhesion strength (MPa) between conventional and experimental composite resin groups

Groups	Mean	SD	*Post hoc analysis
Conventional	11.61	0.23	A
NP 1	11.44	0.30	A
NP 2	10.60	0.21	B
NP 3	10.49	0.17	B

* Different capital letters in a row implies statistical significant differences between the groups (P < 0.05)



CONCLUSION

Yttrium Fluoride nanoparticles at 1% concentration demonstrated significant anti-bacterial effect without compromising the adhesion strength.

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