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Shear-peel strength comparison of orthodontic band cements including novel calcium-silicate

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Objectives: Stable attachment of molar bands for arch wires plays an important role in successful orthodontic treatments. Novel calcium silicate cements demonstrate apatite-forming capability in vitro (B. Ranjkesh et al 2016). The aim of this study was to compare shear-peel strength of novel calcium silicate with fluoride and fast-setting, Glass ionomer, and Zinc phosphate cement, used for luting of orthodontic bands on molars kept one month in phosphate buffering solution (PBS).

Materials and methods: The roots of 35 extracted human molars were embedded in acryl. Three groups were allocated. An orthodontic band (AO) was fitted on the free crown. Each group of the teeth (n>10) was cemented with novel calcium silicate (Protooth), Glass ionomer (Orthocem), or Zinc phosphate (DeTrey Zinc). The cements were mixed according to the manufacturers instructions. Samples were stored at 37ºC in humid chamber for 24 h and one month in PBS. Standardized orthodontic band pull-off test was applied on all teeth by Instron machine to obtain individual stress-strain curves and measure shear-peel strength. Data were analyzed using non-parametric Mann-Witney test.

Results: The results showed that, both novel Calcium Silicate (Protooth) and Zinc phosphate cement (DeTrey Zinc) were significantly higher than Glass ionomer cement (Orthocem) when looking for the force (N, $p<0.05$) and the shear-stress (MPa, $p<0.05$). The values for novel calcium silicate cement (Protooth) were higher than Zinc phosphate cement (DeTrey Zinc), but not with statistical significance difference ($p>0.05$).

Conclusion: This study on luting of orthodontic bands demonstrated that bonding strength of novel calcium silicate (Protooth) can match and improve the bonding strength of Zinc phosphate (DeTrey®Zinc) and Glass ionomer (Orthocem) cement, respectively. In conclusion, the shear-bonding strength of novel calcium silicate cement with fluoride seem relevant for band cementation. Further studies seem relevant.