COMMENTARY

EFFECT OF PROLONGED DIRECT AND INDIRECT PEROXIDE BLEACHING ON FRACTURE TOUGHNESS OF HUMAN DENTIN

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The purpose of this article was to determine the possible adverse effects of direct versus indirect dental bleaching on the fracture toughness of human dentin after 2 months of bleaching. This work was an extension of the group's previous work on the adverse effects of bleaching on the flexural strength and modulus of bovine dentin.[1] In both studies, direct exposure to bleach produced similar reductions in material properties (modulus of elasticity and fracture toughness, respectively). No such effects were seen when intact enamel was present. The current work is even more clinically relevant because it was done using human dentin. The authors point out that the relative contribution of changes in either the collagen or noncollagenous proteins of dentin or the mineral phase to the reductions in K_{1C} of dentin needs further study. In a study titled "Reversal of dentin bonding in bleached teeth,"[2] the authors were able to restore 50% reductions in shear bond strength of composite resin induced by 35% H_2O_2 solution or Rembrandt bleaching gel by a 10-minute treatment with 10% sodium ascorbate. One wonders if prolonged treatment (ie, 24 hours) with 10% sodium ascorbate or other reducing agents would restore the K_{1C} to control levels. This would have to be done after bleaching because concurrent use of an oxidizing agent (H_2O_2) and a reducing agent might cancel out the bleaching effect of H_2O_2.

One approach to counteracting the potential demineralizing effects of bleaching agents would be to store the teeth in remineralizing solutions that mimic the ion products of calcium and phosphate in saliva. Another approach would be to add amorphous calcium phosphate to the bleaching gels.[3]

Now that the authors have identified the direct effect of bleaching agents on weakened dentin, they can use the same model to evaluate potential therapies to prevent or reverse the weakening effect of prolonged exposure to bleaching agents.

REFERENCES

1. Tam LE, Lim M, Khanna S. Effect of direct peroxide bleach application to bovine dentin on flexural strength and modulus *in vitro*. J Dent 2005;33:451–8.

2. Kaya AD, Türkün M. Reversal of dentin bonding to bleached teeth. Oper Dent 2003;28:825–9.

3. Giniger M, MacDonald J, Ziema S, Felix H. The clinical performance of professionally dispensed bleaching gels with added amorphous calcium phosphate. J Amer Dent Assoc 2005;136:383–92.

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