3rd International Conference on
EYE AND VISION
August 21-23, 2017 | Toronto, Canada

Cornea crosslinking with verteporfin nonthermal laser therapy

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This study is to test if corneas treated with combined verteporfin non-thermal laser therapy can increase corneal mechanical stiffness and increase resistance to enzymatic degradation. Human research corneas were obtained from Tissue Bank International (Baltimore, Maryland) and from North Carolina Eye Bank (Winston-Salem, North Carolina). Riboflavin 5'-phosphate sodium salt hydrate, 20% (w/w) dextran solution (from Leuconostoc mesenteroides) and collagenase A (from Clostridium histolyticum, E.C. 3.4.24.3) were obtained from Sigma Aldrich (St. Louis, Missouri). Barron R artificial anterior chambers were purchased from Katena Eye Instruments (Denville, New Jersey). The VEGA LED-based UV emitter was purchased from Costruzione Strumenti Oftalmici (Firenze, Italy). Untreated corneas were dissolved in collagenase A in 5.47 h ± 0.21 hours. Cross-linked corneas demonstrated a slower rate of dissolution (20.06 h ± 1.23hours). We report for the first time that verteporfin non-thermal photodynamic laser increases corneal mechanical stiffness and resistance to enzymatic collagenase degradation. Although a clinical study of this methodology in human patients is still needed, our results suggest that verteporfin non-thermal photodynamic laser induces crosslinking cornea tissue that is like collagen crosslinking (CXL) using ultraviolet-A (UVA) irradiation combined with riboflavin. V-NLT could represent an alternative treatment for cornea ectatic diseases.

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