

Biomechanical evaluation of atmospheric pressure cold plasma and cross-linking treatment in ex vivo porcine corneas: preliminary results.

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Purpose

To evaluate and compare the biomechanical properties of ex vivo porcine corneas exposed to atmospheric pressure cold Helium plasma and cross-linking in different conditions (fresh, healthy, lesioned, cultured).

Methods

94 porcine corneas were split in 16 populations based on the combination of different conditions: healthy, lesioned, fresh, in culture, plasma-treated, cross-linking treated and untreated. Sample treatments were performed by means of a previously developed plasma source that generates an ionized helium flow for 2 or 4 minutes, and by means of the CXL Vetuvir® machine, using the Dresden protocol. Tensile tests were performed on corneal strips, which were subjected to four incremental strain values (up to 32%), each of which held constant for 400 s. Two-stages non-linear exponential decay curves were interpolated. ANOVA test of the estimated curves parameters and post-hoc pairwise comparisons among levels were performed using the Bonferroni correction. A p-value of less than 0.05 was considered a significant change.

Results

Based on the tensile relaxation curves, the lesioned plasma-treated corneas, in fresh and cultured conditions, exhibited no significative difference compared to the healthy fresh no treated ones, independently of the treatment time. Considering the effect of the two treatments on the lesion, a significative greater stiffness was found for the plasma against the cross-linking.

Conclusion

In this study a greater stiffness and less relaxation was found in helium plasma treated cultured group compared to other conditions, suggesting further promising in vivo application for corneal healing. More studies on corneal hystology and ultrastructural anatomy after plasma treatment are ausplicable.

Conflict of Interest

I do not declare any conflict of interest.