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Abstract Title: **Corneal Deformation in an Inflation Porcine Corneal Model Measured With Scheimpflug Imaging**

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Purpose: To study the biomechanical properties of cornea from its response to varying intraocular pressure (IOP), in a situation as near as possible to the in-vivo state.
Methods: Enucleated intact porcine eyes were placed in a holder that mimics the orbit. A needle was inserted from the top of the eye, entering the anterior chamber between the lens and the iris, leaving the cornea untouched. IOP was measured using a blood-pressure monitor system, and varied injecting isotonic serum. A Scheimpflug imaging-based 3D corneal topographer (Pentacam, Oculus) was used to measure anterior and posterior corneal shapes, and corneal pachymetry. Custom routines were developed to determine radii of curvature of the anterior (R_{ant}) and posterior (R_{back}) corneal surfaces, corneal apex position and corneal-scleral linkage points. Measurements were performed at different pressures (0 to 120 mm Hg above atmospheric pressure) in 9 eyes. In 2 eyes measurements were also done with decreasing pressure.
Results: 1) We found two separate regimes with increasing pressure: **(a)** Between 10 and 30-40 mm Hg, R_{ant} increases at a rate 29 ± 4 μm/mm Hg (mean ± std across *n* = 5 eyes) and R_{back} at 30 ± 1.5 μm/mm Hg (*n* = 5). Central and peripheral pachymetries drop at a rate -4 ± 1.7 μm/mm Hg (*n*=5). Corneal apex moves forward at 20 ± 10 μm/mm Hg (*n* = 3). **(b)** Between 40 and 120 mm Hg the changes in radii are smaller and not systematic across eyes: R_{ant} changes at -0.6 ± 1.8 μm/mm Hg (*n* = 9) , and R_{back} changes at 0.2 ± 3 μm/mm Hg (*n* = 9). Pachymetry keeps dropping in all eyes, at -0.8 ± 0.2 μm/mm Hg (*n* = 9). Corneal apex moves forward at 2.0 ± 1.2 μm/mm Hg (*n* = 3).
2) When decreasing pressure, pachymetry stays approximately constant between 100 and 60 mm Hg. When going down from 60 to 20 mm Hg, it increases 0.3 ± 0.1 μm per mm Hg.
3) The points of linkage between cornea and sclera move at 200 ± 80 μm/mm Hg during the first regime, and at 39 ± 7 μm/mm Hg during the second regime (*n* = 3).
Conclusions: We provided experimental data for better characterization of corneal biomechanics. The presence of two different regimes and hysteresis indicate that the cornea is not elastic in the whole range of pressures, at least beyond 40 mmHg.The observed deformation is consistent with a shift of corneal edges, suggesting that full understanding of corneal biomechanics requires considering both corneal and scleral mechanics.

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