

THE MECHANICAL EFFECT OF VALSALVA MANEUVER (VM) ON ANTERIOR LAMINA CRIBROSA: AN ANALYSIS USING SWEEP SOURCE OPTICAL COHERENCE TOMOGRAPHY (SS-OCT)

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ABSTRACT

Aims: This study was conducted to determine the mechanical effect of Valsalva manoeuvre (VM) on the anterior lamina cribrosa depth (ALCD) using the Swept-Source Optical Coherence Tomographer (SS-OCT) in young, healthy eyes. The ALCD changes (ALCDC) were measured at different time points after the cessation of a controlled VM.

Methodology: This cross-sectional study included 30 eyes of 30 young and healthy participants. The optic nerve head (ONH) was scanned using Topcon DRI SS-OCT (Topcon, Japan) using the 1 HD-line strategy at a few time points; before VM (baseline), and after VM termination at minutes-zero, -one, -two, -four, -six, -eight and -15. A controlled VM was conducted by sustaining expiratory pressure at 40mmHg for 20 seconds through a rubber tube connected to an aneroid sphygmomanometer. Scanned ONH images were exported into Adobe Photoshop CS3 software for ALCD measurement. The ALCD was taken as the distance from the Bruch's membrane openings to the anterior lamina cribrosa layer. ALCD values for analysis was taken from an average of three measurement points (deepest point, 50µm and 100µm temporal away) in each scan. The ALCDC was taken as an absolute (modulus) value calculated by the difference between |ALCD at each time point and the baseline.

Results: Twenty-three eyes showed anterior ALCD displacement (towards the cornea) after VM termination. The average ALCDc was the highest at minute-0, 38.01±19.62µm, and consistently decreased to the lowest 2.72±3.20µm at minute-15 (p<0.001, RM-ANOVA). Tukey HSD posthoc test showed ALCDC at minute-zero was significantly higher than all time points (p<0.001) except to minute-one. The ALCD reverted to the value of the baseline between minute-6 to minute-8.

Conclusion: VM termination mostly displaced lamina cribrosa anteriorly. VM causes displacement of the lamina cribrosa even after six minutes of its termination. The mechanical changes elicited by VM may affect the optic nerve bundles hosted by the lamina cribrosa.

Keywords: Valsalva manoeuvre, anterior lamina cribrosa depth, swept-source optical coherence tomography