Advancing Precision in Outflow Facility Calculations

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Purpose

Tonography, a non-invasive method to measure outflow facility, provides insights into aqueous humor drainage resistance. Lack of consensus on calculation methods hinders standardization in outflow facility studies. Our aim is to present contemporary approaches for computing outflow facility and to advocate for an optimal methodology, promoting consistency and reliability.

Methods

Subjects with ocular hypertension (OHT) or open-angle glaucoma (OAG) were enrolled in a multicenter, prospective, randomized crossover trial of latanoprost and timolol (ClinicalTrials.gov Identifier NCT04412096) as part of Eye Dynamics and Engineering Network 2 (EDEN2). 26 eyes from 16 participants underwent 2-minute pneumatonography using the Model 30 (Reichert, Depew, NY). With variables from the equation defined in Table 1, outflow facility was calculated using 12 different methods (Table 2). Spearman's rank-order correlation (ρ, rho) was conducted to see if calculators had uniformly ordered results. Calculators were compared for the quantity of outliers, or values outside the physiologic range (0-0.8 µl/min/mmHg). Also, the calculators' resistance to variability was assessed by examining the standard deviation (σ) in a subset of suboptimal tonography tracings (≤5/10), graded on a scale of 10.

Results

26 eyes from 16 participants (11 males, 5 females; 58 ± 11 years; 8 OHT, 8 OAG) were included. Strong positive correlations (ρ=0.73–0.99) were found among all calculators, except IOP_Vc (ρ=-0.02–0.11), which was consequently excluded. Of the remaining calculators, the number of outliers varied, ranging from 6-15 out of 149 outflow facility values per calculator. Those with 10+ outliers were eliminated (Pc_125, Pc_125_Vc, and Pc_125_Poly). Constant_E had few outliers and exhibited the lowest σ in the suboptimal tonography tracings subset (σ=0.276), indicating superior resilience in non-ideal contexts. Constant_E had no significant difference between sex, age, or OHT vs. OAG (p=0.07, p=0.23, p=0.55, respectively).

Conclusions

Our results endorse a linear regression outflow facility calculator, utilizing a constant ocular rigidity and including corneal indentation volume. This calculator is the best for broad applicability. Standardizing the calculation among independent labs will enable a more direct comparison of data.