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Diagnostic value of the Stratus OCT Optical Coherence Tomograph, Heidelberg Retina Tomograph (HRT II) and GDx VCC Scanning Laser Polarimeter to detect structural damage in glaucomatous eyes

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Purpose To compare the diagnostic capacity to discriminate between normal and glaucomatous eyes of different optical imaging devices, Optical Coherence Tomography (OCT), Heidelberg Retina Tomograph (HRT), and GDx Nerve Fiber Analyzer (GDx VCC).

Methods A total of 66 normal subjects and 74 glaucomatous patients were included in the study. Subject eyes were classified into the diagnostic groups based on intraocular pressure and standard automated perimetry. Every patient underwent complete ophthalmic examination including GDx VCC, HRT II and Stratus OCT 3000 evaluation. The receiver operating characteristic curves (ROC) were plotted to obtain the diagnostic value (sensitivities at fixed specificities -85% and 95%-) and the area under curves (AUC) of the different structural parameters assessed by the optical imaging devices.

Results In glaucomatous eyes the best parameters from each device were the GDx VCC Nerve Fiber Index -NFI- (AUC=0,879), the OCT retinal nerve fiber layer global average thickness (AUC=0,945) and the HRT linear discriminant function FSM (AUC=0,899). No statistically significant differences were found between the AUCs for these parameters. Nevertheless, at a fixed specificity of 85% and 95% OCT showed better sensitivity than HRT and GDx ($p<0.05$).

Conclusion Several structural parameters measured by the optical imaging devices of this study are useful to discriminate glaucomatous damage with high diagnostic abilities. Nevertheless, the best OCT and HRT parameters showed higher sensitivities than the best GDx VCC parameters.

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Dynamic Contour Tonometry after intraocular surgery

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Purpose Postoperative intraocular pressure measurement is prone to error due to temporary alteration of bulbar and corneal properties, like corneal edema, incisions and gas tamponades. This study compares pressure readings of dynamic contour tonometry as a new method for intraocular pressure measurement with Goldmann applanation tonometry.

Methods The study included 31 eyes of 31 subjects (10 eyes after standard pars plana vitrectomy with C3F8 gas tamponade and 21 eyes after clear cornea incision phako emulsification. All measurements were performed one day postoperatively. The dynamic contour tonometric measurements were compared with Goldmann applanation tonometric values obtained at the same examination. Altogether, 93 dynamic contour tonometric measurements and 62 Goldmann tonometer measurements were analyzed. Additionally, corneal pachymetry was performed.

Results Mean dynamic contour tonometric measurements after cataract surgery (22.07 ± 7.21 mm Hg) did not show significant ($p=0.979$) differences when compared to mean applanation tonometric values (22.10 ± 8.39 mm Hg). Pressure measurements after surgery with gas tamponade was 21.52 ± 6.22 mm Hg for dynamic contour tonometry and 21.01 ± 7.63 mm Hg for applanation tonometry. Differences were not significant ($p=5.83$). No significant correlation between tonometric values and central corneal thickness were found.

Conclusion Dynamic contour tonometry and applanation tonometry pressure readings did not show significant differences in eyes after intraocular surgery. Compared to literature data, pressure values measured by dynamic contour tonometry seem to be slightly lower when compared to applanation tonometry.

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Agreement between a new tonometer-ICARE- and Goldmann applanation

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Purpose The Goldmann applanation is the gold standard to measure intraocular pressure (IOP). Nonetheless several drawbacks remain: corneal contact exposes to an infectious risk, patient must usually be seated, measure requires a training, children and pusillanimous patients feel uncomfortable and any modification of the corneal surface can alter the results. Therefore new physical method of tonometry with less disadvantages needs to be evaluated. ICARE tonometer (TIOLAT, Finland) is based on the measurement of the speed of the rebound of a small harmless disposable probe thrown on to the cornea without topic anaesthesia. Aim: to determine the agreement between both methods.

Methods Three trained doctors of our glaucoma department performed 314 consecutives measures on 29 patients with both methods in a random order. Agreement between both tonometers was evaluated with the Bland and Altman method.

Results IOP with ICARE were significantly higher than with Goldmann applanation: 18+/-6 mmHg, (from 6 to 54) median 17 versus 16+/-6 mmHg (5 to 51), median 15, $p<0.001$. Bland Altman plots: a mean overestimation of 2 mmHg was described with ICARE and 95% of these measures were between -4 and +8 mmHg around Goldmann IOP. No variation of agreement in relation to the level of IOP was highlighted.

Conclusion The new ICARE tonometer slightly overestimated IOP but remains clinically relevant. Considering its advantages in case of patients suffering from dystrophic cornea, in certain early post operative period, in children, and lying patients, this user-friendly tonometer could be an alternative method to the applanation. The lower threshold of detection and absence of bias for high IOP make it usable for mass screening.

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Comparison of the ICare® rebound tonometer with the Goldmann tonometer in a normal population

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Purpose The aim of this study was to evaluate the accuracy of measurement of intraocular pressure (IOP) using a new induction/impact rebound tonometer (ICare®) in comparison to the Goldmann applanation tonometer (AT).

Methods Forty six optometry students (14 males, 32 females) aged from 17 to 30 years (mean SD, 22.74 2.97) comprised the study group. Right and left eyes were measured, however only measurements from the left eye were considered for statistical analysis while the right eye acts as demonstration The ICare® was handled by an optometrist and the Goldmann tonometer by an ophthalmologist.Two measurement series, of six measurements were obtained for Icare, and the average value was recorded. For the Goldmann tonometer, two readings were obtained, and the average was recorded.

Results In this study, statistically significant differences were found when comparing the ICare® rebound tonometer with applanation tonometry (AT) ($p < 0.05$). The mean difference between the two tonometers was 1.34 mmHg ± 2.03 (mean ± SD) and the 95% limits of agreement were 3.98 mmHg. A frequency distribution of the differences demonstrated that in more than 80% of cases the IOP readings differed by less than 3 mmHg between the ICare® and the AT .

Conclusion In the present population the ICare® overestimates the IOP value by 1.34 mmHg on average when compared to Goldmann tonometer. Nevertheless, the ICare® tonometer may be helpful as a screening tool when Goldmann applanation tonometry is not applicable or not recommended, since it is able to estimate IOP within a range of ± 3.00 mmHg in more than 80% of the population.