Intraocular Pressure Measurement Pre- and Post Refractive Surgery Using GAT and CorVis ST bIOP Algorithm

A.Eliasy[1], K.Chen[2] and A.Elsheikh[3,4]

[1]School of Engineering, University of Liverpool, Liverpool L69 3GH, UK, eliasy.ashkan@gmail.com
[2]School of Engineering, University of Liverpool, Liverpool L69 3GH, UK, hskchen5@liverpool.ac.uk
[3]School of Engineering, University of Liverpool, Liverpool L69 3GH, UK, elsheikh@liverpool.ac.uk
[4]NIHR Biomedical Research Centre for Ophthalmology, Moorfields Eye Hospital NHS Foundation Trust and UCL Institute of Ophthalmology, UK, elsheikh@liverpool.ac.uk

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Introduction: As an essential routine eye examination, intraocular pressure (IOP) measurement is used to risk profile and manage glaucoma. Goldmann applanation tonometer (GAT) is the reference standard for IOP measurement but its readings are influenced by corneal geometry, thickness and tissue stiffness [1]. A new non-contact device, CorVis ST (Oculus Optikgeräte GmbH, Wetzlar, Germany) has been developed to provide a more accurate estimation of IOP [2]. This study aims to assess the new CorVis ST biomechanically-corrected (bIOP) algorithm by statistically comparing its IOP estimations obtained before and after LASIK and SMILE refractive surgeries against those obtained with GAT.

Methods: Thirty six patients treated with LASIK (14 patients, 20 eyes) or SMILE (22 patients, 30 eyes) were included in this retrospective case-study. The following settings were used for LASIK's femtosecond laser flap creation: flap diameter 8.4-8.5 mm; optical zone 6.5-6.75 mm; flap thickness 110 µm. For ReLEx SMILE, the following settings were used: cap diameter 7.9 mm; optical zone 6.25-6.5 mm; cap thickness 100 µm. Preoperative and postoperative (1 to 3 months) evaluation included slit lamp biomicroscopy of the anterior and posterior segments, Goldmann applanation tonometry (GAT-IOP), and CorVis ST bIOP measurements. Statistical analyses were performed using SPSS 24 (IBM, Armonk, NY).

Results: Pre-operative GAT-IOP showed significant correlation with central corneal thickness, CCT (R=0.22, p=0.047 for LASIK and R=0.17, p=0.037 for SMILE). Conversely, no significant correlation was found between bIOP and CCT pre-operatively (LASIK: R=0.09, p=0.705 and SMILE: R=0.068, P=0.706). After LASIK treatment, there were significant decreases in GAT-IOP (-3.2±3.4mmHg, p<0.001), compared to preoperative readings, while bIOP did not undergo significant variation (0.1±2.1mmHg, p=0.80). Similarly, in the SMILE group, there were significant decreases in GAT-IOP (-3.2±2.1mmHg, p<0.001), compared to pre-surgery, while bIOP showed no significant differences (0.8 ± 1.8mmHg, p=0.273).

Conclusions: The study shows that bIOP readings pre and post LASIK and SMILE are not significantly different and not significantly correlated with CCT. In contrast, GAT-IOP underwent significant reductions postoperatively and showed significant correlation with CCT preoperatively. These results suggest that bIOP algorithm would be better able than GAT to compensate for the effect of CCT and the surgery-related biomechanical changes.

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