



## LETTERS TO THE EDITOR

### Evaluation of Goldmann applanation tonometry, rebound tonometry and dynamic contour tonometry in keratoconus



### Evaluación de la tonometría por aplanación de Goldmann, la tonometría de rebote y la tonometría de contorno dinámico en el queratocono

Dear Editor,

We read with great interest the article by Özcura et al.,<sup>1</sup> concerning the evaluation of Goldmann applanation tonometry (GAT), rebound tonometry (RT) and dynamic contour tonometry (DCT) in patients affected by keratoconus, suggesting that DCT may be the most appropriate tonometer to use in keratoconus for the measurements of intraocular pressure (IOP), because DCT does not appear to be dependent upon corneal thickness (CCT) and radius (CR).

This paper confirms previous finding in normal patients, as Lanza et al. found that DCT showed higher values of IOP, mainly related to CCT and volume, concluding that, if in the future DCT should be considered the gold standard, higher values of IOP could still be considered normal.<sup>2</sup>

In our opinion, in cases of keratoconus the difference between DCT and GAT could also be related to the corneal biomechanical changes, such as corneal hysteresis (CH) and corneal resistance factor (CRF). The same happens in corneas that underwent refractive surgery, where the changes in corneal thickness and radius make GAT and IOL power calculation unreliable.<sup>3–7</sup>

Moreover in these patients a significant decrease of CH and CRF immediately after myopic PRK that remains stable over the follow-up has been described, compared to normal eyes, in which these parameters have been shown to be related to the corneal shape and thickness. So these parameters could in addition influence the unreliability of GAT, making the DCT potentially better.<sup>8,9</sup>

A similar behavior therefore could be present in patients affected by keratoconus, where CH and CRF changes<sup>10</sup> too could influence the differences between GAT and DCT, increasing or decreasing such differences.

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## Reply to comment by De Bernardo and Rosa on ‘‘Evaluation of Goldmann applanation tonometry, rebound tonometry and dynamic contour tonometry in keratoconus’’



## Réplica al comentario de De Bernardo y Rosa a ‘‘Evaluación de la tonometría por aplanación de Goldmann, la tonometría de rebote y la tonometría de contorno dinámico en el queratocono’’

We would like to thank the De Bernardo and Rosa for their comment and interest in our study entitled ‘‘Evaluation of Goldmann applanation tonometry, rebound tonometry and dynamic contour tonometry in keratoconus’’ in which we compared three tonometers in patients with keratoconus.<sup>1</sup> In this cross-sectional study, we concluded dynamic contour tonometry (DCT) may be the most appropriate tonometer to use in keratoconus for the measurements of intraocular pressure (IOP), because DCT do not appear to be dependent upon central corneal thickness (CCT) and corneal radius of curvature (CR).

We compared these three tonometers in normal and glaucomatous eyes in another study.<sup>2</sup> As the study of Lanza et al.,<sup>3</sup> we found that DCT has highest IOP measurements among these tonometers. Rebound tonometry (RT) was most influenced tonometer from CCT although all tonometers were significantly positive correlated with CCT except DCT in glaucomatous eyes. CR did not influence IOP measurements. Corneal biomechanical properties, such as corneal hysteresis (CH) and corneal resistance factor (CRF) are other factors that affect the measurement of IOP as you stressed. Both CH and CRF decrease in keratoconic corneas compared with normal corneas because of mechanical weakening of the stroma. Furthermore the analysis of these corneal biomechanical properties may contribute to early diagnosis of keratoconus in the future.<sup>4</sup> Bayer et al. reported that both DCT and GAT were significantly influenced by CH and CRF. According to the regression models, DCT was

slightly less affected from CH and CRF when compared with that of GAT. The magnitude of effect of CH and CRF on DCT measurements was quite different. The IOP decreases 1.78 mmHg/1 mmHg increase in CH and increases 1.83 mmHg/1 mmHg increase in CRF for the DCT.<sup>5</sup>

Because of the many difficulties in IOP measurements on the cornea especially with keratoconus, researchers and clinicians are interested in new tonometers that measure IOP independently of these corneal properties. The Goldmann applanation tonometer is currently the most widely used device in clinical practice, and is accepted as the gold standard method for IOP measurement. However, a new tonometer may be a gold standard in the near future.

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