The EFCLIN 2004 Measurement Exercise

(Or what Went on in the Measuring Hut)

By Tony Hough

The central topic on the EFCLIN 2004 conference programmed was a review and discussion on the development of wavefront-guided contact lenses. Part of this program included a debate as to whether the industry was indeed ready to manufacture such lenses. Principal conference speaker John de Brabander set out the tempting possibilities while the author was invited to outline the problems in this area. As part of this case for the defense, I devised the measurement exercise which was carried out on during the meeting in the EFCLIN Measuring Hut.

To provide lenses which will correct higher order aberrations we need in the first instance to be able to control the power-related dimensions of the lower order aberrations (sphere, cylinder) to a small fraction of the current ISO standard ±0.25D. The purpose of the measurement exercise was to take a range of toric front surface rigid lenses and try to establish the reproducibility of measurement for power-related dimensions; to do this, we simulated an international ring test using five independent laboratories, albeit that in this instance all five were located in the Measuring Hut.

The accuracy and precision of power measurement of toric contact lenses has always been difficult to assess. Worse, there is no credible commercially available instrument which will do this automatically. Every contact lens manufacturer who produces custom torics relies on a skilled and experienced technician to measure the lens using a manually focusing focimeter ("lensometer") and then to decide if the lens meets its specification. The internationally agreed tolerances for power-related dimensions are ±0.25D for both sphere and cylinder and ±5 degrees for axis direction.

It is worth noting that this activity has never been tested in a real international ring test; there has been a ring test to determine the reproducibility of power measurement for spherical lenses having a wide range of powers and the results of this have then simply used to specify credible tolerances for toric lenses.

Because there is now considerable discussion about the introduction of custom wavefront-guided contact lenses, it is essential to know the repeatability and reproducibility of current best practice methods when applied to toric lenses.

This is now especially relevant.

Anticipating the debate on wavefront-guided lenses, it seemed sensible to test the performance of power measurement for "ordinary" toric lenses before we attempted wavefront controlled lenses.

The results of the experiment will be presented fully elsewhere but the success of the exercise was due to the enthusiastic and dedicated support of a group of skilled and experienced lens manufacturers who were among the delegates at the EFCLIN meeting.

Each technician was identified as a "laboratory" and each had its own manually focusing focimeter. I would like to thank those who gave up their time to measure each lens 5 times. The measurements were masked and randomized – neither the "manager" nor the measuring technician knew what the labeled powers were. The 60 lens measurements provided 180 power-related dimensions: 60 sphere power, 60 cylinder power and 60 axis direction - not to mention calibration!

The five "superlabs" were:

Lab #1: John Schilperoort, Hoge School van Utrecht, optometrie department, The Netherlands

Lab #2: Lee Dickerson, ABBA Optical Inc, USA

Lab #3: Eleftherios Karageorgiadis, EYEART, Greece

Lab #4: Morten Sejersen, Con-Lens, Denmark

Lab #5: Anatole Diep, Menicon Holdings Europe, France

Lab #1

Lab #2

Lab #3

Lab #4

Lab #5