An application of the Nidek EAS-1000 system for pupillometry

Andrew K.C. LAM, PhD, FAAO; Jim CHAN, BSc(Hons); Rae YAN, BSc(Hons); Calvin KWOK, BSc(Hons)
School of Optometry, The Hong Kong Polytechnic University, Hong Kong SAR, China.

INTRODUCTION

The Anterior Eye Segment analysis system, EAS-1000 (Nidek Co., Ltd., Aichi, Japan), is a device for measuring anterior chamber angle using a Scheimpflug principle. It can also capture a retro-illumination image for cataract assessment. The illumination level can be adjusted and a permanent record can be stored in the system. The objective of the current study was to apply this EAS-1000 system for pupillometry on a sample of normal Chinese adults. Two factors, namely age and refractive error, were investigated for their influence on pupil diameter.

METHODS

The retro-illumination mode of the Nidek EAS-1000 system was used. The device was first calibrated using circular apertures (artificial pupils) of different diameters (3 mm to 8 mm at 1 mm interval). Each artificial pupil was measured from a calliper (precision of 1 μm) and the EAS-1000 system respectively. The measurement results from these two methods were plotted using linear regression model with a conversion equation derived. Eighty adult (ranged from 20 to 39 years) Chinese subjects were recruited and the horizontal and vertical pupil diameters of their right eye were measured five times. Correlations of their overall (mean of the horizontal and vertical) pupil diameters with their age and refractive error were studied.

RESULTS

The median age of our subjects was 28 years. The mean spherical equivalent (sphere + ½ minus cylinder) of the whole sample was –4.82 D (ranging from 0.625 D to –14.375 D). No subjects had hyperopia more than +1.00 D. The calibration equation was, Y = 0.993 X + 0.041 (Pearson correlation $r^2 = 0.9998$, $p < 0.001$), where Y is the “calibrated” value and X is the “measured” value. The mean difference between the horizontal and vertical pupil diameters was 0.04 ± 0.14 mm. The overall (average of horizontal and vertical) pupil diameter was used for analyses. Figure 2 shows the correlation plot between the mean overall pupil diameter and age. The correlation was significant (Spearman rank correlation: $r = −0.55$, $p < 0.001$).

We found that the retro-illumination mode in the EAS-1000 system can be used for pupillometry. The “measured” value is very close to the “calibrated” value. The pupil diameter becomes smaller with aging but it is independent on the amount of myopia. Further study is required to compare it with other common pupillometers. The main drawback of the EAS-1000 system, in common with some commercial pupillometers, is the lack of dynamic evaluation of pupil variation.

REFERENCES