Changes in straylight and corneal light scattering in a newly diagnosed case of type 2 diabetes

Key words: cornea, C-Quant, diabetes, Lenstar, ocular biometry, scatter

Visual problems may be the first symptoms of diabetes. There have been several reports of transient changes in refraction of people newly diagnosed with diabetes. Visual acuity and refraction may be affected when there are ocular biometric changes. Small but significant biometrical changes have been found by some authors during hyperglycaemia and during reduction of hyperglycaemia. Here, we describe a case of type 2 diabetes that was detected from ocular straylight and intraocular thickness measurements.

Straylight (also ocular straylight and retinal straylight) is a measure of how light peripheral to that originating from a target of interest affects performance at a task involving the target. Straylight is affected mainly by forward light scatter from the cornea and lens.

A 29-year-old male university student was a participant in an ocular biometric study at Queensland University of Technology, with his left eye undergoing a series of tests on 5 April and 16 May 2012. Refraction was R -1.25/-0.50 × 165 and L -1.25/-0.25 × 5, with visual acuities R 6/12 (amblyopia) and L 6/6. Three measurements were taken with a Haag-Streit Lenstar LS 900 at each visit and intraocular distances were determined (Figure 1).

Further ocular biometric testing occurred on 28 November for the purpose of validating some experimental procedures. We noted approximately 17 μm increase in corneal thickness, 0.4 mm increase in lens thickness and 0.3 mm decrease in anterior chamber depth compared with the previous visits (Figure 1). A week later, he complained of discomfort when looking at a laser show during night-time. We had just acquired a C-Quant (Cataract Quantifier) from Oculus Optikgeräte (Wetzler, Germany), which determines straylight by a subjective compensation comparison method. Left eye straylight was measured as 1.32 ± 0.11 log(\(s\)) (Figure 2).

On 25 February 2013, the participant reported continuation of night-time problems. Straylight measurements were R 1.16 ± 0.06 log(\(s\)) and L 1.35 ± 0.10 log(\(s\)) (Figure 2).

On 10 May 2013, his annual urine analysis showed +4 glucose levels and he was diagnosed by his physician with type 2 diabetes three days later after a blood test that gave HbA1c of 9.2 per cent and fasting blood glucose of 11.1 mmol/l. The participant was advised by the doctor to control diet and increase physical activity. Laser scanning in vivo corneal confocal microscopy of the left eye was performed on 10 May using the HRT3 Heidelberg Retinal Tomograph (Heidelberg Engineering GmbH, Heidelberg, Germany). Images showed light scattering in the cornea, with the corneal sub-basal nerve plexus having a low contrast against the background at the level of Bowman’s layer (Figure 3, top row).

On 20 August 2013, ophthalmic measurements and medical tests were repeated. HbA1c and fasting blood glucose were at normal levels of 6.5 per cent and 5.7 mmol/l, respectively. Corneal thickness, anterior chamber depth and lens thickness were similar to those obtained in April and May 2012 (Figure 1). Straylight was now R: 0.87 ± 0.12 log(\(s\)), L: 0.91 ± 0.09 log(\(s\)), close to mean age-normal levels. Corneal light scattering had decreased according to microscopic images (Figure 3, bottom row) and the participant was no longer complaining of discomfort looking at laser shows.

COMMENT

This clinical communication demonstrates greater corneal light scattering and possibly for the first time, increased straylight during hyperglycaemia in newly diagnosed diabetes. The straylight increase was probably caused by increased light scattering accompanying the temporary increases in corneal and lenticular thickness; evidence was found for changes in corneal light scattering (Figure 3). It has been found previously that people with diabetes have greater corneal light scattering than people without diabetes. The decreases in anterior chamber depth and increase in lens thickness during hyperglycaemia are in agreement with other studies.

Straylight has practical implications for people with hyperglycaemia when driving at night-time. From a clinical viewpoint, it will...
be interesting to pay attention to the contribution of the layers of the cornea to increased light scattering during acute and chronic changes in blood glucose levels.

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