CASE REPORT

Refractory changes in hyperosmolar diabetic decompensation: when hyperglycaemia improves vision

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SUMMARY

Type 2 diabetes is a frequent condition in humans with about 350 million affected people. One of the complications is blindness caused by damage of the blood vessels in retina, cataract or glaucoma. But in an acute developing hyperglycaemia, changes in sugar level in blood modify the refraction in the eye. Thus people complain of blurred vision. We present a case of a patient with hypermetropia who reported quick amelioration of his vision as hyperglycaemia developed, because of myopisation.

BACKGROUND

The changes of vision in diabetes are well known, but frequently make it worse and cause blurred vision.¹ It is rare that an improvement of vision is reported and detected as a cause of new onset of diabetes.

CASE PRESENTATION

A 54-year-old man with no significant medical history wore glasses for both hyperopia and presbyopia. Visual impairment for reading began 6 years before consultation, with the need to use reading glasses. Two and a half years later, he presented difficulties for far vision and hyperopia was diagnosed. From that time the patient wore progressive glasses (for right eye: s +1.5 c -0.5 at 40°, left eye s +1.25 c -0.25 at 110° with an addition of s +1.75 for near vision).

Two years later the patient reported blurred vision while he was watching the screen at the airport with his glasses. When he removed his glasses, he could read the screen clearly. He also realised that he could read the small print on his smartphone without any problem. He abandoned his glasses. A check-up with his optician revealed a normalisation of the refractive defect with an emmetropisation (right eye s 0, c -0.5 at 50°, left eye s -0.25 at 85°). Surprised by those values, the optician recommended a medical check-up. A few weeks after, the patient presented asthenia, polydipsia (4–5 litres a day) and vertigo. He consulted at the emergency department 4 days later. His glucose level was 50.2 mmol/l (905 mg/dl) and osmolality 402 mosm/l.

After correction of the hyperglycaemia, his vision returned to his previous values and he took his previous glasses.

DISCUSSION

The pathophysiology of presbyopia is not fully understood; research evidence most strongly supports a loss of elasticity of the crystalline lens, although changes in lens curvature from continual growth and loss of power of the ciliary muscles have also been suggested.

Hyperopia is caused by an imperfection in the eye (often when the eyeball is too short or the lens cannot become round enough), causing difficulty in focusing on far or close objects. As an object moves toward the eye, the eye must increase its optical power to keep the image in focus on the retina. If the power of the cornea and lens is insufficient, as in hyperopia, the image will appear blurred.

Myopia is a condition of the eye where light coming in does not focus directly on the retina but in front of it. When looking at a distant object, this causes the image to be out of focus.

Refraction is the change in direction of a wave owing to a change in its medium. The phenomenon of myopia during hyperglycaemia was first reported by Duke-Elder in 1925.² He suggested that the refractory changes were owing to osmotic pressure involving the lens. It has been suggested that the refractive changes observed at times of altered blood sugar levels could be related to both morphological and functional changes of the lens. In 1999 Furushima *et al*³ studied the effect of the augmentation of glucose level in healthy volunteers by measuring their refractive system. He concluded that myopia in hyperglycaemia might be because of the thickening of the lens caused by a relaxation of the zonule of Zinn induced by ocular hypotension. However, another study did not support this hypothesis and suggested other causes such as changes in retinal or optical cerebral cortex.^{4–5} Some authors believed that it induces hyperopia but not myopia.⁶ There is however another cause which might explain refractive changes: hyperglycaemia induces the non-enzymatic glycosylation of proteins, which may affect vitreous collagens, thus, altering the vitreous.⁷ The aqueous humour does not play a role in the changes of refraction in hyperglycaemia.⁸

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Learning points

- ▶ The biological basis of refractive changes in the eyes of patients with diabetes has not yet been established and the underlying mechanism is still unknown.
- ▶ Our case tends to support the theory of myopisation induced by hyperglycaemia. When the glucose level was corrected, our patient recovered his previous refraction quickly during the days following hospitalisation.
- ▶ In conclusion, diabetes must be borne in mind in cases of rapid change of vision, should it be amelioration or deterioration.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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