Two cases of diabetic zonular cataracts

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Osmotic changes to the lens are known to occur with dramatic variations in blood sugar. Most often, these changes result in refractive changes, but not opacification within the substance of the lens. We present 2 cases with a shared history of dramatic sudden reductions in blood sugar following previously uncontrolled diabetes mellitus and peculiar zonular ridges in the perinuclear zone of their lenses. This unusual cataract might be the result of the rapid blood sugar reduction. To our knowledge, this form of cataract has not been reported previously.

CASE 1
A 74-year-old man presented for evaluation of cataracts. He had typical cataract symptoms of reduced vision and inability to correct vision to his satisfaction with spectacles. She had noted a generalized reduction in visual performance in all lighting and an inability of her eye doctor to fully correct her vision with spectacles. She had been diagnosed with diabetes over 10 years ago and had recently achieved control of previously uncontrolled type II DM.

On examination, he was found to have had a +1.25 diopter (D) refractive shift on his right eye and a +1.00 D shift on his left eye from his spectacles, which had been made 12 months ago. There were 2+ nuclear sclerotic cataracts and what were described as zonular perinuclear ridges on the lenses of both eyes (Figure 1). Cataract surgery was discussed with the patient, and he proceeded through surgery and recovery uneventfully with both eyes.

DISCUSSION
DM has long been recognized as a source of changes to the crystalline lens. In the 1920s, Duke Elder proposed that the refractive effect of hyperglycemia was to produce myopia.1 It has since been shown that induction of myopia occurred on both a chronic and an acute scale with fluctuations in refractive error demonstrable within minutes blood sugar spiking.2 Other studies have confirmed

CASE 2
A 64-year-old woman presented for evaluation of cataracts. She had noted a generalized reduction in visual performance in all lighting and an inability of her eye doctor to fully correct her vision with spectacles. She had been diagnosed with diabetes over 10 years ago and had recently been started on metformin alone. However, over the last 18 months, she lost control of her blood sugar, and as recently as 6 months previous to our examination, her glycosylated hemoglobin was 14.1%. Because of this, she had recently been started on Humalog insulin, which had an immediate positive effect in her blood sugar control, and her last glycosylated hemoglobin, taken 1 week before our examination, was 7.0%.

Comparing autorefraction with her habitual spectacle correction, which was 1 year old, she was shown to have a +1.37 D hyperopic shift on the right eye and +1.87 D hyperopic shift on her left eye. On examination, there were 1-2+ NS, 2-3+ peripheral cortical spokes and prominent zonular ridges (Figure 2). The ridges here were more dramatic than in case 1, but followed the same circumferential pattern and occupied the same lenticular space. The patient opted to pursue cataract surgery, which was performed successfully. Her follow-up was uneventful.

DM has long been recognized as a source of changes to the crystalline lens. In the 1920s, Duke Elder proposed that the refractive effect of hyperglycemia was to produce myopia.1 It has since been shown that induction of myopia occurred on both a chronic and an acute scale with fluctuations in refractive error demonstrable within minutes blood sugar spiking.2 Other studies have confirmed
the increased thickness of the diabetic lens compared with normal.3 There have been further case series and research into hyperopic shifts occurring within diabetics as well, particularly around initiation of better glucose control.4,5 Beyond causing refractive changes, which have been felt to be lenticular in origin, DM has also been associated with increased rates of all 3 common cataract types (nuclear sclerotic, cortical, and posterior subcapsular) over chronic periods. In the Beaver Dam study, a 1.0% increase in glycated hemoglobin was associated with a 15% and 12% average change in risk for nuclear and cortical cataracts, respectively, at the study’s 5-year review, and a study from the United Kingdom showed an approximate doubling of the detection of cataracts in a diabetic population compared with a nondiabetic population.6,7 Furthermore, specific cataractous changes such as snowflake cataracts have long been associated with diabetics.

In our cases, 2 patients with recently achieved dramatic improvement in blood sugar control shared ophthalmic findings of both a modest hyperopic shift and unusual circumferential perinuclear ridges. To our knowledge, the 2 cases presented represent the first anterior segment photographs of these lenticular changes. Although the changes in blood sugar control and hyperopia are almost certainly linked, it is more speculative as to whether the perinuclear ridges themselves are also related to the diabetic status and, if so, what their specific origin is.

A similar, if not identical, finding has been described previously.8 In 2005, a single case report published in the New England Journal of Medicine described a 62-year-old patient with recently achieved good control of their diabetes who developed interesting lenticular changes. The clinical description in this case seems to match our case, and high-quality dramatic Scheimpflug images are provided, but no anterior segment photographs are provided, making it difficult to interpret whether the case provided is indeed the same clinical entity as ours. In the previous case, the findings were dramatic enough to show up on Scheimpflug imaging as significant optical cavitations, which the authors termed sugar cracks. It seems possible, as the authors of the previous case describe the sugar crack as transient, that our cases may represent the resolution stage of the same phenomenon. Unfortunately, however, because both of our patients were complaining of cataract-induced vision loss, surgery was performed and so we are unable to comment on any possible evolution over time in our lens findings. In both the previous case and ours, the proposed mechanism would be a change in the lens osmotic gradient due to hyperglycemia leading to lenticular swelling. Rapid reduction in blood sugar likely led to a rapid restoration in the osmotic gradient in the lens with subsequent changes in hydration, which resulted in the ridges seen. We would propose the nomenclature of diabetic zonular cataract.

WHAT WAS KNOWN

- Variations in blood glucose occurring in diabetes have the potential to cause refractive and cataract development in the crystalline lens.
- Although both nonspecific (nuclear sclerosis, cortical cataracts, and posterior subcapsular changes) and unique (snowflake) cataracts may occur with diabetes, zonular ridges in patients with diabetes have not been previously described in the literature to the authors’ knowledge.

WHAT THIS PAPER ADDS

- The previously undescribed cataract type in 2 patients achieving rapid reduction in blood sugar will assist clinicians in identifying the issue and to query for the association with diabetes, if unknown at the time.

REFERENCES


Figure 1. Patient 1: subtle circumferential ridges surrounding the fetal nucleus. Their depth is mid-lens, as demonstrated by the in-focus fetal suture.

Figure 2. Patient 2 shows much more dramatic perinuclear ridges, but in the same circular distribution in the same anatomic zone of the lens.

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