Pigment dispersion syndrome induced by a phakic lens. Monitoring by anterior segment Optical Coherence Tomography

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ABSTRACT: A 29-year-old man came to our department complaining of pain and photophobia in the right eye (OD). He reported uneventful bilateral intraocular collamer lens (ICL) implantation 5 years previously. In April 2012, he presented with anterior uveitis with macular edema in the OD. Visual acuity (VA) was 0.5 in the OD, and 1.0 in the left eye (OS). Pigment dispersion on the lens and nasal corectopia were observed in the OD only. Anterior segment optical coherence tomography (OCT) revealed bilateral iridolenticular contact, more marked in the OD. After bilateral explantation of the ICL, the ocular symptoms disappeared and VA was recovered.

Serial anterior segment OCT following ICL implantation is extremely useful and can be an effective method for monitoring the lens position, allowing early detection of long-term complications.

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OCT is a simple-to-perform, non-invasive examination that enables high resolution images of structures in the anterior segment of the eye to be obtained. It has multiple applications in both the anterior and posterior segment of the eye, and is currently an essential tool for retina specialists to assess the macular area, and for glaucoma specialists to observe changes in the optic disc and nerve fiber layer.

Knowledge of anterior chamber morphology, follow-up of phakic intraocular lens (IOL) implants and their relationship with the iris, crystalline lens and sulcus, have allowed us to identify diseases and their pathophysiology that we were unaware of prior to its introduction. It enables measurement and morphological evaluation of the IOL vault, which is defined as the perpendicular distance between the anterior pole of the lens or crystalline lens and the horizontal line joining two points on the scleral spur. IOL-induced pigment dispersion syndrome (PDS) has been observed in IOLs positioned in sulcus or in-the-bag. The mechanism of PDS has been described and well-established for years, triggered by mechanical friction between the posterior part of the iris, the zonular fibers and the IOL, producing pseudophakodonesis; other possible causes are the IOL material, its thickness and inadequate diameter.

Phakic IOLs can alter structures directly related with their location, increasing the risk of anterior subcapsular cataract and elevated intraocular pressure (IOP). One of the most widely used phakic IOL models is the implantable collamer lens (ICL) (Staar, Inc. Monrovia, CA, USA), composed of a hydrophilic collagen polymer, with high compatibility to prevent the side effects of active metabolism of the crystalline lens.

The aim of this paper is to present the case report of a patient who had an ICL implanted in both eyes, and which 5 years post-surgery, induced PDS with concomitant anterior uveitis and macular edema. Clinical symptoms resolved with extraction of the ICLs.

CASE REPORT

In June 2012, a 29-year-old man attended our clinic with a one-week history of headache, and photophobia, dysphotopsias, haloes, ocular pain and floaters in both eyes, predominantly the right. His medical
history included allergic rhinitis. He had undergone uneventful phakic IOL implantation with an ICL in both eyes 5 years previously. According to the patient, he was diagnosed with right acute anterior uveitis with macular edema in April 2012, and did not recover his former visual acuity (VA). He regularly practiced high intensity sports.

On ophthalmological examination, VA in the right eye (OD) was 0.5, and in the left eye (OS) was 1.0. Biomicroscopy of the OD revealed an ICL IOL in the posterior chamber, some pigment dispersion on the IOL, and nasal corectopia (Figure 1), with no reaction in the anterior chamber and disc hyperemia. In the OS, the examination showed an ICL IOL in the posterior chamber, with no inflammatory activity in the anterior chamber. Intrinsic motility was within the reference range. IOP was 9 mmHg in both eyes. Bilateral disc edema was noted in the fundus, more intense in the OD, with normal macula in both eyes. The visual field showed superior arciform scotoma in the OD and generalized loss of global mean sensitivity in the OS. Macular and disc OCT showed bilateral disc edema, more intense in the OD, so the patient was referred to hospital to rule out an acute neurological event. Fluorescein angiography (FAG) found early hyperfluorescence consistent with papillitis in the OD, with normal findings in the OS. Computed tomography and lumbar puncture were also normal. Laboratory test results were unremarkable: complete blood count and routine biochemistry results were within reference ranges, and C-reactive protein (CRP), rheumatoid factor (RF), VDRL, angiotensin-converting enzyme (ACE), anti-neutrophil cytoplasmic antibodies (ANCA) and HLA A29, B2, B7 and DR2 tests were negative; serology tests were positive for cytomegalovirus (CMV) IgG only. There were no abnormal findings on brain and orbital nuclear magnetic resonance imaging (MRI), except for a single hyperintense focal lesion in the right parasagittal region of the corpus callosum. Auditory neurophysiologic examination was normal. Topical and oral corticosteroid treatment was prescribed, and a watchful attitude was adopted. Following anterior segment OCT using the Topcon 3D OCT-2000 Spectral Domain system, a low vault of 167 microns was observed between the IOL and crystalline lens, as well as probable peripheral iridolenticular contact in the OD and OS (Figures 2 and 3). After the prescribed treatment, a gradual improvement was noted in the papillitis symptoms, which eventually disappeared completely. The VA did not improve however, and the patient continued to report persistent dysphotopsias and haloes. The IOLs were then explanted from both eyes, with recovery of the VA, which returned to 1.0 with disappearance of the haloes and dysphotopsias (Figure 4). An endothelial count performed post-explantation showed cell density 2268 cells/mm² and hexagonality 69% in the OD, and cell density 2233 cells/mm² and hexagonality 59% in the OS.

DISCUSSION

As we know, the crystalline lens continues to grow concentrically throughout life. This will cause progressive intraocular changes, and the space between the iris and crystalline lens will therefore decrease steadily over the years.

OCT is a crucial diagnostic procedure in understanding the natural growth of the crystalline lens.

Posterior chamber phakic lenses (ICL and phakic refractive lenses [PRL]) have been a therapeutic option in the correction of ametropia in patients who cannot benefit from corneal refractive treatment.

Numerous complications have been described with ICL phakic lenses, including haloes, glare, chronic anterior uveitis, pupil ovalization, anterior subcapsular cataract, increased IOP, endothelial loss, pigment dispersion (as in our case), pupillary block and glaucoma.

The use of anterior segment OCT allowed us to determine the etiology of the patient’s condition: iridolenticular friction which caused pigment dispersion from the posterior part of the iris, altering the blood-aqueous barrier and thereby inducing the production of inflammatory factors responsible for the macular edema observed. The patient’s sporting activities aggravated pigment dispersion by iridolenticular friction, accentuated by a grade 1 vault. We have not found papillitis described as a complication of ICL implantation, and it may have had another etiology, e.g. viral. In our case, we believe it was a casual finding.
Figure 2. Anterior segment OCT of the OD, in which iridolenticular contact and a low grade 1 vault between the IOL and crystalline lens can be seen.

Figure 3. Anterior segment OCT of the OS; a low grade 1 vault can be seen.

Figure 4. Anterior segment OCT of the OD after IOL explantation.

We conclude that in the insertion of phakic ICLs, the possibility of growth of the crystalline lens (which occurs naturally in humans over time) should be assessed, as should changes in the shape and position of the lens with accommodation. The vault should also be accurately evaluated prior to surgery. OCT monitoring of ICL implants could aid in the early diagnosis of any changes in relation to structures in the anterior segment.
REFERENCES


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