suffered from acute angle-closure glaucoma caused by an IPE cyst around the pupillary margin. This is the first reported case of secondary angle-closure glaucoma present from birth and caused by primary IPE cysts.

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Optic Neuropathy Secondary to Sub-Tenon Anesthetic Injection in Cataract Surgery

Direct optic nerve injury secondary to retrobulbar injection is a relatively uncommon but significant cause of blindness following cataract surgery.1 Believed to be safer than retrobulbar or peribulbar anesthetic injection, sub-Tenon anesthesia nonetheless provides equally effective anesthesia and akinesia.2-4 Use of shorter, blunt-tipped needles with a more anterior site of injection are thought to reduce or eliminate the risk of optic nerve injury.2-4 To our knowledge, we report herein the first case of traumatic optic neuropathy secondary to sub-Tenon anesthesia and provide evidence of the mechanism of injury.

Report of a Case. A healthy 78-year-old man noted “total blindness” in his right eye just after an “uncomplicated” cataract extraction in that eye. Preoperatively, the patient had a Snellen visual acuity of 20/200 OD with macular fibrosis, and a 3+ nuclear sclerosis cataract on the right. Potential acuity meter readings showed a visual acuity of 20/60 OD and the axial length was 23.97 mm. Phacoemulsification had been performed with a scleral-tunnel approach, with implantation of a posterior chamber intraocular lens. Anesthesia was provided as a 2-mL sub-Tenon injection of 4% lidocaine hydrochloride, 3 mm posterior to the inferonasal limbus using a Masket cannula. Supplemental anesthesia was provided by 4% topical and 1% intracameral lidocaine.

Results of postoperative anterior segment examination on the 3 days after surgery were unremarkable including the appplanation tonometry that measured between 16 and 20 mm Hg. Postoperative vision, first recorded on postoperative day 3, was light perception OD and 20/40 OS. Fundus examination showed previously noted macular fibrosis. Pupillary function was not tested. Subspecialty referral was made because of the concern of an optic neuropathy. Peripapillary hemorrhage and late staining of the disc by fluorescein angiography were evident 1 week later in the right eye. A magnetic resonance imaging (MRI) scan of the head and orbits was interpreted as being normal. Neuro-ophthalmic examination 2 weeks later showed no light perception OD and an afferent pupillary defect on the right. The right optic nerve was pale; peripapillary hemorrhage was not evident. Review of the MRI scan revealed 2 cuts suggestive of an abnormal signal in the immediate retrobulbar segment of the right optic nerve. Repeated MRI showed an increased T2-weighted signal of the right optic nerve with mild gadolinium enhancement (Figure 1). A diagnosis of optic neuropathy secondary to direct trauma from the sub-Tenon injection of anesthetic was made.

An Experiment With Sub-Tenon Cannulas. The average axial length of 7 cadaver eyes obtained from the New England Eye Tissue Bank, Boston, Mass, was 23 mm (range, 20-25 mm). The lengths of 3 commercially available cannulas (Masket, Eagle, and Visitec) were measured to be 23, 22, and 26 mm. The correct in situ orientation of an eye was made by considering the locations of the insertions of the extraocular muscles. Each of the cannula was ad-
vanced from the limbus along the sclera in the inferonasal quadrant, which is typically used to deliver anesthetic injections. The tip of each cannula reached the optic nerve even before the hub of the cannulas had been advanced to the limbus (Figure 2).

Comment. Unexpected poor visual outcome following cataract extraction is frequently the result of a pre-existing age-related maculopathy or optic neuropathy, which might not have been recognized in advance of the removal of an opaque crystalline lens. Alternatively, cataract surgery can cause an ischemic optic neuropathy because of reduced optic nerve perfusion pressure related to perioperative fluctuations in intraocular pressure or a traumatic optic neuropathy due to direct injury from the injection needle used to deliver anesthesia. Of these, only injury from an injection might be associated with an MRI scan showing abnormalities in the period shortly after the event, as occurred with our patient.

Sub-Tenon injection of anesthesia is performed by first giving topical anesthetic and then elevat-
Detected of Lactate in the Human Vitreous Body Using Proton Magnetic Resonance Spectroscopy

Proton magnetic resonance spectroscopy (1H-MRS) is an effective and useful technique for the metabolic analysis of tissues in vivo because it noninvasively identifies and quantifies tissue metabolites such as N-acetylaspartate, lactate, and choline. This technique is frequently used to assess the chemical composition of normal and pathologic brain tissue to investigate infarction, neoplasm, and mitochondrial disease. Similar application of 1H-MRS to ocular disease may prove beneficial for the noninvasive analysis of intraocular metabolism. Tissues of particular metabolic interest, such as the optic nerve and retina, are not amenable to direct study with 1H-MRS because of volume constraints and the high likelihood of contamination of the spectra by surrounding tissues. However, the relatively large size of the vitreous body should allow spectroscopic assessment of ocular metabolism. Lactate was the dominant metabolite detected in a study using 1H-MRS with a high-field (4.7-T) magnetic resonance imaging (MRI) scanner to determine the vitreous metabolic spectrum in healthy rabbits. The goal of our study was to assess the feasibility of performing 1H-MRS on the human vitreous in vivo and to determine if lactate is the dominant spectral resonance.

Report of Cases. Four healthy subjects and 1 with optic neuropathy (5 eyes) participated in the study with institutional review board approval. We used 1H-MRS (1.5-T Phillips NT clinical scanner; Phillips Medical System, Best, Holland) with a standard head coil to view the spectra of the vitreous. A set of high-resolution T1- and T2-weighted images from different orthogonal orientations were recorded to provide anatomical landmarks. To minimize spectrum contamination caused by partial volume effect from surrounding tissues, a single 10 x 10 x 10-mm3 voxel was localized in the vitreous, using sagittal T1- and axial T2-weighted MR images (Figure 1). The spectra were acquired with single-voxel 1H-MRS using the point-resolved spectroscopy method with the following acquisition parameters: repetition time, 1500 milliseconds; echo time, 272 milliseconds; and sweep width, 1000 Hz. A 3-Hz line broadening was applied using a Gaussian filter before Fourier transformation. After Fourier transformation, the spectra were phase corrected. No baseline correction was applied. The water line width was in the range of 12 to 15 Hz after the automatic first-order shimming (3-5 minutes). The average number of signals was typically 800. During acquisition, a foam pillow was placed around the head to minimize head movement, and the subject was instructed to look at a fixation target to minimize eye movement. Using the chemical shift selective suppression method, 90% water suppression was accomplished. No additional fat suppression was performed. The spectra were processed and analyzed using the scanner manufacturer’s software. Lactate resonance was assigned by using the chemical shift of water as a reference and measuring the J-couple. Assignment of the lactate resonance was further confirmed by comparison with the spectrum of a phantom containing lactate solution.

Vitreous spectra collected in each of the 5 vitreous bodies using 1H-MRS yielded 1 dominant resonance in addition to a residual water signal (Figure 2). The chemical shift of this resonance was 1.38 ppm, which was determined using the resonance of water at 4.68 ppm as an internal reference. This resonance was a doublet with a J-coupling of 9 Hz compared with the theoretical J-coupling constant of 7 Hz for the methyl proton of lactate. The chemical shift and characteristic J-coupling supported the assignment of the resonance to lactate. The spectrum obtained from the patient with optic neuropathy did not vary from the spectra of healthy subjects.