Acute intraoperative rock-hard eye syndrome and its management

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PURPOSE: To evaluate the use of pars plana needle aspiration of retrolenticular fluid in the immediate management of an acute intraoperative rock-hard eye syndrome (AIRES).

SETTING: Private practice, Sydney, Australia.

DESIGN: Retrospective case series.

METHODS: Data over an 18-month period were collected to evaluate efficacy, complications, and visual outcomes in patients who had pars plana needle aspiration for management of AIRES, which is an acute intraoperative shallowing of the anterior chamber and a marked increase in intraocular pressure (IOP) during phacoemulsification cataract surgery but without evidence of a choroidal hemorrhage. Preoperative and postoperative (1 day, 1 week, and 1 month) data were evaluated. Resolution of AIRES and postoperative posterior segment status, IOP, and corrected distance visual acuity (CDVA) were the main outcome measures.

RESULTS: Acute intraoperative rock-hard eye syndrome occurred in 6 (1.45%) of 413 surgeries. All 6 patients were women with a mean age of 81 years. Four patients had dense nuclear cataracts. In each case, the anterior chamber depth and IOP normalized immediately after pars plana needle aspiration and the procedure concluded uneventfully. Mild vitreous hemorrhage was observed in 1 patient postoperatively. At 1 month, the IOP was normal in 5 of 6 cases, while the CDVA was 20/12 in 5 of 6 cases.

CONCLUSION: Although the etiology of AIRES is iatrogenic, immediate resolution was achieved uneventfully with pars plana needle aspiration, which appears to be a safe management technique with satisfactory outcomes.

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We have observed an ophthalmic surgical emergency that we call acute intraoperative rock-hard eye syndrome (AIRES). The syndrome is characterized by acute intraoperative shallowing of the anterior chamber and a marked increase in intraocular pressure (IOP) during phacoemulsification surgery, but without evidence of choroidal hemorrhage.

In the context of intracapsular cataract surgery (ICCE) and extracapsular cataract surgery (ECCE), this dyad of signs was not infrequently related to expulsive choroidal hemorrhage.[1] Fortunately, with the advent of small-incision techniques and phacoemulsification, the occurrence of expulsive choroidal hemorrhage during cataract surgery has become rare.[2,3] The other differential diagnoses of acute anterior chamber shallowing and IOP elevation include ciliary block,[4,5] pupillary block,[6] capsule block,[7] air pupillary block glaucoma,[8] infusion misdirection syndrome,[9] and subcapsular fluid entrapment.[10]

Over the past 39 years of cataract surgery, one of us (I.C.F.) had on rare occasions encountered cases of acute anterior chamber shallowing and IOP elevation during ECCE and phacoemulsification surgery that were not clinically consistent with any of the above entities. The anterior chamber shallowing and IOP elevation invariably developed within seconds and were sometimes accompanied by other features, including an inability to inject ophthalmic viscosurgical devices (OVDs), iris prolapse, spontaneous

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extrusion of the OVD through the incisions, and resistance to intraocular lens (IOL) implantation. In such cases, we made a diagnosis of AIRES.

It is likely that recent cases of AIRES were related, at least in part, to higher levels of anterior chamber irrigation. This occurs not only from the phacoemulsification but also from hydrodissection, hydrodelineation, and irrigation of the posterior capsule and equatorial cortex with a hydrodissection cannula. The latter technique involves manual, relatively rapid injection of a balanced salt solution through a 27-gauge hydrodissection cannula. The balanced salt solution stream is directed toward residual cortical fibers adherent to the posterior capsule and to the cortex in the peripheral capsular bag. Its intent is to eliminate residual cortical fibers on the posterior capsule, attempting to minimize the need for direct capsule polishing and to help loosen tenacious peripheral cortex.

The removal of retrolenticular fluid by pars plana needle aspiration or definitive vitrectomy has been documented in the management of infusion misdirection and ciliary block glaucoma as well as in other situations in which a shallow anterior chamber compromises surgical space.[11–14] The purpose of this study was to evaluate the use of emergent pars plana needle aspiration of retrolenticular fluid in the management of AIRES.

PATIENTS AND METHODS

Retrospective Chart Review

This retrospective chart review comprised a consecutive series of phacoemulsification surgeries performed by the same surgeon (I.C.F.) between December 2010 and May 2012. The goal was to identify cases of AIRES and to evaluate the use of pars plana needle aspiration of retrolenticular fluid in its management. Patients were derived from a community outpatient cataract surgery population. All surgery took place at the Ophthalmic Surgery Centre, an ambulatory day surgery center in Chatswood, Sydney, Australia. The study adhered to the tenets of the Declaration of Helsinki.

Preoperative patient data included corrected distance visual acuity (CDVA), refractive error, grade of nuclear cataract assessed by the Lens Opacities Classification System II (LOCS II),[15] presence of pseudoexfoliation (PXF), and axial length (AL) measured using partial coherence interferometry (PCI) (IOLMaster, Carl Zeiss Meditec AG). If the cataract was too dense to permit PCI, A-scan ultrasound (model 820 ultrasonic biometer, Allergan Humphrey) was used to measure the AL.

Postoperative patient data from the 1-day, 1-week, and 1-month follow-ups were acquired. This included CDVA and IOP at each time point in addition to results of a dilated fundus examination at 1 day and 1 week.

Surgical Technique

Informed by the Lanindar test,[16] all surgeries were performed under assisted topical anesthesia or assisted local anesthesia.[17] A 2.2 mm clear corneal incision was made using a keratome. An Infiniti phaco machine with Ozil Intelligent Phaco (Alcon Laboratories, Inc.), and a dispersive OVD (sodium hyaluronate 3.0%–chondroitin sulfate 4.0% [Viscoat]) were used for nucleus disassembly and removal. Automated irrigation/aspiration (I/A) was performed. Fortified balanced salt solution (BSS Plus) was used in all cases. After phacoemulsification and thorough cortical I/A, the balanced salt solution was irrigated through a 27-gauge hydrodissection cannula (Psi/Eye-Ko, Inc.) to remove residual cortical fibers from the posterior capsule and peripheral capsular bag. Capsule polishing was performed as required. Wound-assisted IOL implantation was performed using a cohesive OVD (sodium hyaluronate 1.0% [Provisc]).

The diagnosis of AIRES was made when the anterior chamber became shallow over a few seconds and the IOP markedly increased. This was evidenced by a rock-hard consistency of the eye on corneal and scleral instrumental palpation in the absence of signs indicative of suprachoroidal hemorrhage or effusion.

Each case was managed intraoperatively with emergent pars plana needle aspiration of retrolenticular fluid with a 23-gauge needle using a 3 mL syringe. Specifically, after fixation of the eye with a toothed microforceps, the needle was introduced transconjunctivally/transsclerally 3.0 mm from the surgical limbus using direct visualization under the operating microscope to assess the needle's position in the anterior part of the vitreous cavity (Figure 1). Retrolenticular fluid was aspirated until a reduction in the tense convexity of the cornea and normalization of the anterior chamber depth were achieved. The needle was rapidly withdrawn. The cataract surgery was then completed.

RESULTS

Over the study period, 413 clear corneal phacoemulsification cataract surgeries with IOL implantation were performed. Six cases (1.45%) developed AIRES after phacoemulsification, I/A, or irrigation of the posterior chamber with the hydrodissection cannula. In each case of AIRES, pars plana needle aspiration of 0.1 to 0.3 mL of retrolenticular fluid was successful in achieving an immediate palpable softening of the globe and deepening of the anterior chamber,

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