Cataract Formation after Pars Plana Vitrectomy

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INITIAL PRESENTATION

Chief Complaint

Decreased vision in the right eye (OD)

History of Present Illness

The patient is a 43-year-old male referred from the retina service for cataract evaluation three days following pars plana vitrectomy for a macula involving retinal detachment OD.

Past Ocular History

- High myopia, both eyes (OU)
- Retinal detachment OD

Past Medical History

- Hypertension

Ocular Medications

- Prednisolone acetate 1% four times daily OD

- Atropine 1% two times daily OD

Allergies

- None

Family History

- Non-contributory

Social History

- No past or present tobacco use
- Rare alcohol use

OCULAR EXAMINATION

- **Distance Visual Acuity** (without correction)
    - OD: Hand motion
    - OS: 20/20
- **Extraocular Motility:** Full in both eyes
- **Pupils**
    - OD: 4 mm dark, 2 mm light, brisk reaction, no RAPD
    - OS: 4 mm dark, 2 mm light, brisk reaction, no RAPD
- **Intraocular Pressure**
    - OD: 14 mmHg
    - OS: 13 mmHg
- **Anterior Segment Examination**
    - OD:
        - Lids: Normal
        - Conjunctiva/Sclera: White and quiet
        - Cornea: Clear
        - Anterior Chamber: Deep and quiet
        - Iris: Normal
        - Lens: Mature, white cataract
    - OS:
        - Lids: Normal
        - Conjunctiva/Sclera: White and quiet
        - Cornea: Clear
        - Anterior Chamber: Deep and quiet
        - Iris: Normal
        - Lens: Clear
- **Dilated Fundus Examination**
    - OD: No view
    - OS:
        - Vitreous: Clear
        - Optic Nerve: Sharp border, no edema
        - Macula: Normal
        - Vessels: Normal

- Periphery: Normal

CLINICAL COURSE

The patient developed a dense cataract just three days following pars plana vitrectomy. Due to the rapid onset and severity of the cataract, there was concern for an iatrogenic break in the posterior capsule during vitrectomy. The decision was made to proceed with cataract extraction (see video). Following removal of the cataract, a peripheral tear in the capsular bag was visible. Despite the presence of a tear, there was enough capsular support to place a three-piece lens in the ciliary sulcus with optic capture through the intact anterior capsulorrhexis.

The patient was continued on prednisolone acetate 1% and atropine 1% OD. At his one month follow up appointment, the patient had a clear visual axis and clear media with best corrected visual acuity of 20/60 OD, which was likely limited by his history of macula-involving retinal detachment.

DISCUSSION

Etiology/Epidemiology

Cataract formation or progression is one of the most common complications of pars plana vitrectomy [1,2]. While the timing of development of a visually significant cataract following vitrectomy varies widely, several studies have shown cataract progression in 80-100% of patients at 2 years follow-up. Nuclear sclerosis is the most common type of cataract following vitrectomy [1,3]. As the number of patients undergoing vitrectomy increases each year, management of post-vitrectomy cataract has become increasingly important [1].

Pathophysiology

Many theories have been proposed for the formation and acceleration of cataract post-vitrectomy, but the exact pathophysiology is poorly understood. Recent studies indicate that removal of the vitreous leads to increased oxygen tension within the eye, resulting in oxidation of the lens fibers and progression of nuclear sclerotic

cataract formation [4].

Signs/Symptoms

The signs and symptoms for post-vitrectomy nuclear sclerotic cataract are the same as age- related nuclear sclerotic cataract, i.e. decreased visual acuity and glare. Diagnosis is made with slit-lamp biomicroscopy [1].

Surgical complications

Several factors can make post-vitrectomy cataract removal more difficult than routine cataract extraction. To start, vitreous removal can make biometry for intraocular lens calculations less accurate, leaving patients with the potential for post-operative refractive surprise [9]. In a vitrectomized eye, the nucleus is often more dense than in age-related cataracts. This may require longer phacoemulsification times or more aggressive instrumentation (using the stop-and-chop and phaco-chop techniques), both of which increase complication rates [1,2,7]. Posterior capsule rupture is a known intraoperative complication, as the absence of vitreous gives the posterior capsule more mobility and increases the risk of capsular rupture [1,2,7]. Similarly, sudden deepening of the anterior chamber intraoperatively, known as lens-iris diaphragm retropulsion syndrome (LIDRS), occurs in up to 50% of patients who have had a vitrectomy [2,7,8]. Damage to the posterior capsule can also occur during pars plana vitrectomy, as illustrated in this case, or during intravitreal injection.

Cataracts that have formed as a result of posterior capsular damage during pars plana vitrectomy are best treated like a posterior polar cataract by avoiding hydrodissection which could cause any preexisting rent in the posterior capsule to enlarge. For a dense lens (like in this case), a "V" groove is an excellent technique. The V groove (also known as the "victory") technique, described by Kelman in 1994, and the "lambda" technique, described by Lee and Lee in 2003, involve sculpting the nucleus in the shape of a V or the Greek letter lambda (λ). This is followed by cracking along both "arms" and removing the central piece first. This technique avoids stretching the capsular bag while lens pieces are removed [11-12].

Despite numerous potential complications, there remains debate in the literature as to whether the complication rate of post-vitrectomy cataract extraction is higher than cataract surgery in non-vitrectomized eyes [2,5,6,7,10]. Nevertheless, with the increased utilization of vitrectomy, practitioners must be aware of these potential complications.

Combined vitrectomy-cataract extraction

Due to the increased difficulty and complication rate of post-vitrectomy cataract surgery, many surgeons have begun performing cataract extraction and IOL implantation at the time of vitrectomy. A recent retrospective study has shown no increase in postoperative complications with combined surgery [13]. This topic remains highly controversial. Combined surgery is beneficial as it reduces surgical burden on the patient and conserves health care resources [13]. The risks include longer operative times and increased postoperative inflammation [2]. Both cataract extraction in a vitrectomized eye and cataract extraction done at the time of vitrectomy are technically challenging surgeries. A deeper understanding of these challenges is essential to prevent adverse outcomes.

ETIOLOGY/EPIDEMIOLOGY	SIGNS
• Nuclear sclerosis develops in 80-100% of lenses within 2 years of PPV	• Glare • Decreased vision • Halos

PRESENTATION	TREATMENT/MANAGEMENT
• Rapid progression of cataract formation indicates possible damage to posterior capsule during PPV	• If there is concern for posterior capsule damage, avoid hydrodissection • Consider V groove technique

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