International Ophthalmology **25:** 143–146, 2004.

Vitreoretinal surgery for optic pit associated serous macular detachment: a discussion of two cases★

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Received 8 January 2003; accepted 29 March 2004

Key words: endophotocoagulation, macular detachment, optic pit, retinal detachment, retinotomy, subretinal fluid drainage, vitrectomy

Abstract

Purpose: To report the successful surgical outcome of two patients with a serous macular detachment and cystoid macular edema associated with a congenital optic nerve pit. *Method:* Case reports. Two patients with a serous macular detachment associated with a congenital optic nerve pit were treated with 360° peripapillary endophotocoagulation during vitrectomy, attempted internal subretinal fluid drainage, and fluid–gas exchange. *Results:* In both cases, the retina remained attached during a follow-up period of 6 months, and the patient's vision improved dramatically. One patient improved from the counting finger level to 20/70, and the other improved from 20/200 to 20/70. *Conclusion:* The use of 360° peripapillary endophotocoagulation after pars plana vitrectomy for the treatment of optic nerve pit associated retinal detachment resulted in excellent visual acuity and anatomic reattachment. Attempted internal subretinal fluid drainage was unsuccessful and did not contribute to the success of the case.

The natural course of macular detachments associated with congenital optic nerve pits is unpredictable. In a study by Brown et al. [1], 55% of 20 eyes with untreated serous macular detachments had a visual acuity of 20/200 or less after 5 years, with spontaneous resorption of subretinal fluid in 75% of these eyes. Cases with chronic serous detachment progress to cystic degeneration of the macula, lamellar hole formation, depigmentation of the retinal pigment epithelium, and degeneration of photoreceptors. Various treatment modalities have been tried, but responses have been variable.

We describe two patients with serous macular detachment due to congenital optic nerve pits, who were successfully treated with pars plana vitrectomy, attempted internal subretinal fluid drainage under perfluorocarbon, fluid–air exchange, 360° peripapillary endophotocoagulation, and C3F8 injection. We also discuss the unique challenges of subretinal fluid drainage in these cases.

★ This paper was presented as a poster at the Vitreous Society 19th Annual Meeting, Puerto Rico, 27th November to 1st December, 2001.

Patient 1

A 45 year old white man was followed for years by the retina service with a longstanding serous macular detachment associated with an optic nerve pit OS. His vision deteriorated steadily over a 5-year period and he developed severe cystoid macular edema. His best corrected visual acuity was 20/200 OS, and retinal examination revealed a temporal optic nerve pit, serous macular detachment, and foveal cystic changes with underlying RPE changes. A pars plana vitrectomy was performed. A retinotomy site at the temporal edge of the domed detachment was marked with intraocular diathermy and opened with a micro-vitreoretinal (MVR) blade. Subretinal fluid drainage was attempted with a bent silicone cannula under the

dome of the detachment, but only a small amount of subretinal fluid was obtained. Perfluorocarbon liquid (perfluoro-octane) was introduced over the dome of the detachment, and it was found that it was not heavy enough to cause spontaneous extrusion of the fluid from under the retina. A fluid–air exchange was performed and additional drainage of fluid was done while the retina was tamponaded by the gas bubble. Overall, a minute amount of subretinal fluid was successfully removed despite repeated attempts. An endolaser probe was used to apply laser photocoagulation around the optic nerve 360°. A very light white discoloration was obtained, with no damage to the nerve fiber layer. Additional laser spots were placed around the retinotomy site.

On the first post-operative day, the retina was attached except at the inferior equator where the pocket of subretinal fluid was displaced, indicative of the subretinal nature of the fluid. Four days after surgery, the retina was completely flat to the ora serrata, and visual acuity was 20/80. The barrier seemed thin temporally, so 200 further laser spots were placed around the optic nerve (200 mm/140 mW/100 mseconds). Six months later his vision was 20/70.

Patient 2

A 14 year old girl with an optic nerve pit and serous macular detachment OS had a visual acuity drop from 20/40 to the counting finger level over a 1 year period. Examination revealed a serous macular detachment, and marked cystic degeneration of the fovea. A pars plans vitrectomy was completed. A tapered 40-gauge extrusion needle was introduced obliquely across the retina superotemporally to try to drain the subretinal fluid through a self-sealing retinotomy, but this was unsuccessful after two attempts. The temporal site was therefore marked with intraocular diathermy and a full-thickness retinotomy was made. The subretinal fluid was then removed, but inadequately. Perfluorocarbon liquid (perfluoro-octane) was used to attempt to push fluid out of the retinotomy, but this was not successful. A fluid–air exchange was performed and additional drainage attempted with equally poor success. Photocoagulation spots were applied to the temporal part of the optic nerve, and on the temporal retinotomy site. The air was then exchanged for 14% C3F8 gas.

On the first post-operative day, the macula was dry and the subretinal fluid was displaced inferiorly, and the patient had developed a posterior subcapsular cataract. Three weeks later, vision was 20/200, and the retina was completely attached. Three months later, there was accumulation of submacular fluid around the inferior edge of the laser barrier around the optic nerve. The patient was taken to the operating room again. A pars plana vitrectomy was performed. Endolaser photocoagulation was used to apply 181 spots for 360° around the optic nerve, obtaining a very light gray discoloration. Based on the experience gained from the first patient, and the first surgery of this patient, no attempt was made to drain the subretinal fluid this time. A complete fluid–air exchange was performed, followed by exchange of air for 14% C3F8. On the fourth post-operative day, the retina was attached, but the patient developed a small hyphema and inferior vitreous hemorrhage. Two months later she underwent cataract extraction, after which she had 20/100 vision and an attached retina. Six months after the initial surgery, her vision was 20/70.

Discussion

The origin of the subretinal fluid in optic-pit associated retinal detachment is controversial, and the pathogenesis of the detachment has been debated. Billi et al. [2] postulated tractional retinal detachment due to an anomalous adhesion of the posterior hyaloid face and anomalous persistence of Cloquet's canal or primary vitreous. Rutledge et al. [3] demonstrated by optical coherence tomography that the detachment was secondary to a macular schisis-like cavity which communicated with the optic disc, noting that none of the eyes demonstrated a direct connection between the macular detachment and optic pit. Based on the results of vitreous biomicroscopy, fluorescein angiography, and response to treatment in 19 eyes, Bonnet [4] hypothesized the mechanism underlying serous macular detachment complicating optic nerve-head pits is traction retinal detachment combined with a rhegmatogenous component in the roof of the optic pit. Postel et al. [5] later noted a subtle tear on

fundus biomicroscopy in the diaphanous tissue overlying the optic nerve pit in seven cases. For this reason, they believe treatment should include the formation of a barricade to fluid movement. They also added that these tears may be subtle and may not be noted on clinical examination.

The use of laser photocoagulation as a barricade along the disc margin in the area of retinal detachment dates as far as 1976, when Brockhurst [6] described retinal reattachment in five of six cases of congenital optic nerve pit associated with serous macular detachment treated by this method. Annesley et al. [7] later reported the resolution of submacular fluid in four of five eyes after juxtapapillary krypton laser photocoagulation. The fifth eye required three sessions of krypton laser photocoagulation followed by pars plana vitrectomy and intraocular gas injection. Our experience has been that juxtapapillary photocoagulation adjacent to the detachment is not sufficient to prevent tracking of the subretinal fluid around the edges of the photocoagulation barrier and redetachment of the macula, as in patient 2 in this series. We therefore advocate photocoagulation for 360° adjacent to the optic nerve to help prevent tracking of fluid around the edge of the barricade and redetachment of the macula.

In 1988, the adjunctive use of intraocular gas injection and vitrectomy was described in papers by Lincoff et al. [8], Schatz and McDonald [9] and Cox et al. [10]. Cox noted that complete resolution of submacular fluid required 2 months to 2 years. In a single case report of one patient, Snead et al. [11] reported the complete resolution of a macular detachment associated with an optic nerve pit treated by vitrectomy, endolaser, and gas tamponade as a primary procedure.

In 1993 Lee and Peyman [12] reported the successful use of internal drainage of the submacular fluid in addition to pars plana vitrectomy, endolaser, and sulfur hexafluoride injection in one patient. They applied the endolaser photocoagulation to the papillomacular bundle in a grid pattern, unlike the other authors who attempted to create a laser barricade surrounding the optic nerve. This is so far the only published report on the adjunctive use internal subretinal fluid drainage in treating these optic pit associated macular detachments. We hope to add our experience of subretinal fluid drainage to the current body of knowledge on this subject.

Many retinal surgeons take a stepwise approach to treating optic nerve pit associated macular detachments, starting with laser, followed by gas injection, and eventual vitrectomy. This subjects the patients to the trauma of repeated interventions and failures. In an effort to obtain a successful outcome with a single intervention, we have combined all the seemingly critical steps into one procedure – peripapillary laser and long-acting gas tamponade afforded by vitrectomy. In an attempt to increase the safety margin in doing endophotocoagulation across the papillomacular bundle and perhaps increase the chance of a successful outcome, we had hoped to drain the subretinal fluid dry, but this failed despite persistent attempts. Based on the experience gained from the first two operations, no attempt was made to drain subretinal fluid on the third surgery. In both our cases, we found that the subretinal fluid was thick and difficult to drain, requiring multiple attempts. This maneuver adds significant risk of additional complications and was not instrumental in the success of our two cases.

The natural history of retinal detachment associated with optic nerve pits remains largely uncertain. Sobol et al. [13] reported that 80% of 15 eyes followed for an average of 9 years had visual acuities of 20/200 or less at the time of last evaluation, and noted that severe visual loss occurred within 6 months of initial presentation. Our patients regained a substantial amount of the vision lost, and maintained those gains for their entire follow-up period of 6 months.

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