

# The Management of Retinal Detachments Associated With Choroidal Colobomas by Vitrectomy With Cyanoacrylate Retinopexy

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**Abstract:** The techniques used and the outcome in eyes treated for retinal detachment associated with choroidal coloboma are described. We reviewed the medical reports on five eyes of five patients with retinal detachment associated with choroidal coloboma who underwent vitrectomy. Retinal breaks were identified at the margin of or within the coloboma and the retina was successfully reattached by vitrectomy and cyanoacrylate retinopexy in four of the five eyes. The remaining one eye, with no visible retinal break both before and during surgery, also underwent cyanoacrylate retinopexy at regions suspected of retinal break, and was successfully reattached. In four eyes (80%) the vision showed improvement and had a visual acuity of 20/100 or better after surgery. None of the eyes required silicone oil tamponade or endophotocoagulation around the disc or at the *papillomacular bundle*. For the management of retinal detachment associated with choroidal coloboma, cyanoacrylate retinopexy is the method of choice, providing adequate chorioretinal adhesion and satisfactory visual outcome. **Jpn J Ophthalmol 1998;42:323-326** © 1998 Japanese Ophthalmological Society

**Key Words:** Choroidal coloboma, cyanoacrylate retinopexy, retinal detachment, vitrectomy.

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## Introduction

Coloboma of the choroid, a rare condition caused by faulty closure of the embryonic fissure, is often associated with several other ocular disorders, including iris coloboma, loss of inferior lens zonules, and optic disc abnormalities. The prevalence of retinal detachment in eyes with choroidal coloboma, because of typical retinal breaks unassociated with the coloboma or to those within the coloboma or along its margin, has been reported to be as high as 40%.<sup>1</sup> Previous series of eyes undergoing scleral buckling for the treatment of retinal detachment with retinal breaks within the coloboma or along its margin have resulted in poor surgical outcome.<sup>1-3</sup> Wang and Hilton,<sup>2</sup> having reviewed the literature to discover that

only 18 of 42 eyes (43%) with retinal detachment associated with choroidal coloboma resulted in successful reattachment, concluded that vitrectomy with intraocular gas tamponade and creation of chorioretinal adhesion along the edge of the coloboma is the preferred treatment. Hanneken and colleagues<sup>4</sup> advocate that cyanoacrylate retinopexy<sup>5,6</sup> is a useful technique for closing the atrophic break at the base of coloboma. Herein we describe our techniques used and the outcome in five eyes treated for retinal detachment associated with choroidal coloboma.

## Materials and Methods

We reviewed the medical records of five consecutive patients, one man and four women ranging in age from 5-65 years (Table 1), who underwent surgery between 1992 to 1996 for retinal detachment associated with choroidal coloboma. Their preoperative visual acuity ranged from hand motion to 20/30

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**Table 1.** Characteristics of Patients

Case	Sex	Age	Micro Cornea	Iris Coloboma	Disc Coloboma	Visible Break	Refractive Error	Nystagmus	Fellow Eye
1	F	39	No	Yes	No	Within coloboma	-2.5 D	No	Normal
2	F	22	Yes	Yes	No	Margin of coloboma	-11.0 D	No	Normal
3	F	65	Yes	Yes	Yes	Within coloboma	0	Yes	Choroidal coloboma
4	F	5	No	No	Yes	Within coloboma	0	No	Normal
5	M	18	No	No	Yes	No	+2.5 D	No	Normal

F: Female. D: diopter. M: male.

(Table 2). Nystagmus was associated in one eye (20%), iris coloboma present in three (60%), microcornea in two (40%), and choroidal coloboma associated with coloboma of the optic disc in 3 (60%). Proliferative vitreoretinopathy was not identified in any eye. Retinal detachment attributable to a peripheral break outside the coloboma was not included in this study. Table 1 summarizes features of the fellow eyes. The mean follow-up period was 31 months, and a minimum of 6 months follow-up surgery was possible in all patients.

### Surgical Technique

Three-port vitrectomy was performed under retrobulbar anesthesia in four subjects and under general anesthesia in one pediatric patient (Case 4). Three of the eyes underwent pars plana lensectomy using the phacofragmentation unit and a secondary infusion, which was followed by suturing of the contact lens ring and axial vitrectomy.

When posterior detachment of the vitreous was not found during vitrectomy, the vitreous cutter port

with linear suction was placed onto the optic disc to separate the hyaloid from the retina *toward the vitreous base as far as possible*. This maneuver was difficult to achieve in Cases 4 and 5 because of incomplete posterior vitreous detachment and firm adherence of the vitreous over the detached retina. The colobomatous area was carefully inspected with an endoilluminator under high magnification of the operating microscope, and the retinal break at the margin of or within the coloboma was identified in all eyes except in Case 5.

In each patient, simultaneous air–fluid exchange and endodrainage were performed, and an attempt was made to drain subretinal fluid through the retinal break at the margin of or within the choroidal coloboma. Because these maneuvers, however, did not lead to total retinal attachment in Cases 3, 4 and 5, another endodrainage retinotomy was accomplished in order to totally reattach the retina. In most eyes, total reattachment of the retina within the colobomatous region was difficult and required additional maneuvers, such as relaxing incisions extending along the edge of the coloboma to relieve the tension from the thin and transparent dysplastic retina.

**Table 2.** Results of Surgery

Case	Preoperative	Surgery	Postoperative		
	Visual Acuity		Visual Acuity	Anatomic Result	Follow-Up (Months)
1	HM	1)PPL,PPV,R,CR,air 2)PPV,R,CR,air	20/40	Attached	55
2	6/200	1)PPV,R,CR,20%SF6 2)PPL,PPV,PHC,CR,20%SF6	20/50	Attached	10
3	20/200	PPL,PPV,R,DR,PHC,CR,20%SF6	20/100	Attached	46
4	16/200	1)PPV,R,DR,PHC,CR,20%SF6 2)PPV,R,PHC,CR,20%SF6	12/200	Attached	12
5	20/30	PPV,DR,PHC,CR,20%SF6	20/20	Attached	32

HM: hand motion. PPL: pars plana lensectomy. PPV: pars plana vitrectomy. R: retinotomy within colobomatous area. DR: drainage retinotomy outside colobomatous area. CR: cyanoacrylate retinopexy. PHC: endolaser photocoagulation. SF6: sulphur hexafluoride.

Once the retina had settled, cyanoacrylate retinopexy was applied around the retinal break at the margin of or within the colobomatous area. (In Case 5, in which no visible retinal break was identified, the margin suspected to have a break was treated.) Endophotocoagulation only along the endodrainage retinotomy site was performed in Cases 3, 4, and 5. Gas tamponade with air or 20%-sulphur hexafluoride was used in every eye whereas silicone oil tamponade was never introduced, and the patients were encouraged to remain in prone position during the early postoperative period. Because of recurrent retinal detachment, second surgery became necessary in three eyes that consisted of posterior vitreous detachment if it had been incomplete in previous vitrectomy, reattachment of the retina by endodrainage, additional relaxing retinotomy within the coloboma, cyanoacrylate retinopexy and endolaser treatment. As in the first surgery, endolaser treatment along the coloboma margin was not employed except in Case 2 in which two to three rows of overlapping burns along the entire margin were provided.

## Results

Table 2 summarizes the results. The number of surgical procedures needed to achieve retinal reattachment ranged from one to two maneuvers (average of 1.6), and the retina in all five eyes (100%) remained attached during the follow-up period, which varied from 10–55 months. Four eyes (80%) showed improved or had a visual acuity of 20/100 or better after surgery, but because of hypoplasia of the macula, the final visual outcome did not improve in Case 4.

In four eyes, the retinal break was identified either before or during surgery, three of which existed within the colobomatous crater in the thin rudimentary retina and one at the margin of the coloboma. Although cyanoacrylate glue had successfully closed most retinal breaks during surgery, it did not adequately adhere to the retina and flaked off partially in one eye (Case 1) and totally in another eye (Case 2) 3 months after initial surgery. In these two cases, additional surgery was needed because of retinal redetachment. None of the eyes developed proliferative vitreoretinopathy.

## Discussion

Although conventional scleral buckling techniques successfully treat retinal breaks and retinal detachments outside the coloboma,<sup>7</sup> these procedures often result in a low rate of anatomic success

in closing the breaks at the margin of or within the colobomatous region.<sup>2</sup> In 1983, Gonvers<sup>8</sup> reported the use of silicone oil tamponade to treat a retinal detachment associated with choroidal coloboma. Wang and Hilton<sup>2</sup> reviewed the literature and concluded that the method of choice was vitreous surgery with long-acting gas tamponade in conjunction with chorioretinal adhesion around the coloboma. This is logical because vitrectomy allows removal of vitreous traction, identification of any break within the coloboma, intraoperative laser treatment or other intraoperative maneuvers for chorioretinal adhesion, and creation of a space for gas or silicone tamponade. These findings then bring us to the next question of what is the preferred method of (1) chorioretinal adhesion and (2) retinal tamponade?

1. Because the break within the intercalary membrane lies over depigmented tissue, laser photocoagulation, cryotherapy, and diathermy do not provide adequate chorioretinal adhesion within this region. Hence, in managing retinal detachment associated with choroidal coloboma, attempts have been directed toward isolating the coloboma from the rest of the retina rather than sealing the retinal break.<sup>8</sup> For chorioretinal burns, laser photocoagulation is preferred because of its precise controllability compared to cryotherapy or diathermy. When the coloboma does not involve the optic disc, a double or triple argon laser barrier is recommended<sup>9,10</sup>; whereas when it does involve the disc, endophotocoagulation with red krypton light should be performed while care is taken to avoid heavy burns and preserve the internal retina.<sup>11</sup> In our experience, however, precise control of the burn intensity was difficult to achieve with endophotocoagulation. Additionally, McDonald and associates<sup>12</sup> reported that conducting peripapillary endophotocoagulation, especially through the papillomacular bundle, can damage the nerve fiber and prevent visual recovery despite successful reattachment of the retina. In our study, cyanoacrylate retinopexy proved to be an effective alternative that did not damage the papillomacular bundle.
2. Numerous reports<sup>4,8,9</sup> discuss the injection of silicone oil to treat retinal detachment in eyes with choroidal coloboma. Long-term use of silicone oil, however, can lead to significant complications, including corneal damage, cataract, glaucoma, and retinal redetachment associated with silicone oil removal.<sup>9,13</sup> In our eyes, postoperative retinal tamponade was accomplished using room air or

medium-acting gas (20% SF<sub>6</sub>), maintained under prone positioning of the patient; these eyes required neither long-acting gas, such as perfluoropropane or silicone oil because of the immediate and strong adhesion of the retina achieved by the cyanoacrylate glue.

These findings have led us to believe that cyanoacrylate retinopexy alone is adequate for chorioretinal adhesion within the colobomatous area. Hanneken and associates<sup>4</sup> in 1991 also reported the usefulness of cyanoacrylate retinopexy for sealing the break at the base of coloboma. In all of their patients, however, a firm chorioretinal adhesion at the edge of the coloboma resulted from either endocryotherapy or endolaser photocoagulation performed to isolate the rudimentary retina in the coloboma from the remaining peripheral retina. Based on our experience and the fact that cyanoacrylate glue leads to immediate, long-lasting and strong adhesion of the retina and the underlying tissue,<sup>5,6,14,15</sup> we feel that glue retinopexy may obviate both endocryotherapy and endolaser photocoagulation at the edge of the coloboma as well as the long-term retinal tamponade with silicone oil.

There are some problems associated with the use of cyanoacrylate glue. One of the most significant problems is that flattening of the retina with endodrainage through the anomalous retina overlying the choroidal coloboma is often difficult to achieve and results in residual subretinal fluid preventing effective glue application. This phenomenon occurs because the sclera of the coloboma is concave, diaphanous retinal tissue stretches taut over the coloboma, and the fluid is displaced into the concavity as the air is injected. To relieve this situation, we often needed to place relaxing incisions on anomalous retinal tissue overlying the choroidal coloboma, which completely flattened the retina in all eyes.

One other question yet to be answered is: Why did the retina of Case 5, which showed no visible retinal break, reattach after glue retinopexy? *It is possible that the tiny retinal break was sealed by glue retinopexy without ever being detected.* However, Schubert,<sup>16</sup> having studied the histologic sections obtained from eight choroidal colobomas, concluded that the subset of coloboma-associated retinal detachment consists of both a central break in the inner layer and a break in the outer layer at the margin of the coloboma. In Case 5, however, we were not able to identify any break in the inner layer, even under high magnification of the operating microscope focused on the center of the colobomatous region, nor the presence of schlieren because of the subreti-

nal viscous fluid flowing through the inner break during fluid-air exchange. Because of the possibility that there was an outer layer break, however, this region was treated by glue retinopexy, which sealed the break through the inner retinal layer.

In conclusion, cyanoacrylate retinopexy avoids<sup>5</sup> excessive manipulation of the eye, decreasing papillomacular bundle damage and the release of chemotactic and growth factors, which are associated with proliferative vitreoretinopathy. We, therefore, feel that this procedure should be regarded as the method of choice for improving visual outcome and anatomic success of vitrectomy performed for retinal detachment associated with choroidal coloboma.

## References

1. Jesberg DO, Schepens CL. Retinal detachment associated with coloboma of choroid. *Arch Ophthalmol* 1961;65:163-73.
2. Wang K, Hilton GF. Retinal detachment associated with coloboma of the choroid. *Trans Am Ophthalmol Soc* 1985;83:49-62.
3. Sakai T. Three cases of retinal detachment associated with congenital coloboma of the choroid. *Nihon Ganka Kiyō (Folia Ophthalmol Jpn)* 1968;19:808-12.
4. Hanneken A, de Jaun, Jr, McCuen II BW. The management of retinal detachments associated with choroidal colobomas by vitreous surgery. *Am J Ophthalmol* 1991;111:271-5.
5. McCuen II BW, Hida T, Sheta SM. Transvitreal cyanoacrylate retinopexy in the management of complicated retinal detachment. *Am J Ophthalmol* 1987;104:127-32.
6. Sheta SM, Hida T, McCuen II BW. Cyanoacrylate tissue adhesive in the management of recurrent retinal detachment caused by macular hole. *Am J Ophthalmol* 1990;109:28-32.
7. Michels RG, Wilkinson CP, Rice TA. *Retinal detachment*. St Louis, MO: CV Mosby, 1990.
8. Gonvers M. Temporary use of silicone oil in the treatment of special cases of retinal detachment. *Ophthalmologica* 1983;187:202-9.
9. Gopal L, Kini MM, Badrinath SS, Sharma T. Management of retinal detachment with choroidal coloboma. *Ophthalmology* 1991;98:1622-7.
10. Corcostegui B, Guell JL, Garcia-Arumi J. Surgical treatment of retinal detachment in the choroidal colobomas. *Retina* 1992;12:237-41.
11. Thomas EL, Apple DJ, Swartz M, Kauka-Van Norman D. Histopathology and ultrastructure of krypton and argon laser lesions in a human retina-choroid. *Retina* 1984;4:22-39.
12. McDonald HR, Lewis H, Brown G, Sipperley JO. Vitreous surgery for retinal detachment associated with choroidal coloboma. *Arch Ophthalmol* 1991;109:1399-402.
13. Chan C, Okun E. The question of ocular tolerance to intravitreal liquid silicone. *Ophthalmology* 1986;93:651-60.
14. McCuen II BW, Hida T, Sheta SM, et al. Experimental transvitreal cyanoacrylate retinopexy. *Am J Ophthalmol* 1986;102:199-207.
15. Hida T, Sheta SM, Prora AD, McCuen II BW. Experimental transvitreal cyanoacrylate retinopexy in a primate model. *Am J Ophthalmol* 1987;103:782-9.
16. Schubert HD. Schisis-like rhegmatogenous retinal detachment associated with choroidal colobomas. *Graefes Arch Clin Exp Ophthalmol* 1995;233:74-9.