HYDROGEL IMPLANT FOR SCLERAL BUCKLING

Long-term Observations

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Abstract: The authors report long-term follow-up clinical observations of 82 eyes in which episcleral or intrascleral hydrogel implants were used as buckles in the repair of rhegmatogenous retinal detachment. Three fourths of the eyes were observed for 24 months or more. The implant material provided a durable and effective scleral buckle, did not produce erosion or infection, and was tolerated well by all patients. **RETINA** 5:38-41, 1985

In a previous communication, we reported our short-term experiences with a hydrogel implant for scleral buckling.[1] The implant is soft[2] and appeared to be well tolerated by the eye.[3,4] In this article, we report our long-term observations in 82 eyes with hydrogel scleral buckling implants followed 6–53 months.

Subjects

Eighty-two eyes of 79 patients had scleral buckling for rhegmatogenous retinal detachment using the hydrogel implant. This nonconsecutive series of eyes included those reported previously.[1] The patients' ages ranged from 9 to 80 years; 84% of detachments occurred in patients older than 40 years of age. A 9-year-old patient had bilateral retinal dialysis. Thirty-five eyes (42.7%) had previous cataract surgery (Table 1). Thirty-eight eyes (46.3%) were myopic; 15 of these had a refractive error of −10 D of myopia or more.

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Methods

Preoperative Workup

A detailed ocular history was recorded for all patients; a thorough preoperative examination included external examination of periorbital structures, extraocular muscle functions, tonometry, biomicroscopy of the anterior and posterior segments, and indirect ophthalmoscopy with a detailed fundus drawing.

Surgical Procedure

The surgical procedures performed on the 82 eyes are summarized in Table 2 and have been described previously.[1]

Meridional Buckle. The meridional implant was used in 26 eyes to produce a localized buckle to close a retinal break that developed the fishmouth phenomenon during the primary scleral buckling. Five of the 26 eyes had a rhegmatogenous component compli-

Table 1. Previous Cataract Procedure in 35 Eyes Subjected to Various Scleral Buckling Procedures

Procedure	Number of Eyes
Meridional implant under hard silicone	
Intracapsular cataract extraction	16
Iris-fixed intraocular lens	2
Anterior chamber intraocular lens	2
Intrascleral implant without band	
Intracapsular cataract extraction	4
Iris-fixed intraocular lens	1
Intrascleral implant with band	
Intracapsular cataract extraction	1
Iris-fixed intraocular lens	1
Episcleral implant without band	
Intracapsular cataract extraction	1
Episcleral implant with band	
Intracapsular cataract extraction	5
Iris-fixed intraocular lens	2

cating a severe diabetic tractional retinal detachment. In 17 additional eyes the meridional implant was used for revision of the scleral buckle; in 10 eyes it was the second operation and in 7 the third. Sixteen of the 43 eyes were aphakic and 4 were pseudophakic; 2 in the latter group contained iris-fixed intraocular lenses, and 2 had anterior chamber lenses (Table 1).

Intrascleral Buckle Without Band. In 8 of 14 eyes that had no encircling element, the intrascleral implant was placed in a radially oriented trap-door scleral bed to buckle a posteriorly located retinal break produced by diabetic traction membranes. The surgical procedure in these eyes was combined with closed vitrectomy and complete filling of the vitreous cavity with sterile air. In the other six eyes, the implant was used in an equatorially oriented trap-door scleral bed.

Intrascleral Buckle With Band. The implant was supported by an encircling band in seven eyes that had primary scleral buckling. Retinal breaks were located in several quadrants of the fundus.

Episcleral Buckle Without Band. Of the six eyes that had episcleral implantation of the hydrogel material without an encircling band, two had rhegmatogenous retinal detachment secondary to diabetic traction membranes, one had moderate proliferative vitreoretinopathy, and another had traumatic rhegmatogenous retinal detachment with proliferative vitreoretinopathy. Closed vitrectomy was performed in these four eyes. The other two eyes had total retinal detachment with multiple retinal breaks distributed in all quadrants.

Episcleral Buckle With Band. Twelve eyes had episcleral implant with encircling band; in one of these eyes the implant was used for revision of scleral buckle.

Table 2. Surgical Procedures in 82 Eyes

Procedure	Number of Eyes
Meridional implantation under hard silicone	
Primary buckling	26
Diabetic tractional detachment	5
Second operation	10
Third operation	7
Primary intrascleral implantation without band	
Radial trap door with vitrectomy and air-fluid exchange	8
Equatorial trap-door	6
Primary intrascleral implantation with band	7
Primary episcleral implantation without band	6
Vitrectomy for vitreous membranes	4
Primary episcleral implantation with band	11
Revision of scleral buckle	1

Postoperative Workup

Patients made postoperative follow-up office visits at 3, 6, 12, 36, and 52 weeks. At each follow-up visit, the patient was questioned about pain, ocular redness, ocular discharge, and improvement or deterioration of vision. Anterior segment examination included inspection of the conjunctiva overlying the area of hydrogel implantation, intraocular muscle movements, palpation of the globe for tenderness, tonometry, and slit-lamp examination of the cornea, anterior chamber, crystalline lens, and anterior vitreous. The posterior segment was evaluated with direct and indirect ophthalmoscopy to determine the status of the retina, height of the buckle, and condition of the retina and choroid on the buckle.

Results

The anatomic results in the 82 eyes that had scleral buckling with the hydrogel material are shown in Table 3. There was no discomfort, infection, or migration of the implant in any of the cases.

Meridional Implant. Of 43 eyes that had meridional implant under a hard silicone scleral buckle, 35 (81%) had successful retinal reattachment. In 19 eyes, the reattachment was successful on the first operation and in 16 eyes after the second, third, or fourth operation. Reoperations were required for recurrent retinal detachment caused by reopening of previously closed breaks outside the meridional implant or by development of new retinal breaks. In all cases, the meridional implant provided a high buckle that had a smooth contour and a stable height. There was no evidence of retinal or choroidal thinning in the buckled area.

There were eight failures in this group of 43 eyes. These cases all exhibited severe proliferative vitreo-

Table 3. Anatomic Results by Type of Surgery in 82 Eyes

Result of Surgery	Type of Surgery				
	Meridional Implant (N = 43)	Intrascleral Implant		Episcleral Implant	
		Without Band (N = 14)	With Band (N = 7)	Without Band (N = 6)	With Band (N = 12)
Reattached retina	35 (81)	11 (78.6)	7 (100)	5 (83.3)	12 (100)
1 operation	19	10	7	4	11
2 or more operations	16	1	0	1	1
Failure	8 (19)	3 (21.4)	0	1 (16.7)	0

Numbers in parentheses represent percentage.

retinopathy, and a minimum of three revisions of the scleral buckle were performed. All patients refused additional surgery. Four of the eight had previous cataract surgery, and two had an anterior chamber intraocular lens.

Intrascleral Implant Without Band. In 11 of 14 eyes (78.6%), intrascleral implant without an encircling band permanently reattached the retina, after a primary scleral buckling in 10 eyes and after a reoperation in 1 eye. Despite the absence of an encircling band, an effective buckle height was maintained in all eyes. There were no clinical signs of chorioretinal thinning or erosion.

Three cases failed because of the development of severe rubeosis iridis, glaucoma, and phthisis following repeated cyclocryosurgery for rubeotic glaucoma. One of these eyes had anterior chamber pseudophakia. Failure in these cases was not attributable to the use of the hydrogel implant.

Intrascleral Implant With Band. In all seven eyes with intrascleral implant with an encircling band, the retina was reattached on the first operation. The implant provided a constantly high buckle with no evidence of erosion. The encircling band opposite the implant produced a high indentation but showed no signs of erosion during the follow-up period.

Episcleral Implant Without Band. The retina remained reattached in five of six eyes that had this procedure. In one of these five eyes, a reoperation was necessary to close a new retinal tear. The only failure occurred in an eye with a traumatic retinal detachment, in which the development of proliferative vitreoretinopathy made the eye inoperable.

Episcleral Implant With Band. In the 12 eyes that had an encircling band over the hydrogel episcleral implant, there was no evidence of conjunctival erosion or implant exposure externally. The retina was permanently reattached in all eyes. The buckle showed a stable height, smooth contour, and no erosion of the choroid or retina.

Discussion

Although this study involved a nonconsecutive series of eyes and no controls, we think that this long-term follow-up study is important in reinforcing our short-term observations[1] and those of another author[5] that the hydrogel scleral buckling material is safe, effective, and well tolerated by the eye. This versatile implant material can be used in a variety of cases of rhegmatogenous retinal detachment, including complex cases in both young and old patients. It is readily adaptable for intrascleral or episcleral buckling techniques and maintains an effectively stable buckle without an encircling band.

The hydrogel material and silicone sponge both are soft and may be less likely than hard silicone rubber to erode the sclera and choroid. However, silicone sponge appears to be more susceptible to infection[6-8] than is silicone rubber. Because of this serious drawback, we do not favor the use of silicone sponge for intrascleral implantation. Hydrogel implant may minimize these complications. Further, because the hydrogel implant is soft and not likely to produce scleral and choroidal erosion, it is an ideal material for scleral buckling in children.

A major advantage of the hydrogel implant is that the material absorbs and releases antibiotics,[9] which makes it a suitable buckling material for cases of rhegmatogenous retinal detachment developing after vitrectomy for endophthalmitis. Rhegmatogenous retinal detachment patients with potentially infected intraocular foreign bodies, diabetes mellitus, or immunosuppression may also benefit from this implant.

Because the Federal Drug Administration has approved the clinical use of hydrogel implant for scleral buckling, we anticipate an increase in its use. We hope to learn more about the implant's clinical properties, including rate of infection and erosion, and to collect other data that can be obtained in a large series.

Key words: hydrogel implant, rhegmatogenous retinal detachment, scleral buckle.

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