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A TEMPORARY BALLOON BUCKLE FOR THE TREATMENT OF SMALL RETINAL DETACHMENTS

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An inflatable silicone explant has been used to treat small retinal detachments. The device is inserted through the conjunctiva at the ora and expanded beneath the retinal break. Subretinal fluid absorbs because the intrusion of the balloon closes the retinal break. Adhesion is obtained by transconjunctival cryopexy or laser coagulation. The balloon, which is unsecured by sutures, is deflated and withdrawn after one week.

INTRODUCTION

FOR several years, a means to maintain scleral depression beneath a peripheral retinal break in a small detachment has been sought. If the indentation could be sustained for even a few hours, subretinal fluid might absorb, returning the eye to the state that existed immediately after the tear occurred, when it might have been treated with coagulation alone.

A number of extraconjunctival devices, conceived for this purpose, were tested by the retinal fellows in our laboratory during the past five years. M. Wolkstein, MD, and T. Poole, MD, tried a plastic adaptation of the Rosengren ring.[1] F. La Franco, MD, experimented with gluing large sponges into the cul-de-sac. L. Parver, MD, tried an extraconjunctival suction device to hold a sponge in place.

Fixation was a problem with all of the extraconjunctival devices. Scleral buckles are fixated and obtain effective indentation by way of scleral sutures, scleral flaps, or encircling bands. Transconjunctival scleral sutures proved feasible in the rabbit eye and in an elderly patient with thin epibulbar tissue. The retina reattached, but the pressure of the sponge eroded the conjunctiva beneath it, as did all the other extraconjunctival devices.

The procedure described was conceived in the spring of 1977. It abandons the extraconjunctival approach. Instead, a deflated balloon is inserted through the conjunctiva into the parabulbar space, where the epibulbar tissues provide counterpressure.

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The balloon maintains its position initially because of fixation between the bony orbit and the globe. As the eye decompresses, the balloon sinks into a temporary depression in the globe, in which it is retained by the epibulbar fascia and from which it shows little tendency to be dislodged when ocular rotations are restored.

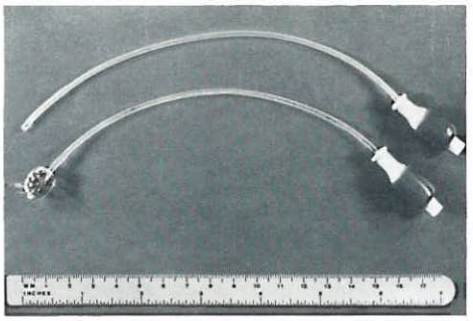

Fig 1.—Silicone balloon device deflated (top), inflated (bottom). Syringe adapter and valve are at right end.

Expandable devices have been used before in the treatment of retinal detachment. Schepens, Freeman, and Couvillion[2,3] use an intraocular balloon for manipulating giant tears. Banuelos, Refojo, Huamonte, and Schepens[4-6] developed an expandable implant to be inserted beneath scleral flaps. Hoepping[7] sutured a balloon to sclera to buckle large posterior breaks and drained subretinal fluid to obtain retinal attachment.

MATERIALS AND METHODS

The buckling device consists of a silicone balloon at the end of a 17-cm soft silicone tube. The balloon can be inflated to a diameter of 1.25 cm by injecting 1 cc of saline. Inflated, it assumes an ovoid shape suitable for a radial buckle. At the other end of the tube is a plastic adapter that fits a standard 30-cc syringe. The adapter contains a valve that retains fluid (Fig 1).

The eye to be treated is given a retrobulbar injection of 2 cc of 2% lidocaine (Xylocaine).

The retinal breaks are localized transconjunctivally by depression and treated with the cryosurgical probe under ophthalmoscopic control. The procedure is the same as that used for prophylactic cryopexy except that the position of the break is marked on the conjunctiva with ink and its distance from the cornea is measured. The radian of the break is also marked anteriorly on the conjunctiva at the ora serrata. If the break is beyond the limits of the conjunctival cul-de-sac, only the radian of the break is marked and the anterior-posterior distance is estimated. Coagulation of posterior breaks is achieved by laser applied in subsequent days after the subretinal fluid has absorbed.

With localization complete, a 2-mm conjunctival incision is made through the mark at the ora, and the deflated balloon is introduced into Tenon's space to the approximate depth of the break. The position of the balloon is ascertained ophthalmoscopically after inflating it with 0.25 cc of saline. Minor adjustments to bring the balloon immediately beneath the break can be made by pushing the tube or slightly inflated balloon transconjunctivally with a wet swab.

Once in position, the balloon is expanded under ophthalmoscopic control to a size appropriate to the height of the detachment and the

size of the break, approximately 0.75 to 1.25 cc. As the balloon expands, it raises intraocular pressure, making it necessary to monitor the central artery and to deflate some if the artery threatens to close. The operation is completed by tying a preplaced suture at the site of the conjunctival incision (Fig 2). The suture stabilizes the exit of the silicone tube and secures the conjunctival edges around the tube in "purse string" fashion. The tube and the valve at its end are taped to the forehead. The lids close easily over the tube (Fig 3). Both eyes are covered with dressings, and binocular patching is maintained until the subretinal fluid has absorbed, usually by the next day. Photocoagulation with the argon laser is added around the breaks in eyes deficient in cryopexy; the long-term attachment will depend on the thermally induced adhesion.

The original intent was to remove the balloon immediately after the retina reattaches, but patients tolerate the balloon with so little discomfort that it is advantageous to leave it in place longer to better secure the adhesion. Thus, it has become customary to reduce the volume of the balloon by withdrawing one third of its contents on the fifth day and the remainder by thirds on the following two days. After the balloon is deflated, the suture at the insertion site is cut and the balloon is withdrawn under topical anesthesia.

SELECTION OF PATIENTS

The balloon has been applied to ten patients with small detachments caused by a single retinal tear or by a group of tears that subtended less than 6 mm in the longest dimension (Fig 4 through 13). The duration of the detachments ranged from two days to two years. Patients were from 20 to 78 years of age. Three patients were aphakic. Both eyes of all patients were covered for at least 24 hours to exclude those whose retina might attach with immobilization alone.

RESULTS

The fluid was absorbed by eight patients in one day, by one in three days, and by one in four days. In

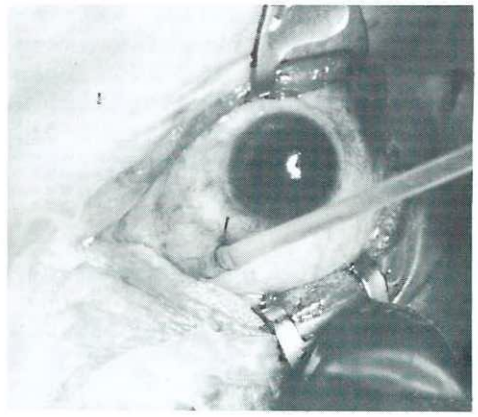

Fig 2.—Balloon in place over inferotemporal break. Silicone tube is stabilized at its exit site with preplaced suture.

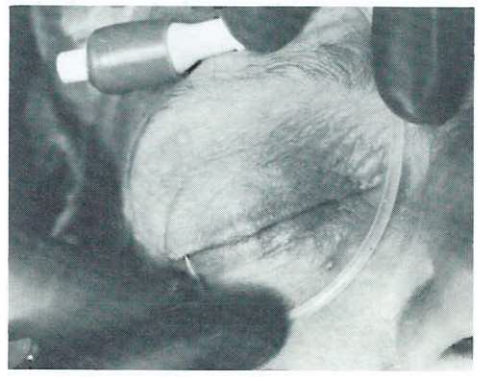

Fig 3.—Eyelids are closed over silicone tube. Adapter is taped to forehead.

the latter case, the balloon was inflated an additional 0.5 cc on the third day to close the break.

The retina has remained attached for 6 to 16 months in nine patients. In one patient it attached initially but began to redetach after deflation because of traction (Fig 9); a vein that bridged the break transmitted sufficient traction from the operculum to the posterior edge of the break to separate the adhesion (Fig 14). The retina was reattached with a sponge buckle.

Macular function was unimpaired by the insertion of the balloon, and diplopia did not occur (Table 1).

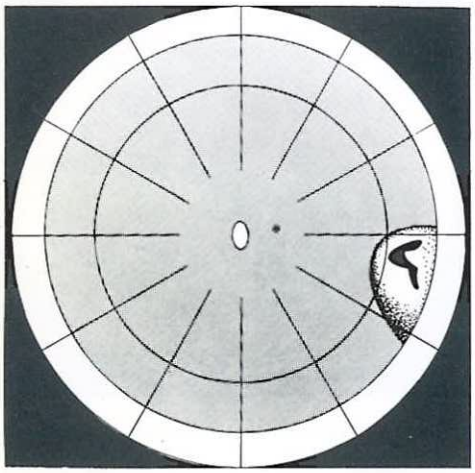

Fig 4.—Early temporal detachment with horseshoe tear at 3:30-o'clock position.

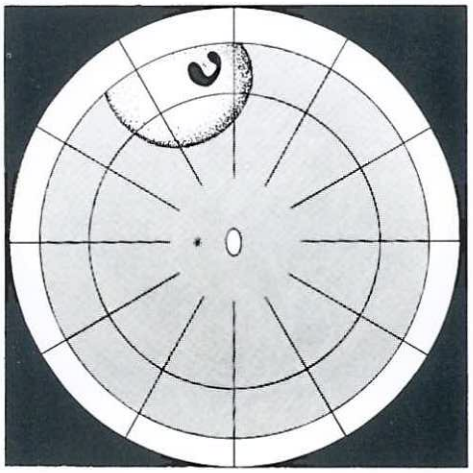

Fig 6.—Superior detachment with horseshoe tear at 11:45-o'clock position.

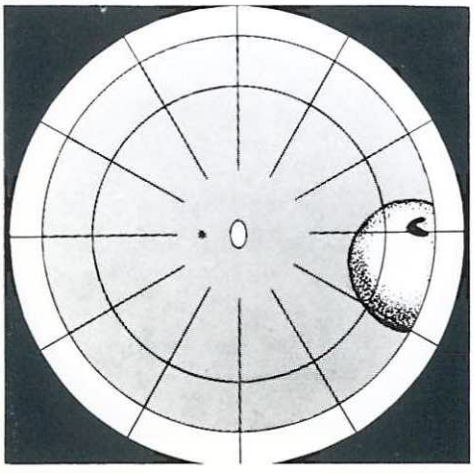

Fig 5.—Early nasal detachment with horseshoe tear beneath medial rectus at 3-o'clock position.

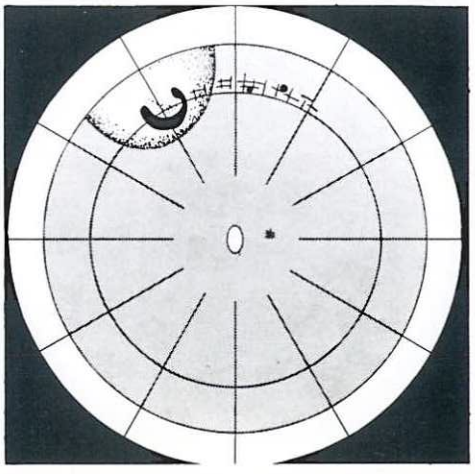

Fig 7.—Superotemporal detachment with horseshoe break at edge of lattice degeneration.

DISCUSSION

The balloon buckle raises the question of whether retinal tears need permanent support. In this series redetachment occurred in one patient because of traction that separated the thermal adhesion. The experience with prophylactic photocoagulation and cryopexy is pertinent. Fifteen years ago it was customary to treat acute operculated tears with buckles even though the retina beyond the tear was not detached. Gradually a trend developed

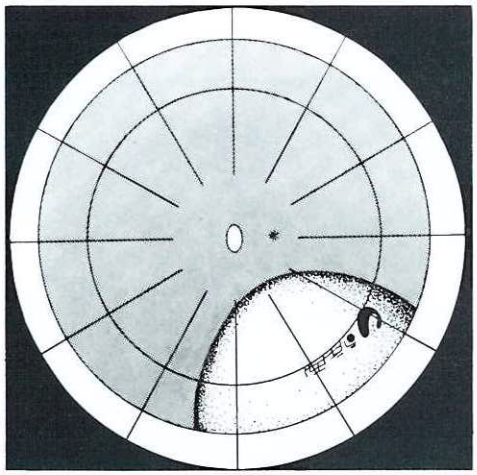

Fig 8.—Inferotemporal detachment with horseshoe tear and round hole at edge of lattice degeneration.

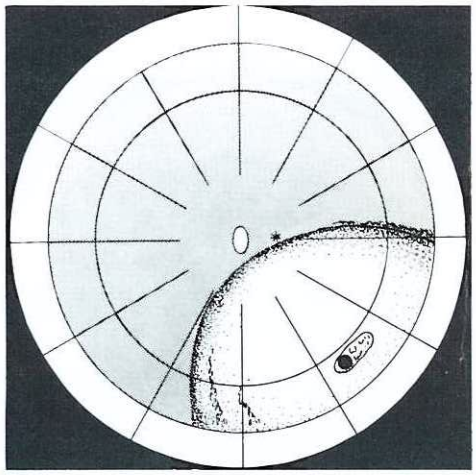

Fig 10.—Inferotemporal detachment caused by hole in cystic retina at 4:30-o'clock position. Multiple pigment demarcation lines indicate its long duration.

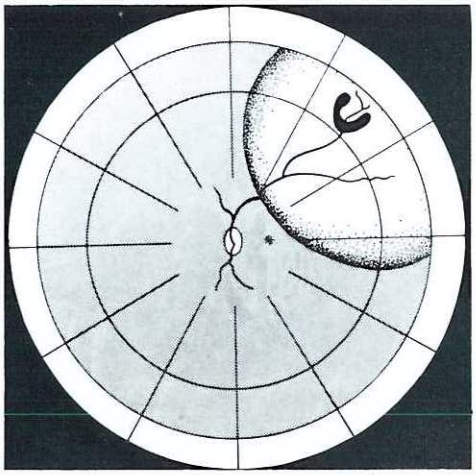

Fig 9.—Superotemporal detachment with horseshoe tear at 1:30-o'clock position. Vessel bridges tear.

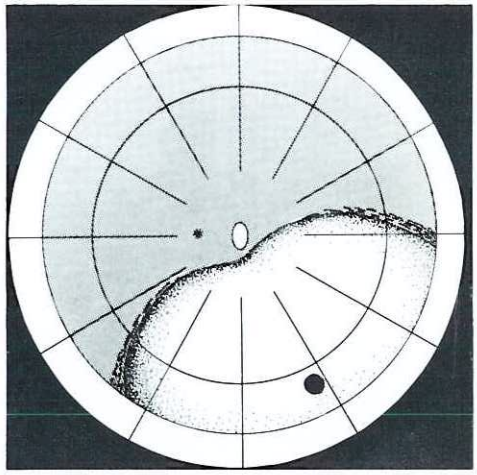

Fig 11.—Inferonasal detachment caused by round hole at 5-o'clock position. Pigment demarcation lines indicate detachment is long-standing.

to treat the smaller ones and then larger ones with coagulation alone. Detachment has been infrequent; two of 61 patients with symptomatic horseshoe tears that were treated with coagulation alone experienced detachment in a series from the Eye Clinic at Bonn, Germany. It is possible that the detachment rate will be higher in patients whose tears have proceeded to manifest detachment. A larger series will determine whether it will be a tolerable rate.

VISUAL RESULTS

FIGURE NO.	PRE-OPERATIVE	POST-OPERATIVE
2	20/25	20/25
3	20/25	20/25
4	20/20	20/20
5	20/25	20/20
6	20/30	20/20
7	20/25	20/30
8	20/20	20/20
9	20/20	20/20
10	counting fingers (amblyopic)	counting fingers
11	20/40	20/20

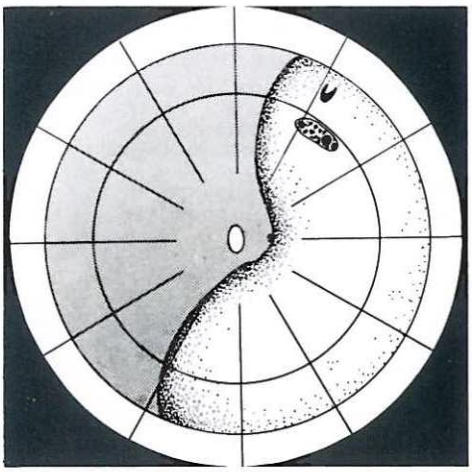

Fig 13.—Temporal detatchment invading macula caused by horseshoe tear at 11-o'clock position and three round holes in cystic area posterior to it.

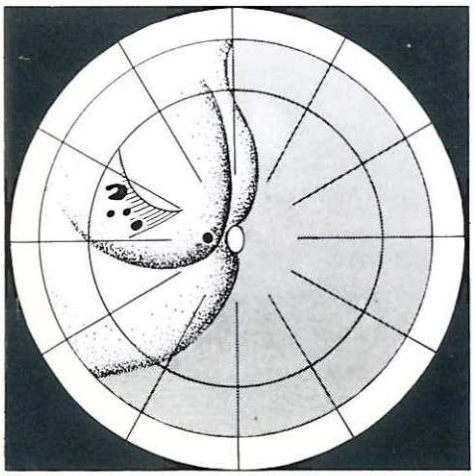

Fig 12.—Temporal detachment in highly myopic patient caused by multiple tears beneath membrane at 9:30-o'clock position. There is hole in internal layers of macular cyst.

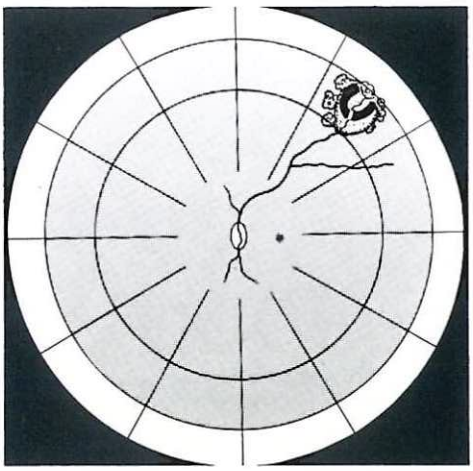

Fig 14.—Retina depicted in Fig 9 beginning to redetach because of traction transmitted to posterior edge by vessel that bridges tear.

CONCLUSION

The balloon buckle is a possible technique for returning selected retinal detachments to the attached state and making them suitable for repair with cryopexy or photocoagulation. It effects reattachment without scleral surgery and without drainage of subretinal fluid. Left in place for a week, it provides support for the retinal breaks while the thermal adhesion is forming.

ACKNOWLEDGMENT

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