

Diplopia after retinal detachment surgery

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SUMMARY Diplopia following retinal detachment usually responds to simple measures. Fifteen out of 311 cases developed diplopia lasting more than three months after conventional retinal detachment surgery. Binocular single vision was restored in 12 of the 15 cases (80%). The mean follow-up was four years. Diplopia was eliminated stepwise. If prisms were ineffective, our first surgical procedure was removal of the scleral buckle. If the retina was flat, we were prepared to remove the buckle early. When diplopia persisted after buckle removal, we proceeded to strabismus surgery. Our most consistent results followed strabismus surgery on the untreated eye. Prisms alone restored binocular single vision in six patients (40%), one of whom preferred to adopt a compensatory head posture. Removal of the scleral buckle restored binocular single vision in three patients (20%), with the help of a prism in one case and a compensatory head posture in another. Binocular single vision was restored after buckle removal and strabismus surgery in three further patients (20%), one requiring a prism in addition. Binocular single vision was not restored in three patients (20%).

Diplopia occurs in 3% to 30% of patients after conventional retinal detachment surgery.¹⁻⁵ Possible causes include the breakdown of an existing fusion weakness, distortion of the globe by scleral buckles, damage to the rectus muscle insertions by traction sutures, and postoperative tissue swelling.⁶⁻¹¹ Permanent adhesions and scarring often bind the rectus muscles down to the underlying sclera.¹⁰⁻¹³ Most cases of diplopia following retinal detachment surgery recover spontaneously. Rectus muscles swollen by cryotherapy return to normal after six weeks.⁸ Even when division of the rectus muscles was more widely practised, and diathermy was used instead of cryotherapy, heterotropia was usually transient.¹⁰⁻¹¹⁻¹⁴⁻¹⁵ It has been postulated that phoria adaptation contributes to the resolution of the initial heterotropia after retinal detachment surgery.¹⁶ Phoria adaptation is observed when the normal fusional range is restored after any induced shift of oculomotor balance.

Many of those with transient diplopia learn to suppress the image from the operated eye, particularly if its acuity is reduced. It has been estimated that between one-quarter and one-third of all patients develop suppression in the treated eye after retinal detachment surgery.⁵⁻⁹⁻¹⁷ There are some who cannot suppress the second image; the ability to

suppress lessens with age, and intractable diplopia may even occur after surgery on amblyopic eyes.¹⁸ Diplopia resolves spontaneously in most cases after retinal detachment surgery, but sometimes persists to become incapacitating. We have studied a group of 15 patients whose diplopia persisted longer than three months after retinal detachment surgery.

Material and methods

Four hundred and thirty-six consecutive cases requiring retinal detachment surgery at St Thomas's Hospital from 1 January 1979 to 31 December 1982 were studied. Surgical techniques included cryotherapy and full-thickness scleral buckling with either Silastic sponges of standard sizes, or solid Silastic bands, gutters, and tyres. 3/0 silk sutures under the rectus muscles provided traction on the globe, but the muscle insertions were not divided. Closed pars plana vitrectomy was performed in 125 of the cases studied.

An orthoptic assessment was performed as soon as any patient complained of double vision after retinal detachment surgery. This orthoptic examination included the measurement of visual acuity and the range of ocular movements. Serial Hess charts were recorded, and the prism cover test was used to measure the angle of heterotropia (the modified

Krimsky test was substituted when the visual acuity was poor). Binocular functions were assessed with Bagolini's striated glasses, the Titmus stereotest, and the synoptophore. Further orthoptic and ophthalmic examinations were conducted at three and six monthly intervals.

First we tried to control diplopia with either adhesive Fresnel prisms or with a prismatic addition to the existing spectacles. We operated only if prisms failed to control the diplopia. Our initial surgical procedure was removal of the scleral buckle, and adjacent rectus muscle insertions were freed of scar tissue at the same time. We performed strabismus surgery as a separate procedure in two cases and combined it with buckle removal in one case.

Results

No patient complained of diplopia after vitrectomy (125 cases). Of 311 patients undergoing conventional retinal detachment surgery 15 (4.8%) developed postoperative diplopia lasting more than three months. Clinical details of these patients are summarised in Table 1, and the effect of scleral buckling

in each case is shown in Table 2. The period of follow-up ranged from two to six years, mean four years.

TIME OF ONSET

Diplopia occurred after the first scleral buckling procedure in 11 of the 15 cases (73%). Double vision was usually present within a few days of retinal surgery, but in three cases its onset was delayed: case 7 had complete unilateral ptosis, case 11 noticed diplopia only after the correction of aphakia, and case 4 was an unreliable witness.

RESPONSE TO PRISMS

At first, fusion was restored with prisms in 11 cases (73%). Seven of these 11 patients still need prisms (47%) but four no longer use them. Two developed a compensatory head posture (cases 6 and 9); and two required strabismus surgery after an initial success with prisms (cases 13 and 15). Five of the seven patients still using prisms needed no other treatment (cases 1-5). Fusion with prisms was achieved by the two remaining patients, after removal of the scleral buckle in case 8, and after removal of buckle and strabismus surgery in case 14.

Table 1 *Clinical course of patients with diplopia after retinal detachment surgery*

Case no	Age	Number of retinal operations	Maximum heterotropia after retinal surgery (prism dioptres)	Time of buckle removal (months after retinal surgery)	Maximum heterotropia after buckle removal (prism dioptres)	Strabismus surgery	Present status	Corrected visual acuity of operated eye after retinal detachment surgery
1	75	1	R/L 6 Exo 16	-	-	No	BSV (prisms)	6/9
2	60	1	R/L 2 Exo 8	-	-	No	BSV (prisms)	6/9
3	58	2	R/L 6 Exo 6	-	-	No	BSV (prisms)	6/60
4	57	1	Eso 8	-	-	No	BSV (prisms)	6/12
5	61	1	R/L 9 Exo 14	-	-	No	BSV (prisms)	6/6
6	63	1	L/R 13 Exo 18	-	-	No	BSV (with CHP)	6/36
7	54	1	R/L 14 Exo 8	18	L/R 2 Exo 8	No	BSV	6/9
8	68	1	R/L 16 Exo 14	15	R/L 4 Exo 8	No	BSV (prisms)	6/9
9	31	1	R/L 3 Exo 10	10	R/L 1 Exo 6	No	BSV (with CHP)	6/6
10	54	2	L/R 9 Exo 12	-	-	No	Torsional diplopia	6/36
11	21	1	R/L 2	-	-	No	Weak fusion with intermittent diplopia	6/9
12	27	3	L/R >20 Exo 8	5	L/R 14 Exo 6	No	Suppresses	6/60
13	34	2	L/R 2 Eso 20	5	L/R 2 Eso 25	Yes	BSV	6/6
14	62	1	R/L 20 Exo 18	14	R/L 3 Exo 16	Yes	BSV (prisms)	6/9
15	46	1	R/L 20 Exo 16	3	R/L 20 Exo 16	Yes	BSV	6/18

R = right eye; L = left eye; Exo = exotropia; Eso = esotropia; BSV = binocular single vision; CHP = compensatory head posture.

Table 2 Details of episcleral buckling and its effects in patients with diplopia after retinal detachment surgery

Type of buckle	Case No.	Diameter of sponge(s) (mm)	Muscle(s) in contact with scleral buckle	Maximally restricted ocular movement	Number of patients with diplopia		
Silastic sponge explant:	radial	1	5	LR	Adduction	2	
		7	5/7.5	SR	Elevation		
	circumferential	8	4	SR/LR	Depression		
		2	5	SR/LR	Depression		
		14	5	SR	Elevation		
		15	5	IR/LR	Elevation/ adduction		
		9	5	IR	Elevation		
		12	7.5	IR	Elevation		6
	oblique	6	7.5	-	Depression		1
	Encirclement alone	4	-	-	Abduction		1
	Encirclement + gutter	11	-	SR	Elevation		1
	Encirclement + sponges	5	5/5	-	Elevation		4
		13	5/7.5	-	Abduction		
		3	7.5/7.5	-	Depression		
		10	7.5/7.5	-	Elevation/ adduction		
Total cases			9		15		

LR = lateral rectus muscle. SR = superior rectus muscle. IR = inferior rectus muscle.

Prisms were of no benefit in four cases (27%). Case 10 had torsional diplopia which was relieved by occlusion. Case 11 had very weak fusion with intermittent suppression, case 12 suppressed completely, and case 7, with a large vertical tropia, was able to fuse after removal of the scleral buckle.

RESPONSE TO CORRECTIVE SURGERY

Removal of the scleral buckle. The scleral buckle was removed in seven cases (47%) between three and 18 months after retinal detachment surgery. Changes in the position of the eyes are recorded as changes in the prism cover test readings in Table 1. Diplopia was eliminated completely in only one patient (case 7), who had a large hypotropia. There was a reduction of the heterotropia in three patients: one became orthophoric with prisms (case 8), one controlled the diplopia with a compensatory head posture (case 9), and the other suppressed (case 12). No change was seen in case 15, but the diplopia was actually worse after buckle removal in the two remaining patients (case 13 and 14); their clinical course is described below.

Strabismus surgery. Three patients (cases 13, 14, and 15) required definitive surgical correction of their strabismus. Case 13 had a medial rectus recession and lateral rectus resection on the buckled eye, but even with prisms horizontal diplopia was not controlled. Medial rectus recession and lateral rectus resection in the fellow eye eventually resolved the esotropia without the need for prisms. In case 14 the scleral buckle was removed at the same time as resection of the superior rectus muscle. Vertical diplopia persisted because of overcorrection, and further

surgery was necessary. The superior rectus muscle was recessed and residual diplopia was eliminated with prisms. Case 15 had an exotropia, with hypotropia in the buckled eye. After removal of the scleral buckle strabismus surgery was performed only on the fellow eye: the lateral rectus was recessed and the medial rectus was resected, with downward transposition of the muscle insertions. Although there was some reduction of the hypotropia, diplopia was not controlled, and further strabismus surgery was needed. Recession of the inferior oblique was combined with further surgery to the horizontal recti, an adjustable suturing technique being used. Diplopia was eliminated in all directions of gaze except extreme laevodepression.

Discussion

Several factors influencing the occurrence of diplopia after retinal detachment surgery have been proposed. They include operative trauma, repeated retinal surgery, and the size, location, and type of scleral buckle used.

The importance of minimising operative trauma by careful surgical technique has been stressed repeatedly.^{6 10 11 19-24} A rectus muscle was divided at the time of retinal surgery in only one of our patients (case 12). The inferior rectus muscle had been detached from its insertion twice before, and its tendon was never identified on exploration of the residual scar tissue. In all other cases the rectus muscle insertions were located, and their integrity was guaranteed by passing traction sutures beneath them. It has been suggested that repeated retinal

detachment surgery is a significant cause of postoperative diplopia,⁶ but we did not confirm this finding: 11 of our patients (73%) developed diplopia after their first retinal operation (Table 1).

Prospective studies have indicated that the size of a buckling element, and its location under a rectus muscle, may influence the onset of postoperative diplopia.^{5,6,23,25} Wide-diameter buckles (7.5 mm or wider combinations) were used in eight (53%) of our cases (Table 2). We found that circumferential sponges were associated with diplopia in six cases (40%) and radial or oblique sponges in three cases (20%), which is in contrast to the conclusion of a recent study.⁵ Only one of our 15 cases was treated with an encircling band alone (case 4), a procedure which is less often associated with diplopia,⁹ though cases have been reported with varying frequency.^{16,23,26,27} This factor probably accounts for the absence of diplopia in the 125 vitrectomy cases in our series. Nine of our 15 patients with diplopia (60%) had a scleral buckle directly related to one or more rectus muscles (Table 2). Restricted ocular rotation in the direction away from the rectus muscle with the underlying scleral buckle occurred in six of these cases.^{5,12,19,27,28} In the other three patients (cases 7, 11, 14) elevation was limited, and the scleral buckle lay beneath the superior rectus muscle, causing a mechanical restriction. A vertically acting muscle (superior or inferior rectus) was involved in eight of these nine cases. This finding is strikingly similar to a report of cases in which the rectus muscle adjacent to the scleral buckles were all detached at the time of retinal surgery.¹⁹

Eleven patients (73%) have confirmed the benefit of prisms in the course of their treatment.^{5,15,17,28,29} Five patients (33%) had their symptoms controlled by the use of prisms alone. It is worth emphasising that seven patients (47%) still require prisms to maintain binocular single vision (Table 1). Torsional diplopia cannot be controlled by prisms, although surgical correction is possible. However, in case 10, we resorted to occlusion and did not attempt strabismus surgery.³⁰

It has been stated that no surgical correction of postoperative diplopia should be attempted until six months have elapsed after retinal detachment surgery.^{15,20} However, our experience of buckle removal suggests that its timing is not critical. We removed the scleral buckle in seven cases (47%), when the use of prisms was impracticable because the angle of deviation was too great. Removal of a circumferential sponge three months after its insertion had no effect at all on one patient (case 15); in another (case 7) the removal of a wide radial sponge under the superior rectus muscle after 18 months allowed elevation of the eye, eliminating the

large vertical muscle imbalance. We see no practical advantage in waiting to remove the scleral buckle once the retina is safely reattached, since early removal should minimise episcleral fibrosis. Although we cannot predict the effect of buckle removal in a particular case, we consider that this is the logical first step in corrective surgery. We were able to control diplopia by removing the scleral buckle in four of the seven cases whose diplopia could not be joined with prisms.

Diplopia persisted after buckle removal in three cases. Definitive strabismus surgery was then performed. After forced duction testing we operated first on the eye which had already been treated. We could thus divide muscle adhesions and correct the underaction of affected rectus muscles.^{13,22,31} In our small series we did not find it necessary to overcorrect the strabismus, employ marginal myotomy, or recess the conjunctiva to enhance the effect of rectus muscle recession, techniques which have all been advocated in the management of diplopia after retinal detachment surgery.^{10,12,13,21,32-34} In both patients with horizontal diplopia who required strabismus surgery (cases 13 and 15) we eliminated diplopia by operating on the eye which had not been buckled. This confirms that strabismus surgery for this condition may be performed on either eye.^{5,27,31} In one patient (case 15) we used an adjustable suturing technique with excellent results to achieve an early and accurate restoration of fusion.^{27,28,35}

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References

- Theodossiadi G, Chimonidou E, Nikolakis S, Apostolopoulos M, Velissaropoulos P. Einige klinische Aspekte der Diplopie nach Operation von Netzhautablösung vermittels Kryopexie und episkleraler Silasticplombe. *Klin Monatsbl Augenheilkd* 1975; **166**: 423-31.
- Theodossiadi G, Nikolakis S, Apostolopoulos M. Immediate postoperative muscular disturbance in retinal detachment surgery. *Mod Probl Ophthalmol* 1979; **20**: 367-72.
- Fava GP, Casu L, Gandolfo E. La visione binoculare negli operati per distacco di retina. *Ann Ottalmol Clin Ocul* 1976; **102**: 187-94.
- Tassler GE, Görtz H. Zur Binokularfunktion nach Amotio-Chirurgie. *Klin Monatsbl Augenheilkd* 1978; **173**: 42-44.
- Waddell E. Retinal detachment and orthoptics. *Br Orthopt J* 1983; **40**: 5-12.
- Sewell JJ, Knobloch WH, Eifrig DE. Extraocular muscle imbalance after surgical treatment for retinal detachment. *Am J Ophthalmol* 1974; **78**: 321-3.
- Shea M. Complications of cryotherapy in retinal detachment surgery. *Can J Ophthalmol* 1968; **3**: 110-5.
- Bell FC, Pruect RC. Effects of cryotherapy upon extraocular muscle. *Ophthalmic Surg* 1977; **8**: 71-5.
- Arruga A. Motility disturbances induced by operations for retinal detachment. *Mod Probl Ophthalmol* 1977; **18**: 408-14.

- 10 Romaine HH. Motility complications in buckling procedures. *Ophthalmology* 1961; **65**: 718-23.
- 11 Dunlap EA. Plastic implants in muscle surgery: a study of the possible use of plastic materials in the management of extraocular motility restrictions. *Trans Am Ophthalmic Soc* 1967; **65**: 393-470.
- 12 Portney GL, Campbell LH, Casebeer JC. Acquired heterotropia following surgery for retinal detachment. *Am J Ophthalmol* 1972; **73**: 985-90.
- 13 Benson WE. *Retinal detachment: diagnosis and management*. Philadelphia: Harper and Row, 1980.
- 14 Ridley H. Some practical points in the treatment of simple detachment of the retina. *Br J Ophthalmol* 1935; **19**: 101-6.
- 15 Hugonnier M, Rougier J, Madelaine J-m, Magnard P. Etude clinique et traitement de la diplopie dans les suites d'intervention pour décollement de la rétine. *Bull Soc Ophthalmol Fr* 1961; 462-7.
- 16 Mets MB, Wendell ME, Gieser RG. Ocular deviation after retinal detachment surgery. *Am J Ophthalmol* 1985; **99**: 667-72.
- 17 Arruga A. Binocularity after retinal detachment surgery. *Doc Ophthalmol* 1973; **34**: 41-5.
- 18 von Noorden GK. *Binocular vision and ocular motility*. St Louis: Mosby, 1985.
- 19 Kanski J, Elkington AR, Davies MS. Diplopia after retinal detachment surgery. *Am J Ophthalmol* 1973; **76**: 38-40.
- 20 Schepens CL. Postoperative care and complications of retinal detachment surgery. *Am J Ophthalmol* 1957; **44**: 115-7.
- 21 McDonald PR, Annesley WH, Rife CJ, Sarin LK. The postoperative complications of scleroplastic procedures for detachment of the retina. *Am J Ophthalmol* 1963; **55**: 52-5.
- 22 Dunlap EA. Plastic implants in muscle surgery: plastic materials in the management of extraocular motility restrictions. *Arch Ophthalmol* 1968; **80**: 249-57.
- 23 Kutschera E, Antlanger H. Influence of retinal detachment surgery on eye motility and binocularity. *Mod Probl Ophthalmol* 1979; **20**: 354-8.
- 24 Roth AM, Sypnicki BA. Motility dysfunction following surgery for retinal detachment. *Am Orthopt J* 1975; **25**: 118-21.
- 25 Mühlendyck H, Linnen HJ. Analyse und Behandlung von Motilitätsstörungen nach Ablatio-Operationen. *Mod Probl Ophthalmol* 1979; **20**: 359-66.
- 26 Déodati F, Bec P, Béchac G. Complications oculo-motrices après cerclage. *Bull Soc Ophthalmol Fr* 1972; 703-8.
- 27 Fells P, Lee JP. Management of strabismus following surgery for retinal detachment. *Trans Eur Strabismol Assoc* 1984; 207-14.
- 28 Peduzzi M, Campos EC, Guerrieri F. Disturbance of ocular motility after retinal detachment surgery. *Doc Ophthalmol* 1984; **58**: 115-8.
- 29 Pearlman JT, Christensen RE. Motility problems following retinal detachment surgery. *Am Orthopt* 1972; **22**: 64-7.
- 30 Schepens CL. *Retinal detachment and allied diseases*. Philadelphia: Saunders, 1983.
- 31 Jampolsky A. Strabismus reoperation techniques. *Ophthalmology* 1975; **79**: 704-17.
- 32 Weekers R, Delville-Hacourt J, Watillon M. Les altérations de la motilité oculaire après résection sclérale. *Arch Ophthalmol (Paris)* 1958; **18**: 409-13.
- 33 Helveston EM, Cofield DD. Indications for marginal myotomy and technique. *Am J Ophthalmol* 1970; **70**: 574-8.
- 34 Hamlet YJ, Goldstein JH, Rosenbaum JD. Dehiscence of lateral rectus muscle following intrascleral buckling procedure. *Ann Ophthalmol* 1982; **14**: 694-7.
- 35 Fells P. The use of adjustable sutures. *Trans Ophthalmol Soc UK* 1981; **101**: 279-83.

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