Sir,

Retinal Necrosis as a Complication of Cryotherapy

Retinal cryotherapy is now the most commonly used method for creating a chorioretinal adhesion in conventional retinal reattachment surgery. It achieves its effect by dissolution of cellular membranes. The strength of the adhesion between the retina and the retinal pigment epithelium is approximately proportional to the intensity of the application.

A number of complications have been reported including intravitreal dispersion of viable retinal pigment epithelial cells[2] and retinal tear extension through the cryosurgical scar.[3] The formation of new retinal tears in cryosurgical scar tissue has been reported as a late complication of cryotherapy for retinopathy of prematurity[4] and recently in the Japanese literature as an early complication of retinal detachment surgery.[5] To our knowledge there are no reports of a generalised necrotic response in all the area of retina which has received cryotherapy. We report such a case.

Case Report

A 70-year-old man presented to the casualty department with a 6 day history of a floater in his left and only eye. There were no symptoms of photopsia or field defects.

He had previously undergone an uncomplicated left extracapsular cataract extraction with a posterior chamber lens implant 2 years earlier. Open angle glaucoma had been diagnosed 10 months earlier and was controlled using timoptol 0.5% b.d. and pilocarpine 1% q.i.d. to the left eye. A left YAG posterior capsulotomy had been performed 5 months earlier. His right eye had suffered a postoperative expulsive haemorrhage following a trabeculectomy 6 years earlier.

Examination revealed no perception of light in the right eye and a visual acuity of 6/6 in the left eye with −3.00 dioptre correction. The left intraocular pressure was 15 mmHg. The left posterior hyaloid membrane was partially separated from the retina and there were pigment cells in the vitreous gel. The retina was flat and no holes or tears were found on scleral indentation. He was given an appointment for review 5 days later.

At this return visit his symptoms were unchanged although the left visual acuity was 6/9 and funduscopy revealed a bullous superotemporal retinal detachment not involving the macula with no retinal hole or tear seen. He was admitted immediately for surgery which was performed by one of us (J.D.S.) on the same day. Examination under anaesthetic revealed very thin sclera containing splits and a horseshoe tear anterior to the equator at 3 o'clock. No other retinal breaks were detected during examination. Since the position of the tear in relation to the detachment did not comply with Lincoff's laws, cryotherapy was applied to the tear and to the anterior attachment of the posterior hyaloid membrane in the superotemporal quadrant where it was judged that any further unseen tears might be situated. Each cryotherapy lesion was carefully monitored and the end point was whitening extending to the surface of the retina; adjacent lesions overlapped very slightly and no refreezing was applied in any area. A 3 mm radial plomb was used to buckle sclera over the tear. External drainage and fluid exchange with Hartmann's solution was performed and the retina was observed to re-attach.

The next day the tear was found to be flat on the buckle although there was a small amount of subretinal fluid inferior to the plomb. Later that day the patient complained of a shadow over the vision worse than before surgery. Examination at this stage revealed visual acuity of light perception and a bullous superotemporal detachment involving the macula with several large ragged holes in the retina along and within the area of cryotherapy application (Fig. 1). In addition to the full-thickness holes there was extensive thinning of adjacent retina. Vitrectomy was performed on the fourth day after the first operation with injection of 8 ml of 5000 centistoke silicone oil. The retina remained flat in the post-operative period.

Discussion

Macroscopic retinal necrosis resulting within hours of cryopexy has not been observed by us before and we believe this is the first report of such a case. Cellular necrosis following cryotherapy has been demonstrated histologically in various layers of rabbit and human retina and is thought to be the first step in the development of chorioretinal adhesion. This necrosis is thought to result from a mechanical disruption of cells due to formation within hours of large intracellular ice crystals. During thawing, water and electrolytes separate causing a change in pH with rupture of cell membranes.

In our case retinal necrosis took place within 24 hours of surgery. Rabbit retina examined 24 hours after cryotherapy by light microscopy revealed oedema of all layers of the retina, which was thrown into folds with accompanying choroidal congestion and scleral oedema and disorganisation.[8] Histological specimens taken at later stages in the experimental animal show that the normal course is resolution of the oedema, followed by infiltration of pig-

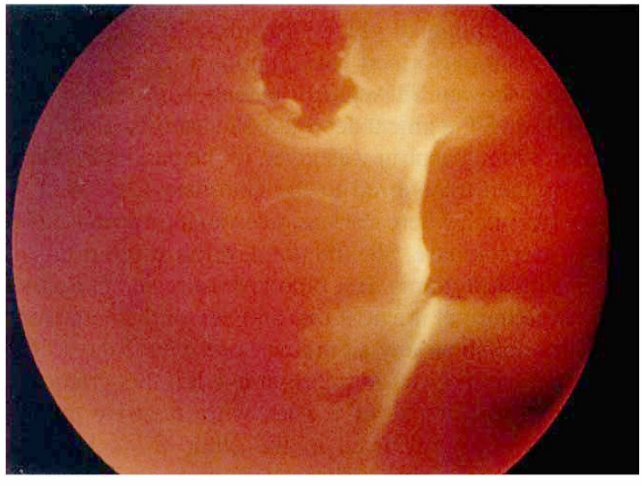

Fig. 1. *Retinal necrosis induced by cryotherapy: ragged holes at sites of cryotherapy and gross thinning of adjacent retina developed within 24 hours of treatment.*

ment-epithelial-derived macrophages, leading to eventual desmosomal adhesion between Müller cells in the neuroretina and the pigment epithelium. In view of these findings it is perhaps surprising that the sort of macroscopic retinal necrosis we describe has not been reported before.

The factors responsible for the unusual response in this case may include an inherent structural weakness in the retina. The scleral thinness and splits as well as the previous adverse reactions in the fellow eye to surgical intervention may support this. It is probable that cryotherapy further alters the structure of the extracellular matrix proteins leading to a critical loss of structural integrity. However, scleral thinness is a common finding in patients with retinal detachment and one would expect such necrosis to occur more often if this were a significant factor.

The scleral thinness may also have contributed to inadvertently heavy cryotherapy, which was suggested as the cause of the cases reported by Okubo and Uemura.[5] Electron microscopy has shown that extension of cellular necrosis into the inner retinal layers does increase with strength of application as judged by clinical retinal whitening, traversing the whole retina including the nerve fibre layer in the heaviest lesions.[6] Overtreatment is thought to be unlikely as a factor in this case since the cryotherapy was applied by a very experienced retinal surgeon (J.D.S.) who is scrupulous in avoiding retreatment of any area of retina. Furthermore if retinal necrosis were simply the result of excess cryotherapy it would be expected to be more commonly reported, especially in the hands of trainees.

The exact reasons for the development of retinal necrosis in this case are unknown. We felt it important to report this unusual and dramatic complication of cryotherapy.

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Sir,

'Balloon Sign' in Allergic Conjunctivitis

Although ocular allergy may be associated with extraocular allergies, the local hypersensitivity of the eye and in particular the conjunctiva is usually predominant.

Despite advances in the basic understanding of ocular allergy, prior clinical experience has formed the basis of

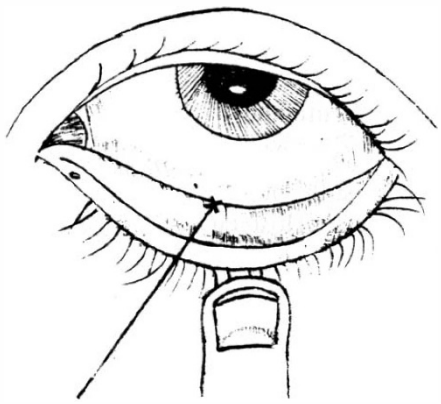

Fig. 1. *The 'balloon sign' for IgE-mediated type 1 allergic conjunctivitis.*