

Intravitreal hyaluronic acid injection

A long-term clinical evaluation

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The perfect vitreous substitute should be a gel with the same viscoelastic and optical properties as vitreous. Of the various types of vitreous implants that have been used over the years none has as yet proved to be entirely satisfactory.

Intravitreal injection of saline solution is useful in re-forming the globe and restoring normal tension in hypotonic eyes after the drainage of subretinal fluid. Unfortunately, it fails to provide the necessary viscosity for tamponading the retina of eyes with giant tears or massive vitreous retraction. Because of rapid depolymerization after its removal from the eye, donor vitreous suffers from the same limitations. It has the added disadvantages of often causing a transient postoperative vitreous haze, and occasionally endophthalmitis (Hudson, 1968).

Although air injection has been successfully used in the treatment of giant retinal tears with everted flaps (Schepens and Freeman, 1967; Norton, Aaberg, Fung, and Curtin, 1969), its rapid reabsorption often fails to provide a sufficiently long tamponading effect during the critical 1 to 3 week postoperative period of

chorio-retinal scar formation. The effects of octa-fluorocyclobutane (C₄F₈) gas are more prolonged and are under investigation (Vygantas, Peyman, Daily, and Ericson, 1973).

Silicone oil is at present the only substance which is capable of permanently counteracting the effects of preretinal membranes which are associated with massive vitreous retraction (Scott, 1973). However, late toxicity and postoperative complications have restricted its use to only the most desperate unocular cases (Watzke, 1967; Okun, 1968; Kanski and Daniel, 1973).

Balazs (1960) was the first to suggest the use of hyaluronic acid, which is a normal constituent of vitreous, as a vitreous substitute. Healon-H is a preparation of human hyaluronic acid which is obtained from the umbilical cord. It has excellent viscoelastic properties because the high molecular weight hyaluronic acid is present in high concentration.

The results of a long-term clinical evaluation of the injection of Healon-H into 7 human eyes, are described below.

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Table *Clinical particulars of seven patients*

<i>Case no.</i>	1	2	3	4	5	6	7
<i>Sex</i>	M	M	F	F	M	F	M
<i>Age (years)</i>	57	48	42	31	66	14	19
<i>Refraction</i>	Aphakia	-19	-14	Aphakia	-2	-1	-2
<i>Extent of RD</i>	Total	Total	Total	Total	Sub-total	Total	Total
<i>Retinal breaks</i>	Multiple	Nil seen	Giant tear (180°)	Single	Multiple	Giant tear (270°)	Multiple
<i>Other findings</i>	Aniridia						Choroidal coloboma
<i>Procedure 1st</i>	Buckle + H-H	Buckle	Buckle	Buckle + H-H	Buckle + H-H	LC+air	Buckle + H-H
<i>2nd</i>	Nil	H-H	H-H	Nil	Nil	H-H	Buckle + H-H
<i>Complications</i>	Chemosis	+1	+1	+1	+1	+2	Nil
<i>Immediate result</i>	Flat	Flat	RD	Flat	Flat	RD	RD
<i>Late result</i>	RD	RD	RD	Flat (6/60)	Flat (6/60)	RD	RD

H-H=Healon-H intravitreal injection
Buckle=scleral buckling procedure

LC=photocoagulation
+1=degree of vitreous haze postoperatively

RD=retinal detachment

Patients and methods

During the period from April 1970 to July 1970, seven patients with retinal detachments were treated with intravitreal Healon-H injections. Three of the patients were females and four were males; their ages ranged from 14 years to 66 years. Details of the seven cases are given in the Table.

The selection of patients for injection was made before surgery when it became evident that conventional techniques had either failed (Cases 2, 3, and 6), or had little chance of success (Cases 1, 4, 5, and 7). The table shows that giant retinal tears were present in two eyes, and six eyes had total retinal detachments; other complicating preoperative factors, such as choroidal coloboma, multiple breaks, aphakia, and high myopia, were also present. As all fellow eyes had normal vision, silicone oil injection was thought not to be indicated in these cases.

The preparation for injection used in this study was a 1 per cent solution of the sodium salt of hyaluronic acid (molecular weight 1.5 million to 3 million), in a physiological buffer. It had been obtained from Dr E. Balazs, of the Department of Connective Tissue Research, Boston Biochemical Research Institute.

All procedures were carried out by members of the Retina Unit under the direction of Mr J. R. Hudson. General anaesthesia was used in all cases. Intravitreal injections of Healon-H were made on eight occasions. In Cases 1, 4, and 5 the injection was performed concomitantly with a scleral buckling procedure; in Cases 2 and 3 it was done after scleral buckling; in Case 6 it was carried out after photocoagulation and intravitreal air injection had failed to re-attach the retina. In Case 7, two separate injections were performed, each combined with a scleral buckling procedure. In all cases the injections were made through the pars plana approximately 5 to 6 mm behind the limbus, after the subretinal fluid had been drained. The amount of Healon-H injected varied from 1 to 4 ml.

Results

All patients have been followed up for at least 4½ years. An immediate re-attachment of the retina was achieved in four cases (57 per cent). Of these, Cases 1 and 2 re-detached and developed massive vitreous retraction within 8 weeks; the other two (Cases 4 and 5) have remained flat and have maintained a visual acuity of 6/60 at the time of writing. In the remaining three cases (3, 6, and 7), failure to re-attach the retina was apparent at the time of initial surgery.

Complications

No operative complications were encountered at the

References

- BALAZS, E. A. (1960) In 'Importance of the Vitreous Body in Retina Surgery with Special Emphasis on Reoperations', ed. C. L. Schepens, pp. 144-146. Mosby, St Louis
- HUDSON, J. R. (1968) In 'New and Controversial Aspects of Retinal Detachment', ed. A. McPherson, pp. 365-370. Harper Row, New York.
- KANSKI, J. J., and DANIEL, R. (1973) *Brit. J. Ophthalm.*, **57**, 542
- NORTON, E. W. D., AABERG, T., FUNG, W., and CURTIN, V. T. (1969) *Amer. J. Ophthalm.*, **68**, 1011
- OKUN, E. (1968) *Trans. Pac. Cst. oto-ophthal. Soc.*, **49**, 141
- SCOTT, J. D. (1973) *Trans. ophthalm. Soc. U.K.*, **93**, 417
- SCHEPENS, C. L., and FREEMAN, H. M. (1967) *Trans. Amer. Acad. Ophthalm. Otolaryng.*, **71**, 474
- VYGANTAS, C. M., PEYMAN, G. A., DAILY, M. J., and ERICSON, E. S. (1973) *Arch. Ophthalm. (Chicago)*, **90**, 235
- WATZKE, R. C. (1967) *Ibid.* **77**, 18-

time of injection. The immediate postoperative clinical findings were assessed with the indirect ophthalmoscope according to the amount of vitreous haze present. The findings were graded according to the overall transmission of light through the ocular media as follows:

- +0 no vitreous haze
- +1 definite haze
- +2 moderate haze, posterior pole details visible
- +3 red reflex but no fundus details visible

Fundus details were easily visible in all cases postoperatively. Four cases had a +1 postoperative vitreous haze, and a +2 vitreous haze was present in one patient. In all cases the vitreous haze cleared within 2 weeks.

The only other immediate postoperative complication was a marked chemosis in one patient which lasted for 1 week. At the time of writing no long-term complications have been encountered that could be attributed to Healon-H.

Comment

The most significant finding from this survey of intravitreal injection of Healon-H is that it is a useful vitreous substitute which does not require special skills or complicated apparatus. Healon-H appears to be well tolerated by the eye, and no serious complications or toxic effects have been encountered after a long follow-up. In this respect it differs from silicone oil.

In assessing the surgical results of Healon-H injection it is important to bear in mind that the patients treated were considered to have difficult detachments. It would appear, however, that Healon-H does not produce a permanent tamponading effect, as two patients developed massive vitreous retraction after an initially successful re-attachment had been achieved, and it would therefore not be an effective method for treating retinal detachments which were complicated by massive vitreous retraction.

Summary

Healon-H was used in the treatment of seven cases of complicated retinal detachment. A permanent re-attachment was achieved in two cases. No serious ocular complications have been encountered after a follow-up of 4½ years.