

## A SURGICAL PROCEDURE FOR THE RELIEF OF VITREOUS OPACITIES ('FLOATERS')\*

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This is in the nature of a preliminary report; one cannot judge by only 3 cases. However, as cases suitable for operation are few and far between, and as I feel reasonably sure of the method and its results, I publish this paper in the hope that others will try it and perhaps make known their results.

I must stress that this procedure is only for those very bad cases where the floaters seriously incommode the patient, and should preferably be used where the vitreous is degenerate and semi-fluid. It should not be used for those very common cases where there is a solitary floater or a few small ones.

During the last 18 years, when examining eyes after the coagulation operation for retinal detachment, I have frequently thought that the vitreous appeared to be clearer than before. Allowing for the freer spread of the ophthalmoscopic beam of light in the interior of the eye after replacement of retinal balloons, the impression remained that there were fewer floaters of both the coarse and fine type.

I nurse my cases, where feasible, in the position which puts the coagulation area into the most dependent position, and it struck me that perhaps under conditions of nearly complete absence of body and eye movements ('complete rest' and double bandaging) some at least of the more mobile floaters settling by gravitation to the most dependent part of the eye, and alighting on a recently coagulated patch, might have stuck to this area.

Careful and prolonged ophthalmoscopic or slit-lamp observation of a fine 'dusty' vitreous haze, such as may follow a severe cyclitis, will more often than not fail to show any obvious movement or settling of individual particles, except as part of a tremor of the whole vitreous body; there also appears to be no change in the position of these particles in relation to each other. However, the study of any undisturbed suspension of fine particles in a medium of even very fluid consistency, will fail to show any obvious sedimentation to the observer's eye. Sedimentation might take hours or days, or longer to become apparent.

It seemed to me that by treating the eye as a 'pot of vitreous' and keeping it very still, one might ultimately expect the sedimentation of particles in a gel of fairly solid consistency. In a vitreous gel changed (as one must suppose) by disease or other process, one might expect a softening of the whole, or in 'channels', which might aid the downward fall of particles in suspension.

A speeding-up of this gravitational settling might be expected from the employment of some form of centrifugal force. It would make an interesting study to observe the effects of the Royal Air Force's experimental centrifuge on large and easily identifiable floaters.

The difficulty of assessing partial improvement in a fine 'dusty' vitreous haze needs no stressing. Both subject and observer, even if highly intelligent and perceptive, may be

liable to errors of unconscious bias. The test of visual acuity (unless improvement is marked) may not be a reliable guide. The most certain method is to use a similar eye in the same or another patient (examined under identical conditions, e.g. of pupillary dilatation, etc.) as a pre- and post-operative control. This I was able to do in one of the cases described below.

A totally different picture obtains in the eye with coarse, mobile floaters in a degenerate, semi-fluid vitreous. Evidence that such floaters settle after a few hours' rest is borne out by the fairly common history of clear vision on waking, and a rapidly increasing turbidity as the eye and body movements stir up the deposit.

### DETAILS OF OPERATIVE TECHNIQUE

The conjunctiva is reflected from the limbus below, and the inferior rectus freely exposed. There is no need to cut the muscle. As there is no inter-retinal separation with fluid or ballooning, as in a detachment, the diathermy reaction comes through easily and only light application of current is needed. (I personally favour the unipolar method.) The insulated diathermy point is applied over an area at 6 o'clock in the form of an ellipse tailing off towards the 5 and 7 o'clock meridians. The main patch of coagulation should stretch backwards from the ora serrata to a distance of about 3 or 4 disc diameters and should lie at the most dependent part of the globe (i.e. with the patient in the Fowler or semi-Fowler position). The coagulation should be moderate, but of sufficient intensity to produce a moderate degree of flocculence in the retina. The small amount of retina thus destroyed gives rise to a small scotoma in the upper field and causes no inconvenience afterwards. The conjunctiva is stroked back to the limbus (stitches are not necessary), atropine ointment is instilled, and both eyes are firmly closed with pads and bandage.

The position of the patient in bed now becomes important and movements of the eyes and head should be restricted to a minimum. The Fowler position is generally a comfortable one, and satisfactory from the nursing point of view. A bolster or 'donkey' under the knees prevents sliding down and helps to restrict movement where a surgical bed is not available. The eyes should not be opened for 10 days, the pads being changed at the dictates of comfort and cleanliness. To avoid stiffness of the neck etc., the position of the head and shoulders should be altered slightly, but all movements (active or passive) should be slow, measured, and deliberate.

### Case 1

An African female 28 years old, with a rather vague history of several years during which vision failed to near blindness.

*Left eye:* Shrunken and disorganized—no perception of light.

*Right eye:* White and uninfamed. Cornea clear. Old shrunken keratic precipitates (K.P.). A.C. and iris normal except for a few old synechiae. Pupil half dilated with mydriatic. Lens clear. In the vitreous, large coarse floaters and fine debris in sufficiently dense concentration to obscure all fundus details; hazy red reflex only;

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movement of eye produces violent and extensive swirling excursions of floaters in a semi-fluid vitreous. *Vision*, counts fingers.

It was felt that operation should be tried as there was little to lose.

**Post-operative Examination.** On the 10th day the patient's vision had improved to 6/18 and she was immediately pleased with the result. The fundus could be clearly seen. Large scattered patches of fairly old choroido-retinitis could be seen in the posterior and peripheral fundus. Unfortunately, we were only able to follow this case for a week or two; we lost track of her after her discharge from hospital. However, the last view we had of her vitreous, in spite of the persistence of some floaters, contrasted impressively with the pre-operative appearance, which one of us in the Clinic had likened to a 'dirty tidal pool'.

### Case 2

A nun (qualified nursing sister) aged 39. First seen by me on 15 January 1953. The left eye had 'gone blind' some months previously and she had received treatment by two eye specialists at another centre. She was told that she had an embolus from a mitral stenosis. At one time she had an acute left frontal sinusitis, since cleared. To leading questions she remembered that the eye had been inflamed and tender on pressure.

**Right eye:** Normal. *Vision* about 2.25 S=6/6.

**Left eye:** White. No K.P. No synechiae. Fine hazy cloud of particles spread evenly through vitreous. Disc hazy, and suggestive of recent papillitis (? aftermath of retrobulbar neuritis). *Vision* about 1.0 S=6/24.

X-ray of teeth and sinuses negative.

15 July 1954. The patient consulted me again with the history that both eyes appeared to have deteriorated. In view of what I had suspected in regard to her teeth, she had independently consulted a maxillary surgeon who had found a 'diseased chip' of bone which he had removed.

**Right eye:** White. New floaters and vitreous haze of moderate degree. Haziness and slight swelling of disc suggestive of papillitis of retrobulbar neuritis. *Vision* about 2.25 S=6/6.

**Left eye:** White. Great increase of vitreous haze and fine particles since last seen 18 months ago. *Vision* about 1.25 S=6/18.

17 May 1955. She saw me again and complained that the floaters in the left eye were 'getting on her nerves'. She consented to undergo what I explained to her should be regarded as an experimental operation of reasonable safety. Here seemed to be an ideal case for trial for the following reasons:

1. Her intelligence and willingness to cooperate.
2. The dusty, particulate and apparently immobile nature of the opacities in the vitreous of the left eye.
3. The presence of opacities of a similar appearance in the right eye (but much less so) which would give the ophthalmoscope a picture for comparison. She was not particularly conscious of the floaters in this eye and the subjective haziness of 1954 had disappeared.

I took particular note of a constellation of 3 course moderate-sized floaters in the eye to be operated on. These were the only coarse ones and their position was slightly to the nasal side of the visual axis.

The patient's behaviour after operation was exemplary and her movements in bed must have been minimal.

**Post-operative Result.** After 10 days the patient was quite emphatic that the vision of the left eye had cleared remarkably. I tried to suggest that possibly she was being deceived partly by wishful thinking and partly by the apparent increased clearness of vision which most patients experience on having their bandages removed. Two days later, however, she was more certain than ever, and now complained for the first time of being conscious of floaters in the right eye, which she now maintained was 'worse' than in the eye operated on. To my surprise and gratification I was able to confirm this ophthalmoscopically. There was still some haze in the left vitreous; but there was no doubt that comparison showed the haze in the right eye to be denser than in the left. There was no reason to believe that since operation on the left eye the haze in the right eye had increased. The appearance was either that my 3 'marker' floaters in the left eye had fused into one, or that two of them had disappeared. The shape of the solitary one appeared different and larger, but its position was unaltered. The visual acuity of the left eye (still partly atro-

pinized) on the 14th day was unchanged (*vision* about 2.5 S=6/18) but the eye appeared to have become a little more myopic.

The following is an extract from a letter from the patient 3 weeks after operation. 'My own observation of the left eye after operation: Eye feels still a little heavy. Central vision clear. On looking downwards I can recognize the floaters partly, which disappear when I raise the eyeball and look straight ahead. I can only notice the floaters very slightly when turning the eye to the left. I only realize now how much the right eye is affected, as the picture before the right eye is quite different from the figures that floated in the left eye, and have now disappeared. Sister typed the report for me because the eye still becomes tired.'

### Case 3

A few months ago this elderly Coloured man returned to me after an absence of 3 years. He had lost the one eye previously, and first came to see me with the request that I should remove his remaining eye, because he was much disturbed by the movements of large dark 'shadows' in the eye. Mentally he did not appear to be normal, and he seemed to be obsessed by his eye. The eye was quiet. The vitreous was a mass of floaters and the fundus details were invisible. *Vision*, hand movements.

I refused to excise the eye, but offered to perform an operation which might help. It was very difficult to determine how much coagulation one was producing below, owing to the turbidity of the vitreous.

On about the 8th day, the patient had a mental storm and discharged himself from hospital before I could examine the eye.

On seeing him again recently I was astonished to find a relatively clear vitreous and a *vision* of 6/24 in a relatively contrite and not ungrateful patient.

### DISCUSSION

The success of operation where the vitreous is degenerate and semi-fluid and the floaters freely mobile is understandable from an appreciation of simple mechanics. On the other hand, in the presence of what *appear* to be fixed floaters, any clearing of the vitreous might, I submit, be due to the following possibilities:

1. That the structure of the vitreous gel is not stationary. Little is known of its structure in life, or of any flow, circulation or movement that might take place, but it seems possible that some of its particles might *eventually* settle, however slow the rate of sedimentation, if encouraged to do so. Using the analogy of the toy 'snowstorm' in the glass sphere, one can visualize the experiment of gradually increasing the density of the medium in which the 'snow' lies suspended, and eventually producing a state of semi-solidity. Under these conditions one might reasonably expect the 'snow' to take months or even years to settle.

2. The heating effect of the diathermy reaction might have some chemical or physical effect (on its specific gravity?) on the vitreous in the neighbourhood of the diathermy reaction, or on the vitreous as a whole. Anyone familiar with retinal detachment operations will bear witness to the considerable rise in the pressure in the eye after several applications of diathermy. I have always considered this to be due to a swelling of the vitreous gel, i.e. an increase in volume which might be expected to decrease its specific gravity. Here the views of a physicist would be of value.

3. The possible speeding up of a possible vitreous 'circulation', on the analogy of the increase of molecular activity when water or any fluid is heated or put under pressure.

4. The vitreous in the vicinity of the diathermized retina might be made more 'sticky' or adhesive to any falling opacities.

5. The processes of inflammation and repair initiated by the electrical burn might multiply and speed up the rate or

volume of cellular and leucocytic scavenging in the eye. The nearer the debris is brought to the inflamed area, therefore, the better.

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