SUPRACHOROIDAL AIR INJECTION
FOR DETACHED RETINA*
PRELIMINARY REPORT
BY
REDMOND SMITH
Moorfields, Westminster and Central Eye Hospital, London

Injection of air into the eye is considered by some authors to be useful in certain cases of detached retina (Spaeth, 1941). Where a considerable quantity of subretinal fluid has been evacuated, with consequent collapse of the globe, there are two ways in which the eye may regain its shape and tension. Either the subretinal fluid may re-form and reproduce the detachment, or aqueous may be formed quickly enough to restore the shape of the globe before subretinal fluid has collected in great quantity.

Presumably both processes tend to occur simultaneously. The crucial matter would seem to be the nearness of the retinal hole to the choroid at the stage when these structures have been rendered adhesive by diathermy. The union is tenuous in its early stages. The conception that the hole itself is "sealed" by diathermy seems difficult to accept, especially as in the case of a large hole it can still be clearly seen. The fact that the edges of the hole are adherent to the choroid may not be ophthalmoscopically obvious as the layer of "physiological glue" may be thick.

However, if the edges of the hole do become adherent to the choroid, the subretinal space becomes a closed pocket. It is no longer in direct contact with aqueous (via vitreous) and hence cannot be fed with high chloride osmotically active fluid. It may be that the boundary between the subretinal fluid and the chorio-capillaris is comparable with the blood-aqueous barrier. If this were the case, and the barrier was intact, the tendency might arise for fluid to be "secreted" into the space by the choroid by virtue of the fact that the subretinal fluid was osmotically active. This is purely speculative, but makes the basis for a rational concept of the peculiar phenomena associated with the formation and absorption of subretinal fluid and its variations.

The "blood-subretinal-fluid barrier" as a concept is useful in developing an argument to explain the behaviour of various types of detachment. In particular one wonders how it is that "spontaneous absorption" of fluid takes place after a retinal hole has been made adherent to the choroid. It would be of great interest to know whether the rate of absorption of such "residual detachments" is related to the degree of damage done at operation to the "blood-subretinal-fluid barrier". Perhaps Bruch's membrane plus pigment epithelium, if left relatively intact over a wide area, retains chloride...
in the subretinal fluid. If this were so, the detachment would not settle, or would only settle slowly as osmotically active substances were lost from the small area of destroyed barrier membrane. Such would be the sequence of events in a detachment with, for example, much fluid below and a small hole above, which was coagulated with minimal diathermy reaction. Is it clinically a fact that a wider area of diathermy reaction (assuming the hole to be “sealed” incidentally) results in a quicker absorption of subretinal fluid? How is it that surface diathermy applied indiscriminately over a large retinal cyst (without puncture) can result in prompt absorption of the cyst. Does not the problem bear, in fact, a very close relationship to the problem of the action of cyclo-diathermy in glaucoma? One might postulate in both that what was happening was the destruction of an area of highly selective barrier tissue between blood vessels and intra-ocular fluid.

This suggested mechanism for the absorption of subretinal fluid, *i.e.*, through a damaged barrier, might explain the well-known clinical phenomenon of delayed absorption after scleral resection. The edge of the resection being at the edge of the pocket of subretinal fluid a very large area of undamaged barrier is left.

It would seem that factors most favouring the reposition of a detachment would be the prompt adhesion of retina to choroid at the site of the hole and the evacuation of fluid. In a case in which a large quantity of fluid had to be removed, and in which there was a risk that its re-formation would remove the tear from proximity with the choroid, it would seem justified to take steps to attempt to reduce the re-formation of fluid if only for the first few hours after operation to give the hole time to become adherent.

The injection of air to fill up a collapsed globe would seem to be one logical method (Rosengren, 1938).

The injection of air into the vitreous body has two disadvantages: it may damage the vitreous and it obscures the fundus view (Hughes and Cole, 1946).

In five recent cases I have injected air into the suprachoroidal space at a site remote from the site of diathermy and puncture for detached retina.

Method

The normal procedure of surface diathermy and puncture was completed and as much subretinal fluid as possible removed by suction.

Air (1.5 ml.) was injected into the suprachoroidal space through an incision 5 mm. from the limbus at the side of the globe opposite to the diathermy operation. The site of injection had been prepared before the globe was punctured for removal of subretinal fluid. A small scratch incision was made almost through the thickness of the sclera and a direct suture inserted, the loop being drawn out a little, as in a direct pre-placed corneo-scleral suture. Subretinal fluid having been withdrawn from elsewhere, a fine hypodermic needle was cautiously introduced, its bevel facing the choroid, and air was injected as the last scleral fibres were pierced (Fig. 1). The immediate result in each case was the appearance of a dark choroidal detachment and the simultaneous escape of more subretinal fluid from the diathermy puncture (Fig. 2).
Suprachoroidal Air Injection for Detached Retina

At this stage a quick inspection of the detached area was made and further diathermy applied if it appeared that the retinal tear was not surrounded. Reaction showed up well because in all cases the previously detached area was flat.

Within a few minutes the air was seen to be working its way all round the eye, until a ring choroidal detachment was produced which precluded further view of the retinal tear if it was in a peripheral position. In some of the cases air escaped through the wound of entry. Secure suturing of this is advisable.

Results

The five cases operated on by this method were all of fairly poor prognosis and the results were encouraging.

(a) Four were cases of superior deep detachment in which the fluid did not absorb well on posture and in which the hole was not in close apposition to the choroid. Of these four patients, Cases 1 to 3 were over 60 years of age, and Case 4 was a high myope with chronic bronchitis. In Cases 1 and 2 the retina was reposed satisfactorily although one had a vitreous haemorrhage. At the present time (4 months after operation) this patient sees 6/36 and the retina can be seen to be flat. Cases 3 and 4 relapsed. This occurred in Case 3 after 3 months when she sneezed and the same hole and the same shaped detachment recurred within a few hours—a failure which might be attributed to inadequate diathermy adhesions. (This patient was later cured by a scleral resection by Mr. Frank Law.) Case 4 (the bronchitic) relapsed after 2 months with a new tear in a site remote from both the old tear and the air injection. This patient is at present awaiting re-operation.
(b) In Case 5 a residual detachment after one diathermy operation was found to have another retinal tear and could not be improved pre-operatively by posture. This retina was reposed satisfactorily with suprachoroidal air and further diathermy.

The procedure is thought to be worth reporting although the number of cases is as yet small. It is felt that it is of value in deep detachments, particularly where the tear is in a deep part of the detachment. Such cases normally give difficulty and it is felt that methods which might be suspected of being "meddlesome" in a more benign type of detachment are justified in these rather more troublesome cases.

**Summary**

Certain factors which may influence the formation and absorption of subretinal fluid are discussed. A plea is made for the recognition of a "blood-subretinal-fluid barrier" and its possible relationship with the blood-aqueous barrier is suggested.

The injection of air into the suprachoroidal space is described and is recommended in cases of deep detachments.

My thanks are due to the surgeons of the Moorfields, Westminster and Central Eye Hospital for their kind permission to operate on their cases and to use the facts in this paper.

**REFERENCES**

