CHAPTER 5 THE VITREOUS

There are two common pathological conditions involving the vitreous, i.e. posterior vitreous detachment and retinal detachment.

The innermost layer of the retina, the internal limiting membrane, is the basement membrane of the retina.

The inner ends of muller's fibres are firmly adherent to the external side of the internal limiting membrane. The collagenous fibres of the vitreous insert into its internal surface but this connection is relatively weak, except near the ora serrata.

Normally the vitreous is firmly adherent to the retina at the ora serrata and to the inner (non-pigmented) layer of the ciliary epithelium over the posterior two-thirds of the pars plana. The vitreous contains more collagen and is more solid in this area (the 'base of the vitreous'). A less firm adhesion exists between vitreous and retina at the disc and macula with a weak union in all other areas. The normal vitreous is a transparent gel made up of a network of collagen fibres the interspaces of which are filled with polymerised hyaluronic acid molecules, water and electrolytes. During the sixth or seventh decade collapse and contraction of the vitreous framework often occurs. The vitreous is then divided into a more solid (gel) portion anteriorly and inferiorly and a completely liquid portion posteriorly and superiorly.

In normal eyes, the vitreous framework is able to pull away from the retina at the time of vitreous collapse and the only difficulty encountered by the patient is the appearance of 'floaters', web-like opacities which float across the patient's field of vision. These represent strands of fibres in the vitreous framework which move in the vitreous cavity with ocular motion. These are visible to the patient only when close enough to the retina to cast a discrete shadow. They are most noticeable when gaze is directed to a bright area such as the sky, and are rarely sufficiently dense to impair visual acuity. The movement of the vitreous with ocular movements, after vitreous collapse, may stimulate the retina by bumping it or tugging on it, thus leading to the subjective symptom of flashes of light (photopsia).

In some 2 to 5% of eyes, abnormal adhesions are present between vitreous and retina, usually in the periphery of the fundus between the equator and the ora serrata. When vitreous collapse and contraction occur in such eyes, the vitreoretinal adhesions may be stronger than the retina itself and traction exerted by the vitreous on the retina frequently leads to tearing of the retina. If a retinal blood vessel is torn, bleeding into the vitreous occurs, causing floaters and reduced visual acuity.

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A spontaneous vitreous haemorrhage should be considered a retinal tear until proven otherwise.

If the full thickness of the sensory retina is torn, a portion of the liquid vitreous may flow through the retinal hole leading to detachment of the retina from the underlying pigment epithelium. In the normal adult eye, the sensory retina is in firm apposition with the pigment epithelium, with a potential space between them. This space represents the cavity of the primary optic vesicle and with retinal detachment it again becomes an actual space.

It is not entirely clear why some eyes with full thickness retinal tears go on to retinal detachment while others do not. They type of tear, situation and degree of vitreous contraction are very important factors. A poorly understood factor may be the degree of adherence normally present between the pigment epithelial cells and the outer segments of the rods and cones. Electron microscopy shows the intimate interdigitation of processes of the pigment epithelial cells with the rods and cones and demonstrates a muco-polysaccaride substance enveloping these structures. When retinal detachment does occur, marked loss of vision results in the detached area. The most probably explanation for this decrease in vision is interference with the regeneration of photosensitive pigments, and retinal ischaemia.

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When the fovea becomes detached there is loss of central vision. At this stage, even with successful detachment surgery normal central vision is unlikely to return. It is imperative that a patient with a small peripheral retinal detachment, or giving a history suggestive of a retinal detachment (floaters, flashes, or partial loss of vision) be referred for immediate ophthalmological assessment.

Treatment of rhegmatogenous (due to a tear in the retina) retinal detachment consists of 'closing' the retinal tear. This is accomplished by producing adhesions between the retina surrounding the tear and the underlying pigment epithelium and choroid. This involves creation of an inflammatory reaction in the choroid and pigment epithelium and establishment of contact between the retina and pigment epithelium in this area until a firm scar is formed. The inflammatory reaction is usually produced by freezing (cryotherapy). Theoretically, contact between retina and pigment epithelium might be secured by either moving the retina to the pigment epithelium or by pushing the pigment epithelium in against the retina.

Since most retinal tears occur near the equator of the globe, the wall of the eye (sclera, choroid and pigment

epithelium) may be pushed inwards against the retina without producing serious distortion of the optical characteristics of the eye. This is done by suturing a piece of biologically inert plastic (silicone) against the external surface of the sclera in such a way as to indent the eye at the site of the retinal tear.

Fortunately the indentation need be created only at the site of the retinal tear and following closure of the tear, fluid from the vitreous cavity can no longer circulate into the subretinal space. The subretinal fluid becomes absorbed into the choroidal circulation and the retina becomes 'reattached'. A more extensive indentation may be produced by encircling the eye at its equator with a plastic band, fastening the ends of the plastic together just as one would fasten a belt around the waist. This may be necessary where there are multiple holes. Because the sclera is buckled inwards, these procedures are termed 'scleral buckling operations.'

Retinal detachments may also be tractional or exudative in nature. In tractional detachment, the sensory retina is pulled away from the retinal pigment epithelium by contracting vitreoretinal membranes. Two important causes of tractional detachment are proliferative diabetic retinopathy and penetrating ocular trauma. In exudative detachments, subretinal fluid derived from the choroid gains access to the subretinal space through damaged retinal pigment epithelium. Important causes of exudative retinal detachment include choroidal tumours and inflammation.