“Tear-off buckle” phenomenon

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Surgeons employing buckling procedures in the treatment of retinal detachment sometimes find, during the operation or post-operatively, that the retinal tears change their position in relation to the buckle. Minor changes of this kind are common and rarely have serious consequences, but if the tear “moves” so that a part of it comes away from the buckled area, the result of the operation is endangered. During operation, the buckle may be readjusted, but if it occurs at a later stage a second operation will be required. The term “tear-off buckle” phenomenon is suggested to describe this complication.

Material

In a study involving 100 cases of retinal detachment, in which different buckling techniques were employed (scleral infolding, segmental silicone rods, and encircling silicone rods), special attention was directed to the movements of retinal tears in relation to the buckle during and after operation (Table). The subretinal fluid was drained by a sclerotomy in all cases, but in most of them it was not the aim to attain complete reposition of the retina at the time of surgery.

<i>Time of Observation</i>	<i>Movement</i>	<i>No. of cases</i>
During operation	(1) Tear movement detected	9
	(2) Movement in posterior direction	8
	(3) Movement in posterior direction requiring re-adjustment of buckle, <i>i.e.</i> “tear-off buckle” phenomenon	4
	(4) Movement in lateral direction	1
After operation	(1) Tear movement detected	5
	(2) Movement in posterior direction	4
	(3) Movement in posterior direction requiring re-operation <i>i.e.</i> “tear-off buckle” phenomenon	2
	(4) Movement in anterior direction	1

Discussion

Three factors seem to produce this movement:

- (1) The location of the buckle, *i.e.* whether it is placed anterior or posterior to a plane midway between the ora and the edge of the optic disc (5-6 mm. behind and parallel to the equator).
- (2) The relationship between the maximum accumulation of subretinal fluid and the buckle.
- (3) The surface area and extensibility of the retina.

MOVEMENT IN A POSTERIOR DIRECTION

This is often seen when the maximum accumulation of subretinal fluid is situated posterior to the buckle, especially when the latter is placed at the equator or anterior to it. When the subretinal fluid is drained by a puncture or sclerotomy posterior to the buckle, the

already relaxed retina becomes stretched in order to come into apposition with its choroidal bed and in so doing exerts a pull on the tear in a posterior direction (Fig. 1). If the position of the tear in relation to the buckle is critical, such a posterior movement may be sufficient to cause the tear to slip over the posterior limit of the buckle and a "tear-off buckle" phenomenon is thereby produced. A similar situation may be reached in the first few days after operation if drainage of the subretinal fluid is incomplete, or if no drainage is carried out as in the original method of Custodis (1953).

The condition of the retina probably plays an important role in producing this posterior movement. A healthy retina would settle down to its bed without exerting excessive pull on the tear, but if there are fixed retinal folds or preretinal formations its surface area will be reduced and the pull may be great. When a meridional fold is present, it interferes with the capacity of the settling retina to become stretched and the pull induced by the retina on the tear becomes most marked at one point. This induces, besides the posterior movement of the tear, a change in the shape of the tear (in one case a horseshoe tear became Y-shaped) and sometimes a gaping aperture like a fish's mouth.

FIG. 1 Possible mechanism of tear movement in a posterior direction. The buckle is equatorial in position with excess fluid posterior to it. When the relaxed retina settles down (a), it exerts a pull on the tear. The "tear-off buckle" phenomenon may thereby be produced (b).

FIG. 2 With a posteriorly placed buckle and excess fluid anterior to it (a), reposition of the retina may be accompanied by a forward movement of the tear (b).

MOVEMENT IN AN ANTERIOR DIRECTION

This is less commonly observed. It occurs with buckles placed posteriorly well behind the equator (Fig. 2) and when the fluid is more abundant anterior to the buckle. Anterior movement was observed postoperatively in a case of total detachment with multiple tears at different meridians for which an encircling silicone rod was used for buckling. Since the tears in the upper part of the retina were more posterior, the rod was placed behind the equator superiorly and anterior to it below to cover the greater circle of the globe. At the

end of the operation the upper tears were separated from the posterior end of the buckle by a very small space and a small amount of fluid was left anterior to the buckle superiorly. In the first 2 days after operation the upper tears were observed to move anteriorly and become separated from the posterior limit of the buckle by a relatively large interval. This did not, however, result in failure of the operation.

MOVEMENT IN A LATERAL DIRECTION

This can be explained on the same basis. Such movements will have serious results if the tear is placed over a buckle situated meridionally perpendicular to the equator.

NO MOVEMENT

If buckles are placed midway between the ora serrata and the edge of the disc (anterior and posterior limits of the retina), no movement is to be expected provided that the amount of subretinal fluid is equal on both sides of the buckle (Fig. 3).

FIG. 3 With buckles situated in a plane midway between the ora serrata and the optic disc and with equal amounts of fluid anterior and posterior to the buckle (a), tear movement after reposition is minimal (b)

Summary

Tears in the retina are sometimes seen to change their position in relation to a buckle placed around the globe in cases of retinal detachment. A movement may occur during operation after the release of the subretinal fluid or in the postoperative period if the fluid is not completely drained. It is probably caused by the pull exerted by the retina when it becomes stretched to contact its bed. If the position of the tear on the buckle is critical, the tear may slip over the edge of the buckled area and a "tear-off buckle" phenomenon is produced. This movement should be allowed for in placing buckles during detachment operations, the position and the size of the buckle being chosen accordingly.

Reference

CUSTODIS, E. (1953) *Ber. dtsh. ophthal. Ges.*, **58**, 102