SCLERAL BUCKLING OPERATION WITH ROLLED SCLERAL FLAP*

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AMONG the various operative procedures carried out for detachment of the retina, I propose to discuss only the methods of scleral buckling and scleral tucking with the various modifications which have been suggested. Weve (1950) was among the first to apply the scleral buckling method in the form of a circular and segmental shortening of the sclera. Everett (1955) followed with scleral tucking by the simple technique of scleral folding. Sturman, Laval, and Weil (1957) studied Everett's method in the eyes of rabbits and were able to establish pathologically the formation of fresh granulations and early fibrosis between the scleral folds, so that complete fusion took place 12 weeks after the operation.

These observations show that Everett's method of scleral tucking produces shortening of the sclera and adhesion between the sclero-choroid and retina. As to retinopexia, Schepens, Okamura, and Brockhurst (1957) emphasize that the ordinary diathermy operation does not always give good results because visible tractions by vitreous adhesions to the retina prevent complete coaptation and perhaps cause fresh tears. For this reason these workers developed the method of scleral buckling, in which, after lamellar resection and excision of the lamellar scleral flap, a polyethylene tube is sewn in to indent the choroid and project into the vitreous cavity. In this operation the retinal tears are closed with diathermy electrodes. These authors also mention two other operative variations of scleral buckling, one without excision of the scleral lamella, and the other with a trap-door scleral flap but without the polyethylene tube.

Dellaporta (1957) published particulars of a method of scleral buckling carried out on laboratory animals. In this case he prepared the scleral strip and stitched up with chromatized catgut after diathermy.

Methods of scleral shortening are most often used in cases of detachment of the retina with extensive tears, in cases of multiple tears with cystoid degeneration of the retina, in cases of major disinsertion of the ora serrata, in relapses after diathermy operations, and in cases of pronounced shrinkage of the vitreous body with large retinal tears.

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In performing the ordinary scleral lamellar resection in cases of retinal detachment and in high myopes; it was possible to establish by post-operative studies that the sutures give way, and that the sclera probably stretches. There were two such cases of high myopia where one operated eye revealed myopia of 19 dioptres and the other of 23 dioptres; 14 days after the operation, myopia decreased by 5 dioptres in the first case, and by 6 dioptres in the second with a resection of a scleral lamella 4 mm. wide. However, 6 weeks after the operation, the initial degree of myopia was re-established. In both cases the lamellar resection of the sclera was performed 10 to 14 mm. from the limbus and, although palpation revealed no stretching of the scleral edges, one could reasonably suppose that the sutures had given way or that the wound had stretched.

For this reason we have modified the usual scleral lamellar resection so that the prepared lamella is put over the sclera after sewing up the scleral edges, and the flap is then sewn down closer to the limbus. This double fixation has proved advantageous not only in cases of retinal detachment but also in cases of high myopia. Although this operative modification does not strictly belong to the domain of scleral buckling, it is mentioned because the sutures may give way in any operation of this type.

The scleral buckling operation was used in several cases of retinal detachment after it had been tried out on a number of laboratory animals.

Method

Under local anaesthesia, the lateral or medial rectus was resected according to the requirements of each case. The sclera was incised anteriorly and a flap 5/6 of the scleral thickness was dissected backwards, the rest of the sclera being so thin that the choroidal pigment was clearly visible. Besides the lengthwise incisions, crosswise incisions of the sclera were made 3 to 4.5 mm. in length, depending on how wide the prepared scleral flap was to be in each case. The crosswise scleral incisions were made in the middle and at the edges of the scleral flap (Fig. 1, opposite).

After the scleral flap had been dissected up, mattress sutures were inserted. The threads were drawn first through the equatorial part of the scleral flap from the inside outwards, and then through the limbal edge of the scleral incision (Fig. 2, opposite).

After diathermy the scleral flap was rolled back into a tube, the sutures were drawn taut over the rolled flap, and the knots were tied (Figs 3 and 4, opposite).

Results in Three Typical Cases

Case 1, a male aged 17, was admitted to hospital on February 3, 1958. One month before the vision had begun to deteriorate in the right eye, and the sight was also poor in the left eye.

Examination.—In the right eye, the lens was clear and there were dustlike opacities in the vitreous body. The optic disc was normal, but the region of the macula lutea showed degenerative changes. From a distance of three pupil diameters from the temporal side of the macula lutea, a retinal detachment reached the region of the ora serrata upwards.
to 11 o'clock and downwards to 7 o'clock. At 8 o'clock, near the ora serrata, an elliptical tear was seen, one disc diameter long by 0.25 disc diameter wide. In front of this tear were three micro-ruptures of the retina, and the surroundings in a range of 1.5 disc diameters showed cystoid degeneration. The visual acuity was 4/60 without glasses. The field of vision showed a defect in the nasal part.

In the left eye there were dustlike opacities in the vitreous body, and the optic disc showed a narrow temporal conus. There were degenerative changes in the macula lutea. The visual acuity was 5/60, and with correction -3 D sph., -1.5 D cyl., axis 180°, it was 6/18.

Operation.—The procedure described above was carried out on the right eye on February 9, 1958, in the area from 7 to 10 o'clock, and a scleral flap was dissected out to a width of

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**Fig. 1.** Longitudinal and meridional scleral incisions: the dotted line indicates how far posteriorly the scleral flap is dissected back.

**Fig. 2.** Elevation of the scleral flap.

**Fig. 3.** Insertion of the mattress sutures over the rolled scleral flap.

**Fig. 4.** Appearance of the operative field after the sutures have been drawn taut and the knots tied.
8 to 12 mm. Scleral buckling was carried out with the rolled scleral flap. Diathermy was applied to the tear with a perforating needle, and the remaining portion of the retinal detachment was treated with a non-perforating ball electrode. Post-operatively systemic and local antibiotics (penicillin) were used with local atropine and cortisone in addition.

Result.—After 8 days the retina was found to be adherent but in the area of the scleral buckling one could see a fold in the retina elevated to 3 dioptres. The retinal tear was completely closed with chorio-retinal adhesions. After 20 days the retinal fold had considerably flattened, and one month after the operation it was scarcely visible. On March 9, 1958, the visual acuity in the right eye was 5/60, and with 1-5 D sph., −3 D cyl., axis 180°, it was 6/36. The field of vision showed a considerable widening in the nasal portion.

Case 2, a male aged 30, was admitted to hospital on March 8, 1958. In April, 1957, he had been hit in the right eye by an air gun pellet, and the visual acuity had become much impaired.

Examination.—The right eye showed vitreous opacities. The optic disc was normal, but beginning nasally from the latter a large retinal detachment involving the nasal half extended from 6 to 12 o'clock right up to the ora serrata. Between 2 and 5 o'clock was a large tear in the ora serrata and immediately in front of the latter four more small horizontal ruptures. In the area of the large retinal tear were adhesions of the vitreous to the retina. The visual acuity was 3/60 without glasses. The visual field showed a narrowing by 15° to 25° in the temporal part.

The left eye was normal.

Operation.—On March 24, 1958, a scleral buckling operation was performed, the lamellar flap being prepared in the nasal part from 11 to 5 o'clock. Near the rolled scleral flap, perforating and non-perforating diathermy treatment of the sclera was carried out.

Result.—8 days after the operation the retinal detachment was completely reattached and in the projection of the scleral buckling one could see a retinal fold elevated by 2-5 dioptres. 6 weeks after the operation this fold was scarcely visible, the field of vision in the temporal part had widened by about 15°, and the visual acuity was 6/12 to 6/10.

Case 3, a male aged 40, was admitted to hospital on February 7, 1958. On January 10, 1958, he had been hit in the left eye with a piece of wood and since then had noticed deterioration of vision.

Examination.—In the left eye the optic disc was normal, but in the upper half a retinal detachment with a large tear from 11 to 1 o'clock was located at 3 disc diameters from the disc.

The visual acuity was 6/36, and visual field considerably narrowed in the lower half.

Operation.—On February 13, 1958, a scleral buckling operation was performed from 9 to 3 o'clock with a rolled scleral flap 4 mm. in diameter; diathermy was applied to the sclera.

Result.—The retinal detachment had considerably flattened 10 days later but was still present although the tear was practically closed. A retinal fold with a prominence of 2-5 dioptres could be seen at the site of the rolled scleral flap. On March 15, 1958, the retina was quite reattached, though there was still a fold in the retina in the upper part between 9 and 2 o'clock. The visual acuity was 6/12 and the field of vision had widened by 15° to 20°.
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Discussion

Having described how a scleral buckling operation may be performed with a rolled scleral flap, we must emphasize that our aim was to form a rolled scleral fold from a flap which took in practically the whole scleral thickness, so that when the flap had been prepared, the pigmented layer of the choroid could be seen shining through it. One may therefore describe it as a total rather than as a lamellar resection of the sclera.

In the first two of the three cases described, retinal detachment with multiple tears was present, and in the third case there was one large scleral tear. In all three cases, the operation was followed by a complete reattachment of the retina, with improvement in visual acuity and in the extent of the visual field. The retinal fold which appeared in each case was more pronounced in the first post-operative days, and the pressure exerted on the choroid and retina undoubtedly had a beneficial therapeutic effect on the post-operative chorioretinitis in the area of the retinal tear. One month after the operation this fold had flattened out in all three cases.

The method described above is useful in cases of retinal detachment with multiple tears or with large tears and disinsertion of the ora serrata; in cases of pronounced cystoid degeneration; in cases with multiple tears especially accompanied by high myopia; and in cases with adhesions of the vitreous body to the retina and large or multiple retinal tears. A retinal detachment in which no tear could be found might also present a further indication for its use. If degenerative changes are pronounced, not only in the area of the retinal detachment but also in the other parts of the retina, then the scleral resection might be increased from 4 to 5 mm. in width. This wider resection of the sclera might likewise be used in cases of retinal detachment with high myopia, where cystoid degeneration of the retina is present as well as atrophic changes.

Summary

A new operative method of scleral buckling for use in cases of retinal detachment is described. After a practically whole-thickness scleral flap has been resected, it is dissected out to form a rolled scleral fold above which double sutures are inserted, drawn taut, and knotted. This method has been used in three cases of detachment, one myopic and the other two traumatic. In all three cases there was complete reattachment of the retina with improvement in visual acuity and enlargement of the visual fields.

REFERENCES