

A SUGGESTION OF AN OPERATION TO CORRECT  
ASTIGMATISM.

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IT has long been known that the contraction of corneal scars produces permanent corneal astigmatism. The following cases furnished facts which suggested the operation.

CASE 1.—Mr. H., aged twenty-four, came to the New York Eye Infirmary, service of Dr. Noyes, in June, 1890, with a small piece of iron imbedded in the upper pupillary margin of the iris. Atropine was prescribed. Several weeks later, vision  $\frac{2}{40}$ , not improved by any glass. The nerve looked round with the ophthalmoscope. Under ether a corneal section was made with a Gräfe knife over the foreign body at an axis of  $45^\circ$ .

The foreign body was removed and a piece of iris with it. One month later, eye quiet, vision  $\frac{10}{60}$ ; with a convex cylinder of 9. D. axis parallel to the corneal section ( $45^\circ$ ), combined with — 5. D. S., vision is  $\frac{2}{80}$ . The effect of the incision was to produce 9. D. of (regular) astigmatism. With the ophthalmoscope, the optic disc is decidedly oval at  $45^\circ$ . The iris is caught in the wound.

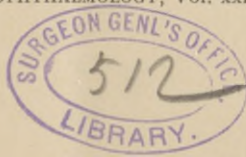
CASE 2.—Mrs. D. (a patient of Dr. R. H. Derby), aged fifty, has been operated upon for glaucoma of the left eye. There is beginning glaucoma of the right eye.

February 8, 1891.—Vision of the right eye is normal and no glass is accepted. The ophthalmometer showed no corneal astigmatism. She has been tested a number of times with the same result.

February 10th.—Iridectomy upwards with a corneal section.

March 5th.—Right vision  $\frac{2}{80}$ ; with a convex cylinder of 2.75 D. axis  $15^\circ$ , combined with — 1.75 D. S., vision  $\frac{2}{80}$ .

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Iris is caught in the wound.

The ophthalmometer showed the astigmatism to be all corneal, the meridian of least curvature being at right angles to the corneal wound.

*March 26th.*—The astigmatism is less. Vision  $\frac{2}{30}$ , with a convex cylinder of 2. D. axis  $15^\circ$  combined with  $-1$ . D. S. The astigmatism is the same with the ophthalmometer.

*May 30th.*—Two months later, the astigmatism had not changed, and the glasses were prescribed. Subsequently the patient came back and received glasses for reading, at which time the astigmatism had not changed.

CASE 3.—Mrs. U., aged forty-nine, has glaucoma of the left eye. Treated by Dr. Weeks.

*April 7th.*—Vision of the right eye normal, no glass accepted. Vision of the left eye  $\frac{2}{40}$ , not improved by glasses.

*May 15th.*—Iridectomy upwards with a corneal section. Two weeks later, a sclerotomy below.

*June 30th.*—Vision of the left eye  $\frac{2}{200}+$ ; with a convex cylinder of 2.25 D. at  $180^\circ$  combined with  $-1.25$  D. S., vision is normal,  $\frac{2}{30}$ . The ophthalmometer showed that the astigmatism was all corneal. Iris is caught in the wound.

Tension of the eyeball  $+$ .

*August 4th.*—One month later, the corneal astigmatism, as shown by the ophthalmometer had not changed. Left vision  $\frac{2}{300}$ ; with a convex cylinder of 2.25 D., combined with  $-2$ . D. S., vision is  $\frac{2}{30}-$ . Tension still  $+$ .

CASE 4.—Mr. H., aged thirty-eight, was injured June 27, 1891, in the right eye by a champagne bottle bursting. There is a linear corneal scar axis  $120^\circ$ . The iris is caught in the wound.

*July 7th.*—Vision of the right eye, which the patient says was good before the injury, is now  $\frac{2}{30}-$ , with a convex cylinder of 1. D. axis parallel to the corneal section,  $120^\circ$ , combined with  $-1$ . D. S., vision is  $\frac{2}{30}$ . Eye is still inflamed.

The ophthalmometer showed the astigmatism to be all corneal, the meridian of least curvature being at right angles to the corneal wound. The left eye is normal.

CASE 5.—Mrs. A., aged fifty-five, was seen February 19, 1892. Right vision with  $+2.75$  D. S. =  $\frac{2}{30}$ . Left vision with  $+2.75$  D. S.  $\odot +1.5$  D. C.  $15^\circ = \frac{2}{30}-$ . The eye which has the astigmatism has a linear scar on the cornea at an axis of  $15^\circ$ . The ophthalmometer showed the astigmatism to be all corneal. This

case suggests the fact that the incision at  $15^\circ$  produced a regular astigmatism by shortening the radius of curvature of the meridian at  $105^\circ$  without lengthening that of the meridian at  $15^\circ$ .

CASE 6.—Mr. B., aged sixty-four, was seen October 10, 1893. Right vision with  $+4.5$  D. S. =  $\frac{2}{1}\frac{0}{0}$  —. Left vision with  $+4$  D. S.  $\ominus +4.5$  D. C.  $105^\circ = \frac{2}{4}\frac{0}{0}$  —. The patient complained that the vision of the left eye had failed in recent years. He has a pterygium of the left eye at an axis of  $15^\circ$ . The radius of curvature of the meridian of  $15^\circ$  was lengthened without appreciably shortening that of the meridian at  $105^\circ$ .

## PROPOSITIONS.

1. A corneal incision lengthens the radius of curvature of that corneal meridian which is at right angles to the line of the incision, and does not flatten any other meridian. The astigmatism produced is a regular astigmatism, and is corrected by a convex cylinder at an axis parallel to the line of the incision.

2. The immediate result is greater than the ultimate result.

3. The astigmatism produced is permanent after a length of time—at least a month after the cornea has healed. There may be at first 3. D. of astigmatism produced. At the end of a month, there may be 2. D. At the end of three months, the astigmatism may still be 2. D., and this amount of astigmatism will be permanent.

4. The amount of astigmatism produced is greater the nearer the incision is to the centre of the cornea. As much as 9. D. can be produced.

5. Mixed astigmatism occurs: (a) temporarily; (b) with incarceration of the iris.

A study of Case 3 would show that Proposition 1 still holds true, and that the myopia is due to other causes than the cornea. The myopia is due to swelling of the lens or to lengthening of the eyeball.

*The operation suggested.*—Incisions of the cornea are made at right angles to the most convex meridian. The amount of correction can be regulated by the number, depth, and location of the incisions.

The operation promises a permanent effect. The risk to

the eye is not great. It is not as dangerous an operation as the operation for iridectomy, which is usually performed without accident. Incarceration of the iris must be avoided to prevent the development of myopia.

The operation was performed tentatively on the two following cases.

CASE A.—Miss K., aged fourteen, had compound myopic astigmatism. October 30, 1891, the left eye was found by the ophthalmometer to have 2.5 D. of astigmatism with the meridian of greater curvature at  $75^\circ$ .

*November 2d.*—The first corneal incision was made. A strip of ordinary adhesive plaster was prepared  $3" \times \frac{1}{4}"$ . This was applied below the eye to act as a guide to the incision to be made. The plaster was applied at an axis of  $165^\circ$ . Cocaine, 2%, was dropped into the eye for fifteen minutes. No speculum or fixation forceps was used. The incision was made with a Graefe cataract knife held parallel to the plaster at an axis of  $165^\circ$ , the edge of the knife cutting the cornea from without inwards. No pain was produced.

There was no escape of aqueous. Bandage was applied.

*November 3d.*—There was some photophobia after the removal of the bandage. No reaction.

*November 8th.*—For the first time the vision of the left eye was equal to that of the right eye. The ophthalmometer showed no change in the corneal astigmatism.

*November 10th.*—Operated as before, but the incision was made deeper and nearer the centre of the cornea. There was no escape of aqueous. Bandage.

*November 11th.*—After the removal of the bandage there was more photophobia than after the first operation. The eyelids were slightly swollen. The eye felt sore. The ocular conjunctiva was not red. Recovered in a few hours. The bandage was not reapplied.

*November 30th.*—Incision repeated. No bandage was applied, and there was no reaction and no pain.

*January 8, 1892.*—Incision repeated.

*January 25th.*—Incision repeated. No bandage was applied after the two last incisions, and there was no reaction.

No effect on the corneal astigmatism could be discovered with the ophthalmometer.

*April 24, 1893.*—The vision of the operated eye is still certainly improved. No scar can be observed by ordinary inspection.

CASE B.—Dr. S., aged twenty-three, has been wearing — 1.25 D. S.  $\ominus$  — 0.75 D. C.  $100^\circ$  for both eyes. The astigmatism cannot be determined with the ophthalmometer.

*April 7, 1893.*—A slight corneal incision was made on the right eye at an axis of  $100^\circ$ . The incision was made on the temporal side of the cornea. No bandage. No reaction after the operation.

*April 8th.*—The left eye was operated upon in the same manner. There was no reaction.

*October 19th.*—The vision of the patient without glasses is better. No trace of the incisions can be made out by ordinary inspection.





