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Cases of Primary Acute Glaucoma, of Primary Hæmorrhagic Glaucoma, and of Secondary Glaucoma.

Cases of Primary Acute Glaucoma, of Primary Hæmorrhagic Glaucoma, and of Secondary Glaucoma, with Remarks and Photo-Micrographs.

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Reprinted from Transactions of American Ophthalmological Society, 1887.

CASES OF PRIMARY ACUTE GLAUCOMA, OF PRIMARY HÆMORRHAGIC GLAUCOMA, AND OF SECONDARY GLAUCOMA, WITH REMARKS AND PHOTO-MICROGRAPHS.

Primary Acute Glaucoma.

FEBRUARY 2, 1883, M. H., a married woman aged fifty-two years, suffering from an attack of acute glaucoma in the left eye, presented herself at the Wills' Eye Hospital. She stated that the attack had lasted twelve days, coming on during a period of mental worry and while at sea, two days after having embarked for this country. She noticed that the eye first became "cloudy, as if something were in front of it which ought to be wiped away," followed the next day by an intense pain, which continued during the whole subsequent ten days passage, preventing her from eating and sleeping properly. The lids were slightly swollen and their veins full, whilst the lining conjunctiva was of a dull red tint. The cornea was hazy and "needle-stuck," with marked ciliary congestion around its entire periphery. The anterior chamber was very shallow, and the pupil was irregularly dilated, with a slight synechia above and to the inside. Intra-ocular tension was much increased (T + 2), and the eyeball felt quite hard to the touch. The patient complained of intense intra-ocular, temporal and frontal pain. The vision in this eye was so impaired that she could only count fingers at two and a half feet.

The patient further stated that on the 5th of August, 1875, soon after a moderate dinner, at which she had partaken of plain food only, without stimulants of any kind, a severe attack of pain and inflammation occurred in the right eye, and that the sight rapidly failed while the ball became stony hard. She had noticed no previous fogging of the sight, and had been

reading for some hours in the same morning. An iridectomy had been performed after the above attack, and the eye had remained quiet ever since. Examination showed that there was a narrow iridectomy upward, the centre of the cicatrix of the incision being in the limbus and each side encroaching upon the clear cornea; while just a little to the outside of the centre, there was a slight cystoid clavus or impalement of the iris in the wound. The eye was quiet and tension normal, the ophthalmoscope showing a small optic disk, slightly grayish in tint and *not excavated*—eyeground fairly healthy with a hypermetropia of three dioptrics.

Owing to the patient's extreme feebleness and exhaustion, no operation was at the time attempted on the inflamed eye, but she was admitted to the hospital, put at rest in bed and given good nourishing diet, while a Heurteloup leech was applied to the temple and eserine repeatedly instilled into the eye. Under this treatment, in two days the cornea became less "steamy" and the eye less congested. On the fourth day the pain had so far subsided that the patient could sleep at night without an anodyne. The pupil, in spite of the eserine, was still irregularly ovoid, with its axis at eighty degrees, but vision had so far improved that with a plus one-eighth spherical lens, the patient could see $\frac{20}{200}$. Sixteen days after admission to the hospital (twenty-eight days after the commencement of the attack), the eye still remaining as above described, an iridectomy upwards and slightly inwards was made with a lance-shaped knife, and a large piece of iris removed with a single upward snip of the scissors. Twenty-four days after the operation, it is noted that the wound was firmly healed, but the cornea was still so cloudy that only a misty view could be had of the fundus; the vertical vessels being best seen with + s. 3. D. Two days later the patient was discharged, and told to use a weak solution of eserine. Two days after leaving the hospital, she returned with a sharp attack of catarrhal conjunctivitis in each eye; this yielded to weak astringents, and the eye became clear and quiet.

On the 18th of April (sixty-eight days after the operation), the patient again presented herself at the hospital, and could

Plate I.

Fig. 1. Section of Globe, M. H. x3.

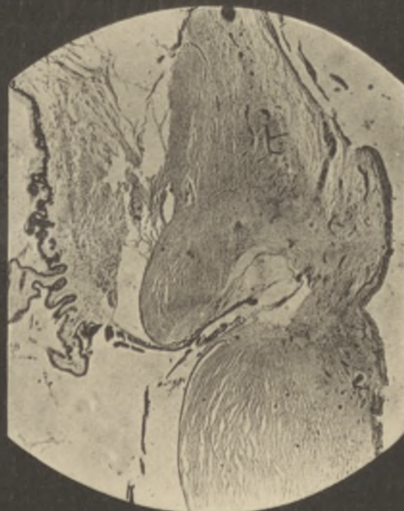


Fig. 2. Iridectomy, M. H. x16.

Fig. 3. Sclerotomy, M. H. x18.

read Sn. 1½ at thirteen inches with + ⅛ *sph.* ⌒ + $\frac{1}{36}$ *cyl.* ax. 165°. The eye, however, never became quiet, the patient returning at intervals with attacks of blepharitis and conjunctivitis until August 6th, 1884 (nearly a year and a half after the operation of iridectomy), when she had a sharp attack of pain which was not relieved by eserine. Two days subsequently a sclerotomy downwards was performed: this was done without the use of an anæsthetic. Nervous shock with chills down the back followed the operation, though there was no pain in the eye.

In November the eye was still unquiet and a cystoid cicatrix which had formed was becoming more prominent and bulging. At this time a stye formed at the outer angle of the lower lid, which suppurated by the use of hot stupes.

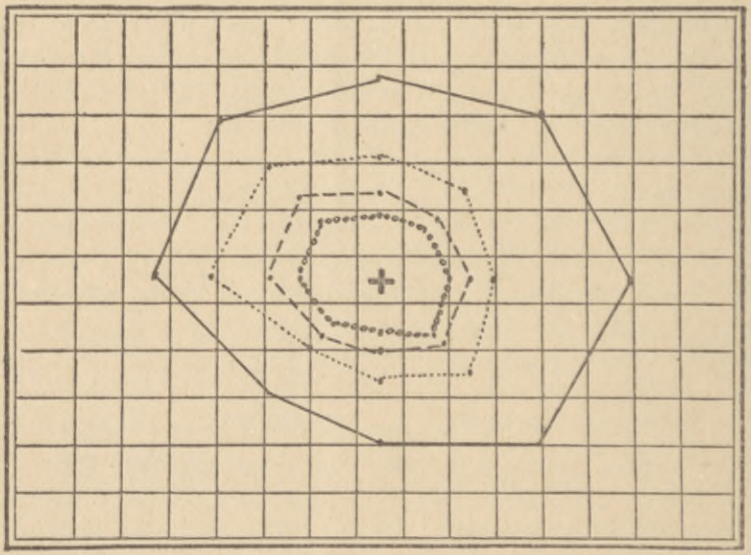
In April, 1885, there was a fresh attack of inflammation of the eye with hypopyon; this disappeared in a few days, leaving the eye still irritable and the anterior chamber obliterated except just opposite the iridectomy.

On the 16th of April, 1885, the eyeball was enucleated under ether, without accident, and the wound healed rapidly.

Except that the patient has occasional attacks of eczema on the back of the wrists, there is no evidence of nerve-disease or constitutional dyscrasia, and the right eye (July, 1887) still remains quiet and serviceable, giving a vision of $\frac{20}{30}$, with correcting glass and having a good field of vision, which is herewith appended.

The photomicrograph now projected upon the screen (Vide Fig. 1, Plate 1), shows a section of the enucleated eye. It exhibits a cystoid cicatrix on the side of the iridectomy, and shows the corneal lamellæ separated and its tissue loosened throughout, especially in the neighborhood of the cicatrices of incision. On the side opposite the iridectomy is seen a cut in the membrane of Descemet, and the cicatrix of the sclerotomy leading outward and downward from it. The remnants of the hypopyon are visible as a band of fibrillated and nucleated tissue at the bottom of the anterior chamber adjoining the sclerotomy scar. The choroid is thickened and its blood-vessels dilated; the larger trunks where they approach the

vortex, being filled with blood. At the optic entrance, the nerve fibres in the head of the nerve have shrunk, and have been pulled away from the concave lamina cribrosa by the drag of the cutting knife. We have thus a specimen of glaucoma before the formation of an excavation, and while the softening atrophic changes in the head of the nerve, which make it so readily give way to intra-ocular pressure, are taking place. More highly magnified sections[1] show these processes in detail. The ciliary nerves where they pierce the sclerotic have an increase of the fibrous tissue envelope around and between the fibres, with proliferation of their nuclei; perhaps this is preparatory to the atrophy which has often been found in the ciliary nerves of complete glaucoma.



EXPLANATION.

This field has been reduced to one-twelfth of its original size. It was obtained by the carrying inwards on a large ruled black-board, of a centimetre square of unglazed white or colored paper on a dead-black card; the patient being placed at about twenty-five centimetres distance from the fixation point, which consisted of a small white cross. The outer ruled lines represent the furthermost boundaries of the white field; the dotted lines bound the yellow area; the stroked lines designate the outer boundaries of the blue field; whilst the ringed lines give the limits of the red field.

[1] Figs. 2 and 3, Plate I., and Fig. 1, Plate II.

Fig. 3. Optic Nerve Entrance, B. x16.

Fig. 2. Iridectomy, B. x16.

Fig. 1. Optic Nerve Entrance, M. H. x21.

Primary Hæmorrhagic Glaucoma.

Miss E. B., aged seventy, applied for treatment at the hospital of the University of Pennsylvania, February 20, 1879, with marked hæmorrhagic retinitis and incipient cortical cataract in each eye. She said that she had had an attack of sudden loss of vision about a year previously, and that the present dimness of sight had come on suddenly with a flash of light, ten days ago, whilst stooping.

In the right eye V. = $\frac{1}{100}$ by holding the card in the upper part of field; this being slightly improved by a convex lens. The ophthalmoscope showed a long black spike in the anterior cortical, the centre of the lens and the vitreous humor being clear. The disc was slightly prominent, and the retinal veins full and tortuous, with a hæmorrhage into the sheath of the upper nasal vein. Numerous hæmorrhages into the retina, one fan-shaped and extending inwards and upwards from the disc, another, a large one, occupying the upper macular region just above the fovea. In the lower part of the retina there were several white splotches of absorbing hæmorrhage.

Vision of the left eye, which was slightly improved by a convex lens, equalled $\frac{2}{12}$. Shoots of opacity were visible in the anterior cortical of the lens. The optic disc showed a partial glaucomatous excavation, most pronounced to the temporal side; scleral ring being broadened all around. Hæmorrhages of older date, with one touching nasal side of the disc.

Fields of vision could not be satisfactorily taken, owing to the extreme restlessness of the patient and the want of steady and continuous fixation; blind spots being encountered at times where the chalk (or even a candle-flame) was lost to view.

On April 1st, the right eye being much more cloudy, its cornea hazy, and its tension increased, with a slight hæmorrhage into the anterior chamber, which had failed to yield to eserine and temporal blood-letting, it was resolved to perform an iridectomy, notwithstanding the unfavorable symptoms: this was done with a lance knife incision at the upper part of the cornea, the operation being completed without any accident

except that on cutting the iris the anterior chamber filled with blood. The wound healed, and the eye did well until the fourth day, when, just after instilling some drops of eserine, an attack of violent pain came on, accompanied by increased clouding of the cornea, followed on the ninth day by a recurrence, without any exciting cause. On the twenty-fourth day, the patient had lost all perception of light in the eye, and the cornea was still too hazy to permit a view of the details of the fundus, although a faint red glare could be seen through the pupil. The cicatrix was bulging, with large red vessels running to it. Tension equalled + 2. This condition was followed every few days by a series of exacerbations with intense pain and greater cloudiness of the cornea. The left eye remained about as at first examination. The patient being unwilling to part with the eye, on the 27th of May an attempt was made to perform a neurectomy. The internal rectus was divided, and a cat-gut suture passed through its proximal end, but the muscle was so rotten that the stitch pulled out on the slightest tension. The optic nerve was then cut, and the posterior end of the globe turned forward to make sure that the optic and ciliary nerves were all thoroughly divided. At this time there was so free a hæmorrhage into the capsule of Tenon, that the lids were swelled shut, and the fissure closed so tight that it was impossible without constant forcible pressure to retain the eyeball in the socket, this persisting even after cutting the outer canthus. The eyeball was, therefore, enucleated, the wound healing slowly, though without accident. The patient was discharged a month later. The vision of the left eye at this time was $\frac{20}{100}$, the pupil being round, the iris sluggish, and tension slightly increased. A year later she returned to the Dispensary, when vision had fallen to $\frac{1}{70}$.

Dr. Edward Jackson, who saw her subsequently, kindly informed me that in September, 1880, she still had occasional pain in the eye, although it was never severe; that vision was dimmer, but there was still sight enough to go about unaided; and that this state of affairs continued unchanged until the patient died of apoplexy one year later.

Fig. 3. Optic Nerve Entrance, G. x25.

Fig. 2. Cystoid Cicatrix, G. x16.

Fig. 1. Retina, B. x50.

PLATE III.

The photomicrographs of sections of the enucleated eye (Figs. 2 and 3, Plate II., and Fig. 1, Plate III.), show that there is a commencing more or less saucer-shaped excavation of the optic disc, which is deepest to the temporal side; the tissue once forming the head of the nerve being pressed down against the tissue of the lamina cribrosa, to which it is united. The lamina cribrosa is also curved backwards. These changes must have taken place in a period of three months, because at the first presentation of the patient, repeated and careful examinations showed that the disc at that time was slightly prominent. A further study of these sections shows that there were hæmorrhages in the sclerotic, and in and around the canal of Schlemm. The retina is also full of hæmorrhages, which are mostly irregular in form, and lie in the inner nuclear layer, though occasionally passing outwards and invading the outer nuclear layer, even to the external limiting membrane; there being but few in the fibre layer.

Although we often see extensive retinal hæmorrhages without increase of intra-ocular pressure, yet in this case the hæmorrhages in the retina seem to have been the exciting cause of the increased intra-ocular pressure. I am inclined to think that this is not infrequent, where they occur in an eye in which there is any obstruction to the return circulation of the blood or lymph. The case is interesting, because it presents one of the rare complications which may render the operation of neurectomy nugatory.

Secondary Glaucoma supervening after a Peripheric Linear Operation for Cataract.

M. G., aged sixty-six years, was admitted to the hospital of the University of Pennsylvania on the 27th of September, 1886. The patient stated that ten years previously, whilst in Manchester, England, he had had an operation for cataract performed upon the right eye, followed by a similar operation upon the left eye one year later. Both of these operations were successful, the patient seeing "fairly well" with his glasses. Eighteen months after the first operation a secondary

operation was done upon the right eye, the pupillary opacities being needled. After this the eye appears never to have become altogether quiet.[1]

Examination of the right eye showed that it was red, its cornea hazy, and that there was much increase of tension (T + 2). No light perception. Just above the cornea there was a cicatrix from a peripheric linear operation for cataract, the cicatrix being cystoid and bulging at both ends. The left eye presented a somewhat similar cicatrix, less cystoid than that of the fellow-eye, though slightly prominent, with impalement of the iris at each end of the scar; the outer end of of the cicatrix being most prominent. With this eye the patient could see to count fingers at five feet. The eye was watery, sensitive to light, and giving out readily when any object was fixed.

On the 27th of October, he was admitted to the hospital. On the day following, ether was administered, and the sightless eye enucleated, causing a free hæmorrhage into the capsule of Tenon, with swelling and closure of the lids, which was readily controlled by a pressure bandage. With the exception of more discharge than usual from the socket for a time, there was no drawback to the healing. The sympathetic irritation in the fellow-eye was entirely relieved, which at present with + ¼ *sph.* has a vision of $\frac{20}{100}$.

The microphotographs (Figs 2 and 3, Plate III.), show sections through the extensive cystoid cicatrix, and through the complete excavation of the head of the nerve.

In conclusion: a study of the cicatrices of these three operations shows, in each case, a displacement of the relative position of the corneal flap and of the corneal stump from which it was cut. In each instance the edge of the flap rides up a little, while the cut edge of the proximal portion of the cornea projects deeper into the anterior chamber. In comparing them with the beautiful and careful drawings of Becker

[1] In a letter dated 30th July, 1887, Mr. David Little of Manchester, England, writes: "When I saw him last, it was January, 1886. It was then noted, "right eye inflamed since November last, sight lost for six years." At present, conjunctiva with thick purulent discharge. Iris bulging at each corner of wound. Anterior chamber half filled with blood. No perception. T.+2." . . . . "Date of first operation was April, 1875."

in his "Atlas of the Pathological Topography of the Eye," we find that a large majority of his plates representing flap operations, with and without iridectomy, Graefe extractions, and iridectomies, show a displacement of the cut edges in a corresponding manner—while two of them (Plate VII. Fig. 2, in the large Atlas, and Fig. XXI. of the small Atlas[1]), give examples of the end of the flap being deeper in the anterior chamber, while the proximal edge of the cornea rises slightly above it. In a few instances only are the inner edges of the incision nearly on the same level.

These facts seem to me to present good anatomical reasons for the utmost diligence on the part of the practitioner to prevent any undue motion of either the body or eyes of the patient after operations, until the wound is sufficiently closed by adherence of the cut surfaces to make it probable that it will not readily give way or be displaced.

[1] "Photographische Albildungen von Durchschnitten gesunder und kranker Augen." Wien, 1876.