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TENSION OF THE EYEBALL;

GLAUCOMA;

ETC.

SOME ACCOUNT OF THE OPERATIONS PRACTISED IN THE NINETEENTH CENTURY FOR THEIR RELIEF.

[*A paper read before the Midland Medical Society, February 3rd, 1863.*]

BY

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INTRODUCTION.

To attain a correct estimate of the progress of medical science, it is essential to take a retrospective glance at what has been done by those who have preceded its representative men of our own time, and endeavour, in a spirit of eclecticism, to adjudge the advantages which have resulted to society from more recent discoveries and methods of practice.

The substance of the following paper, entitled "Some Account of the Operations practised in the Nineteenth Century for the Relief of Tension of the Eyeball, Glaucoma, etc.," was read before the Midland Medical Society on February 4th of the present year, and has since appeared in the BRITISH MEDICAL JOURNAL. So great is the interest which continues to be manifested by the profession in the surgical treatment of intraocular tension and glaucoma, that I would fain believe no apology will be required for publishing the paper in a separate form.

A few words in explanation of the meaning of tension of the eyeball.

If a healthy eye be pressed by the point of the finger, it will be found to possess a certain degree of elasticity, which—although varying somewhat in different persons, without a corresponding alteration of the acuteness of vision, or of the power of adjustment—affords a standard by which surgeons, who have patiently studied the subject in a practical manner, may in numerous cases judge of the pathological significance of this sign, when the eye is diseased.

In order to conduct the examination with a due regard to accuracy of diagnosis, the patient should be instructed to gently close the lids, as in sleep; while the surgeon, standing in front, fixes the globe by placing the index finger of one hand and the second of the other on either side of the eye, taking care to avoid active pressure. He then makes one or two delicate and momentary compressions of the eyeball with the point of the index finger, which is at liberty; using sometimes, for this purpose, two fingers at the same instant. In all cases, he should examine in succession the degree of resistance afforded by the vitreous and the anterior chambers, and the irido-ciliary region.

If the examination be conducted in a rude or

sudden manner, an erroneous conclusion will be arrived at, in consequence of an artificial and temporary tension being induced by the spasm which the manipulation excites in the lids and muscles of the eyeball.

The degree of intraocular tension is in some diseases subject to so much variation from local and general causes, that it becomes of importance to repeat the examination at intervals, and even more than once at the first interview with the patient.

The degree of uneasiness or pain produced from a tension in excess of the normal standard depends on the nature of the disease and nervous susceptibility of the patient. Mr. Wardrop does not seem to have known the value of a digital examination, but to have relied on the situation and nature of the pain felt, and the appearance of the cornea. This remark in regard to pain suggests to me it may be useful to notice that considerable and most injurious pressure is sometimes present without exciting any local uneasiness whatever, the patient having only discovered his blindness or impairment of vision from perhaps an accidental closure of the more perfect eye.

The existence of a tension greater than normal does not of necessity entail a surgical operation for

its relief, inasmuch as there is a class of cases, which the ophthalmoscope will serve to determine, that yield to local and general treatment, aided by a due regard to hygienic measures. But where the tension is attended by the appearance of a rainbow round the flame of a candle or lamp (*iridescent* vision), and by contraction of the lateral field of vision, the defining power of the retina remaining good, a recourse to surgical interference is not to be long postponed; and, should it happen that the vision of one of the eyes has already become much impaired, or been lost, any delay in the application of surgical treatment for the relief of the more useful organ would be in the highest degree culpable.

The increase of intraocular tension ranges from a degree a little more than normal to a condition wherein the globe has assumed a stony hardness, and is incompressible by the finger. And, conversely, the reduction of it may be so great that the eye is flattened in the situation of its motor muscles.

In some cases of much exalted tension, the local application of atropine induces a reduction of it for three or four days, when a recurrence takes place, let the alkaloid be used ever so assiduously. I refer the first phenomenon to the constricting action of atropine upon the coats of the arteries, and imagine

the second to be due to the *vis a tergo* incident to the eye disease having overcome the constriction.

The method of ascertaining the extent of the lateral field of vision is extremely simple, and should never be omitted in an investigation of disordered states of the retina, more especially when accompanied by morbid tension. We proceed as follows :— The patient—having covered one eye by placing the palm of his hand in front of it, without making pressure—is directed to fix his gaze on the centre of the surgeon's face, who stands one or two feet in advance. The examiner now places an extended finger on either side of his own face, and notes the width of the field of vision enjoyed by the lateral halves of the retina. Sometimes it is found contracted on the temporal, sometimes on the nasal side. In chronic glaucoma, the greatest extent of the field of vision is commonly downwards and outwards. The examination is concluded by placing the fingers horizontally, one above and one below the face of the surgeon. In this way the extent of the vertical field of vision is discovered. In Dr. Graef's *clinique*, a black board, with a white cross in the centre, is employed for this purpose. The patient having fixed his eye on the object, white lines are drawn with chalk in different directions, and as far only as he can see them. In this manner an accurate dia-

gram of the sensibility of the retina is obtained. Such diagrams, when preserved, are a useful means of preventing all cavil in respect to the result of an operation on the function of the retina. Whichever test is used, the distance at which the patient stands from it, on a repetition of the trials, must always be the same.

96, *New Hall Street*, *Dec.* 1*st*, 1863.

SOME ACCOUNT OF THE OPERATIONS PRACTISED IN THE NINETEENTH CENTURY FOR THE RELIEF OF TENSION OF THE EYEBALL, GLAUCOMA, &c.

A Paper read before the Midland Medical Society, February 4th, 1863.

THE earliest notice of section of the ciliary structures* for the relief of intraocular tension is found in the *London Medical and Physical Journal* for the year 1802 (vol. vii, p. 209). Dr. Whyte there states, in a most interesting and ably written paper, that in cases of enlargement of the anterior hemispheres of the eye, occurring in Europeans, in consequence of incautious exposure of the eye to a tropical sun, whether complicated by congestion of the choroid veins ("dilated veins of the albuginea") or not, he had derived great advantage by puncturing the eyeball with a couching needle. His incision was made through the sclerotica into the posterior aqueous chamber, the instrument being carried "behind and parallel to the iris". He directs, "the outlet" (incision) should be "proportioned to the existent expansion"; and states that by this procedure he had extracted cataracts, ever without accident, and often with success. From this statement, I conclude the

* The terms ciliary structures, section or division of the ciliary structures, are used throughout this paper for convenience of expression, and not because they are found in the papers or works under review.

instrument used by Whyte was a broad cutting-needle. (*Vide* Diagram *a*.) The following parts would be divided by such an incision: the conjunctiva, sclerotica, radial fibres of the ciliary muscle and ciliary processes. The accidents which I should apprehend from this operation are, traumatic cataract, prolapse of the iris, and a troublesome inflammation of the sclerotica and ciliary processes.

Six years after the publication of the volume containing this paper, which shows Whyte to have been a surgeon of great boldness and originality, we meet with a short article from the pen of Mr. Wardrop in the *Edinburgh Medical and Surgical Journal* (vol. iii, 1807), on the Relief of Inflammation of the Eye by Opening the Cornea and Evacuating the Aqueous Humour. (Diagram *b*) Mr. Wardrop followed up his investigations, and in 1813 presented a valuable memoir to the Medico-Chirurgical Society of London, *On the Effects of Evacuating the Aqueous Humour in Inflammation of the Eyes and some Diseases of the Cornea.* In the same year publicity was given to this paper in the *Transactions* of the Society (vol. iv, p. 142).

Mr. Wardrop, omitting all mention of the observations of Whyte, states that he was led to enter on his special plan of treatment from an acquaintance with the curious phenomena noticed by Dr. Barclay in the dead eye; viz., that if the organ was moderately squeezed in the hand, or had its veins filled with quicksilver or water, the cornea became turbid, and, on relaxation of the pressure, gained its natural transparency.

Mr. Wardrop refers the great and immediate relief which his patients experienced to the sudden "*removal of tension*". This "tension" he considered might be re-

ferable in some cases to an increased quantity of blood in the eye, the aqueous humour being of normal quantity; while in others, he states, it was manifestly increased. Wardrop believed that the operation had a marked antiphlogistic effect; but he did not recommend the treatment as the "sole remedy, but only as a powerful auxiliary in some cases, and in others *as a sure and perhaps only means of preventing the total destruction of the organ.** In an instance of progressive staphyloma attended with inflammation of the tunics, he observed that the latter was arrested by the paracentesis, and did not recur *until the globe resumed its previous state of tension.*

Carl Wedl has investigated the physiological effects of paracentesis of the cornea and sclerotica upon the circulation of the iris and choroid. In his *Pathological Histology* (Sydenham Society's Edition, p. 19), he states, "If the *cornea* of a white rabbit be punctured with a straight cataract needle, the transparent vessels of the *iris*, and the anterior ciliary vessels with the fine branches, visible only under a lens, become apparent after the escape of the aqueous humour. A reddish border is formed around the cornea. After death the vascular ramifications in the ciliary body and the iris are most beautifully displayed. If a puncture be made through the sclerotic into the vitreous humour, no stasis is observed in the ciliary vessels (processes?) until a portion of the vitreous humour has escaped. The quantity of vitreous humour that should be allowed to escape must be limited within certain bounds, otherwise minute

* I have italicised this last opinion, as it embodies even *ipsissimis verbis* the views of the Iridectomy School in 1860, *quoad* the beneficial effects derivable from either operation.

extravasation of blood would appear to occur in the ciliary processes. Wedl refers these phenomena (congestion and extravasation) to a disturbance of the equable pressure which the humours of the eye exert on its internal circulation. After iridectomy performed for glaucoma, Gräfe has noticed "retinal ecchymoses"; "they consist of extremely regular, round spots, which seem to be seated exclusively on the veins, and for the most part where the large trunks unite." (*Memoirs*, New Sydenham Society's Edition, p. 300.)

Continental surgeons appear to have appreciated more fully the value of Mr. Wardrop's practice in cases of ocular inflammation and congestion than his own countrymen. The French and Germans have not only boldly "opened the cornea", but repeated the operation at short intervals, occasionally several times in the twenty-four hours. Their results are reported as having been very satisfactory.

Some seventeen years after the publication of Wardrop's paper, Dr. Mackenzie suggested the propriety of practising paracentesis of the sclerotica for the relief of the tension of glaucoma. (*Glasgow Medical Journal*, Aug. 1830, p. 265.) Since then the several editions of his national work on *The Diseases of the Eye*, have contained similar advice.

Mr. Middlemore remarks, in his Jacksonian prize-essay, that he had noticed, after drawing of the turbid vitreous humour, it was replaced by a more transparent fluid, and the vision of the patient was improved. Mr. Middlemore must, I think, have abandoned the method almost immediately after the publication of his *Treatise on the Diseases of the Eye* (1835), or I should not have failed to have seen or heard of some of his cases.

Desmarres, in his *Traité des Maladies des Yeux* (1847), at page 773, gives an interesting and most instructive chapter on paracentesis of the eye. In acute glaucoma (*une violente ophthalmie interne*) supervening upon the depression of a cataract,* he plunges a Wenzel's cataract-knife (*couteau lanceolaire assez large*, pp. 586, and 597) into the outer and lower part of the globe, and at three *millimètres*+ from the rim of the cornea. (Diagram *c*.) Such an incision would divide the ciliary muscle at its choroid end, the ciliary processes, and the anterior of the retina. The length of the incision which he makes is about one-sixth of an inch, and the depth to which the knife penetrates about one-fourth. I have arrived at these figures by the measurement of a drawing which Dr. Desmarres has given of an instrument (Wilde's needle?) for the performance of sclerotic paracentesis (p. 774). If the inflammation do not yield to a single operation, Desmarres reopens the wound even to a fourth time, or, if need be, as often as active inflammatory symptoms reappear.

The effect is to give immediate relief to local pain, and to subdue an ophthalmia which had proved rebellious to the usual antiphlogistic treatment. These results Desmarres refers to the drawing off of the aqueous humour when highly saturated with lens-molecules, and its replacement by a normal secretion (p. 597). It is in this class of cases that we get a glaucomatous tension; and I have in my own practice witnessed the most satisfactory results from such a proceeding, after paracen-

* The occurrence of glaucomatous pressure after needle operations for cataract, has been specially pointed out by Gräfe (*Memoirs*, Sydenham Society edition, p. 371.)

+ A *millimètre* is about one twenty-fifth of an inch. Three *millimètres* are one-tenth of an inch; four are one-seventh and a half.

tesis of the cornea had failed to give relief. Dr. Hillier Blount, who formerly practised in this town, was a student in 1846 in Dr. Desmarres' clinic. On his return to England, he informed me what marvellous recoveries he had witnessed from plunging a cataract-knife into the eyeball behind the rim of the cornea, in the case of acute internal ophthalmia (acute glaucoma?), when supervening upon the operation of cataract reclination. In glaucoma, as defined by the older writers, Desmarres advises the same plan of relief which, he states, produces "beneficial arrests" in the progress of the disease. In a letter which I received from Mr. Hancock of London on May 17th, 1860, he mentions that the Parisian oculist continued to divide the ciliary structures, commencing his incision rather nearer to the transparent cornea ("division of the ciliary muscle"). He appears, however, to have since abandoned the plan for iridectomy. (See BRITISH MEDICAL JOURNAL, vol. 1862, p. 377.)

We have now arrived at the Iridectomy epoch. In 1855, Von Gräfe announced paracentesis of the cornea as a new remedy for glaucoma; and in 1857, the application of iridectomy* for the same purpose. I believe he made a trial of the latter from observing an improved circulation in the choroid, after its performance in cases where the pupil had been partially obstructed from the effects of an irido-choroiditis.

Mr. Dixon's experience has led him to the conclusion

* Iridectomy is performed by making an incision half an inch long behind the corneo-sclerotic union, and then removing one-sixth of the iris close to its ciliary attachment. By this proceeding, the pupil is made to extend to the ciliary ring, the zonula and the lens alone (it is presumed) intervening between the vitreous and aqueous chambers.

that some instances of acute glaucoma recover after a paracentesis of the cornea (Wardrop's operation)—a fact admitted by Gräfe; while others require, for permanent reduction of tension, a more compound operation, namely, the removal of a small bit of iris. (Holmes's *Surgery*, vol. ii, p. 855.)

Unhappily, a very large proportion of persons affected with glaucoma present the chronic or subacute variety of the disease. In such, let who may operate, the benefit in the greater number of cases is limited to a reduction of the intraocular pressure, and an extension of the lateral field of vision. The patient "does not see better, but in a different manner". As a rule, the sight endures during a longer period; but it is rare for the defining power to become more acute.* In this class, the recurrence of an excess of tension, which may be quite independent of inflammation, is not infrequent, and may generally be completely overcome without a resort to a second or third iridectomy, as advised by Dr. Gräfe. Of the truth of this my own practice has afforded several examples. In some cases, in consequence of the advanced stage to which atrophy of the optic nerve has attained *before* surgical treatment was employed, or the increase *afterwards* of an effusion between the choroid and retina—states which may occur singly or combined—blindness creeps on, notwithstanding the intraocular pressure may be reduced to the normal standard.+

* When subacute glaucoma has been recognised in its early stage, I have known very good results to be obtained from a surgical operation.

+ For valuable information on the pathology of glaucoma, the reader is referred to Mr. Hulke's paper in the BRITISH MEDICAL JOURNAL, 1863, vol. ii, p. 564.

I have seen the progress of idiopathic senile cataract complicated by a subacute glaucoma—a fact of the highest importance in regard to prognosis and treatment.

The statistics of iridectomy operations are sufficiently favourable as to results on vision in acute *primary* attacks of glaucoma, but in the other class (subacute and chronic) are most unsatisfactory and discouraging. None have been published in England since Dr. Bader's valuable and very candid report appeared in the *Ophthalmic Hospital Reports.*

If, however, the profession should agree to consider, with Bowman, *all* excess of tension as glaucomatous tension, and apply for its relief iridectomy, the statistics will then bear criticism from hostile schools of ophthalmology. Such a recourse to Von Gräfe's operation, I consider, would be most unjustifiable, because there are other surgical measures unattended by danger, and which do not entail a permanent deformity, that are fully competent to insure all the advantages which arise from the restoration of the intra-ocular tension to its healthy standard.

It has been asserted by Dr. von Gräfe and some of his followers in this country, that the removal of the glaucomatous state by iridectomy from one eye has no effect (practically) on its fellow. As a general rule, this is correct; but I have occasionally met with instances wherein the relief of the disease in the more seriously compromised organ has been followed by a spontaneous subsidence of the tension in the opposite eye.

An iridectomy sometimes gives rise to confusion of vision from the rays of light which pass through the zonula and margin of the lens, causing " circles of dis-

sipation" on the retina. I propose to remedy this very serious optical inconvenience, when occurring among the labouring poor, by covering the coloboma with an artificial pterygium derived from the sclerotic conjunctiva; this proceeding has a great advantage over a perforated black diaphragm set in a spectacle-frame (a contrivance which one of my iridectomy patients has worn seven years), because it permits of lateral vision. Where the conjunctiva is much atrophied, my plan is inadmissible, and hence has not been applied in the case to which I have referred.

When estimating the value of other methods of treatment, the English section of the Berlin school appear to have forgotten that Von Gräfe has modestly said of his great discovery, "The theory is as yet infinitely darker than the empirical facts". (*Memoirs*, New Sydenham Society's edition, page 357.) They have also failed to remember that, in urging upon the profession the adoption of iridectomy, their appeal has been solely to "empirical facts", and in no wise to any physiological principle which has been made out with distinctness and certainty in the course of the inquiry. They have also overlooked the fact that, with the exception of a few cases of acute glaucoma, the profession have not been placed in possession of full details of the large majority which have been treated by iridectomy. I submit they are not, therefore, in a position to demand of the innovators of iridectomy that which they themselves have hitherto withheld.

Few if any operations on the iris are more easy of performance, or less dangerous, than iridectomy, where the dimensions of the anterior chamber, the texture of

the iris, the attachment of the zonula to the lens, and the tissue of the choroid, are normal. Unhappily, acute glaucoma not unfrequently attacks eyes which have been for years undergoing a slow disorganising process. In such instances, grievous accidents commonly attend on iridectomy, let the operator be ever so skilful and experienced.

The operation, in the hands of able surgeons, has been followed by one or more of the following accidents: opacity of the lens; loss of vitreous humour; hæmorrhage from the ciliary processes; escape of the lens some days after the operation; closure of the pupil; ophthalmitis; and even by sloughing of the cornea.

Whatever may be the ultimate position assigned to iridectomy as a curative agent in glaucoma, there can be no doubt that the publication of von Gräfe's *Memoirs on Iridectomy* by the New Sydenham Society has produced a most beneficial influence on the English school of ophthalmology, by causing greater exactness to be observed in the investigation of diseased processes and the effects of surgical treatment.

Several theories have been suggested to explain the relief of glaucoma by iridectomy. In Dr. von Gräfe's *Memoirs*, we find relaxation of the ciliary muscle, diminution of the secretory surface of the iris, a more perfect exosmosis through the cornea, put forth as in some measure explaining the diminished tension. I shall be forgiven if I remind the Society that, so far back as the spring of 1860, I orally enunciated my belief that the division of the ciliary nerves, at the point where they pass from the ciliary muscle into the iris, formed an important element in the operation; that thereby a more healthy action was induced in the ciliary ganglion,

which, as proved by the experiments of Dr. Radclyffe Hall, presides over the organic function of the eye. Through the kindness of Mr. Square of Plymouth, my theory was embodied in the valuable practical address in Ophthalmic Surgery, delivered by him before the meeting of the British Medical Association at Torquay, in August 1860, and which was published in the JOURNAL of the same year. Since that time I have been gratified by observing that the tendency of opinion among scientific surgeons has been in the direction which I was the first to indicate; viz., that the nerves of the ciliary vessels play an important part in the *rôle* of symptoms which constitute glaucoma, as described by the new school of ophthalmology.

I have been led to attribute considerable importance to *section of the ciliary nerves at the point where they pass from the muscle of the lens into the iris*—

1. From having observed the subsidence of non-inflammatory glaucoma after an intraocular myotomy* which was attended with so little discharge of aqueous humour as to occasion a doubt whether any had escaped. There was no loss of vitreous in these cases.

2. From the superior results obtained in glaucoma cases treated by iridectomy where the iris has been cut close to its origin, as compared with those in which such precaution was not taken; also from the superior results of intraocular myotomy, as compared with division of the ciliary structures at a right angle with the cornea, and with paracentesis of the cornea.

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* Intraocular myotomy is performed by making an incision, with a cataract-knife, on a line parallel with one of the equators of the eye, through the corneo-sclerotic union, pillars of the iris, and ciliary muscle.

3. The phenomena of some forms of glaucoma are only explicable on the supposition that they are due to a non-inflammatory irritation of the vessels; *e.g.*, the transitory nature of the obscurations, the sudden and complete recovery of distinct vision, and the increased secretion of vitreous, without the prior occurrence of inflammation or congestion.

4. Because the principal nervous endowments of the vessels of the inner eye are derived from the ciliary ganglion; also because the fifth pair has an intimate relation to the same nervous centre. (The function of the ganglion-cells discovered in the choroid by Schweiger, and which Mr. Hulke informs me he has seen in Schweiger's preparation, is not yet, I believe, determined.)

5. From a consideration of the reflex action of which the ciliary ganglion must be the centre.

6. From a consideration of the manifestly improved nutrition which takes place after a neurotomy in limbs the subject of neuralgia; and in amblyopic eyes after section of the frontal branch of the fifth nerve, performed for the relief of traumatic irritation of the nerve.

7. From the frequent occurrence of glaucoma among persons who have passed the meridian of life, and whose nervous power was at the time much depressed.

8. From having obtained an enlargement of atrophied and flaccid eyeballs after intraocular myotomy.

9. From having observed long sustained excessive tension of an eyeball from which the *whole* of the iris had been detached by a blow, so that the two chambers were thrown into one; and in which, consequently, there could be no impediment to exosmosis through the

cornea. In this case, paracentesis of the cornea failed to afford relief.

10. From observing that a healthy tension is maintained in eyes affected with congenital coloboma iridis.

The observations 8, 9, and 10 appear to me to weaken very much the importance of a coloboma iridis in the production of a reduced tension as a consequence of an improved exosmosis by the cornea, and to support the theory that section of the ciliary nerves at the place I divide them by my operation constitutes an important step in the direction of cure of glaucoma. This theory is not in any way hostile to the opinion that an iridectomy becomes an imperative necessity where certain chronic pathological changes have taken place which impede or stop the physiological relationship of the vitreous to the anterior segment of the eyeball.

Division of the Ciliary Muscle. Those who have followed me thus far will not fail to have been convinced that section of the ciliary structures is not by any means a modern operation for the relief of tension of the eyeball. The danger, real or imaginary, which has been attributed to operation on these parts, I have shown, were set at nought by Whyte and Desmarres, and, I might have added, in numerous instances by needle-operators for cataract, and the early operators for artificial pupil after a cataract extraction.

A series of ingenious and popularly written papers have appeared in the *Lancet* for 1860 and two following years, from the pen of Mr. Henry Hancock, on "Division of the Ciliary Muscle in Acute Glaucoma", which it now becomes my duty to examine.

In his first lecture, published on February 11th, 1860, he revives the old and exploded doctrine that "glaucoma

depends upon an arthritic condition of the blood"; adding that, " sooner or later, the blood-vessels (of the eye) become structurally diseased in the same way as the vessels and valves of the heart become affected in arthritic disease. Consequent upon these changes, the humours of the eye are affected. *As the disease progresses*, effusion takes place within the eyeball, rendering it tense and hard by the resulting intraocular pressure, which, acting upon the ciliary nerves and retina, causes intense pain, and ultimately total blindness."

The notion that glaucoma is related to an arthritic condition of the blood is not only opposed by such observers as the late Mr. Guthrie senior, Von Gräfe, and Donders, but by the whole of Mr. Hancock's clinical references. Of the large number of cases published by him in illustration of his views, during the last three years, one only (Case III) had suffered from rheumatism, and one from " occasional attacks apparently of an arthritic nature"; this patient (Case XXV) " habitually enjoyed good health". (*Lancet*, Sept. 23rd, 1862.)

The next statement in the lecture which demands notice is, that the ophthalmoscopic signs of glaucoma (cupping of the optic nerve, congestion of the retinal veins?) and " puckering of the retina" (*sic*) " are greatly enhanced, if not in some instances entirely due to the obstruction of the circulation exerted upon them by the spasmodic or extreme contraction of the ciliary muscle, analogous to the spasm so often observed in the muscular fibres of the urethra, as well as in the sphincter ani muscle, in certain affections of those parts."

Mr. Hancock asserts that he arrived at this view by a study of the anatomy of the ciliary muscle and the vessels which pass through it, etc.; but, although he has often re-

peated this statement, he has not informed his readers in what consist the *anatomical peculiarities* which bring about derangement of the whole internal circulation of the eye, with cupping of the optic nerve, and " puckering of the retina", in glaucoma; nor has he adduced any physiological proof, than which nothing could be more easy, did it exist; and, what is still more provoking, his disciples are not permitted even to have clinical evidence of the alleged constriction or spasm. Not a single case is recorded where the spasm was overcome by paralysing the muscle with atropine, and the cupping of the optic nerve and puckering of the retina were *seen* to gradually subside. It is true, he claims to have discovered a sign of *acute* glaucoma which had been " hitherto unnoticed", and which is considered by him to prove the presence of a condition of ciliary spasm similar to what is observed in the sphincter ani, etc. The sign on which he relies consists in a conical condition of the cornea, and the presence of a groove or neck in that part of the sclerotica under which the ciliary muscle is situated. We naturally turn to the cases which illustrate his paper for the clinical proof of this statement; but here the only instance of glaucoma in which the cornea is reported as conical is that of a woman whose eye had been diseased *ten* years, and the vision of it seriously impaired for *six* years. (Case III). We will not stay to discuss whether the case was an example of glaucoma or not. It is enough that it was essentially a chronic disease of the eye, and therefore in no degree supportive of the alleged discovery. Mr. Hancock may be interested by the following short extract from an article on *chronic* glaucoma by Dr. Desmarres: " J'ai vu la cornée, après avoir pris une forme légèrement

conique." (*Traité des Maladies des Yeux*, p. 762; Paris, 1847.)

In the first of a series of articles on "Incision of the Ciliary Muscle," published in the *Medical Times and Gazette* (Jan. 19, 1861, p. 56), I remark: "The existence of ganglion-cells in the choroid (Müller and Schweiger), and the arrangement of its vessels (and nerves) indicate the importance of it in the nutrition of the eye. Is it probable that with such nervous and vascular endowments, the function (circulation?) of the choroid is made subservient to the greater or less tension of a muscle, which, among civilised nations, almost equals in activity that of the eyelid; which, in many occupations—watchmakers, engravers, etc.—is maintained for eight or ten hours of the day in constant contraction, without rendering such employments specially liable to glaucoma or choroiditis? Is it credible that this little delicate muscle, which is only one-eighth of an inch broad, and which is arched to the curve of the case of the eye, and so rich in nerves as to have been mistaken by the older anatomists for a ganglion, possesses such power as to be able to invert by spasm or constriction of its fibres, the arch of the tough fibrous sclerotica, at a point corresponding to its position, and to cone the cornea? According to my observations, before the arch of the sclerotica will suffer inversion or flattening, so as to form a kind of neck to the cornea, its structure must be weakened, either by inflammation of the choroid when it becomes thin, or by a fracture from a blow—as, for example, where the lens has been subconjunctivally dislocated, in which case the cornea has a tendency to become conical. If it be replied that it is the circular, and not the radial fibres, which are in a spasmodic or con-

stricted state, then we should expect the patient would obtain more distinct vision from concave glasses; whereas, in glaucoma, we find he corrects the presbyopia which precedes the impaired vision by wearing convex glasses. Moreover, it has never been explained (by Mr. Hancock) how an incision in the direction of the radial fibres relieves the assumed spasm or constriction of the muscle in question. Assuredly, if an organ like the thoracic diaphragm were in a state of spasm (and its division had been decided upon as practicable and proper), the surgeon would not incise it in the direction of its fibres, but contrariwise. Nor can I admit what is observed in spasm of the sphincter ani, and the relief of it by myotomy, bears any sort of analogy, as stated by Mr. Hancock, to the treatment of glaucoma by cutting asunder the ciliary muscular circle. Before such illustration can be considered of argumentative value, it must be shown that the relation of the vessels to the direction of the fibres in the two muscles is the same. Mr. Hancock is too good an anatomist to be unaware that the hæmorrhoidal vessels which suffer compression and congestion in spasm of the sphincter ani run longitudinally in the gut, and at right angles with the muscular fibres; whereas, the radial fibres of the ciliary muscle and their vessels run parallel,* or nearly so, and, consequently, the latter are not constricted by the former."

To these arguments, Mr. Hancock has never attempted the slightest answer.

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* The vessels of the ciliary muscle resemble those of unstriped muscle in abundance and arrangement, and indicate in the most decided manner the backward direction of the fibres, from their origin at the junction of the cornea and sclerotica, towards the anterior region of the choroid. (Bowman's *Lectures*. London: 1849, page 53.)

But it may be suggested, if there is not spasm, may there not be such constriction of the ciliary region that the eye will expand rather in its antero-posterior axis than laterally, and thereby a conical cornea and a groove over the ciliary muscle be produced?

Modern clinical observations conducted by Von Gräfe, Bowman, and Donders, are entirely opposed to such a view. These authorities agree that, in consequence of the intra-ocular pressure, the cornea, in glaucoma, has a tendency to become flat.* Indeed, it is obvious, on mechanical principles, that the arch of the cornea cannot be lessened without a proportionate expansion of the sclerotic ring (ciliary region) with which its base is continuous. But, while insisting on this view, I by no means pretend that any form of eye is prophylactic of glaucoma; we know that conoidal and buphthalmic eyes sometimes become the seat of the glaucomatous process. Such occurrence, however, is accidental, and in no way in the relation of cause and effect.

One more observation, and I will dismiss the pathological views propounded by Mr. Hancock. If it be true that an arthritic condition of the blood-vessels and ciliary spasm be the main elements in the production of the glaucomatous state, then a resort to operative measures certainly cannot be needful. The patient will only require to be armed in one hand with a solution of atropine to relax his ciliary muscle, and in the other with a supply of antiarthritic medicine to depurate his blood of its *materies morbi*, and in due time he should be cured. Judged by his papers in the *Lancet*, Mr. Han-

* It has been experimentally shown that excessive tension of the eyeball lessens the curvature of the cornea.

cock has not yet essayed anything in a direction so consistent and logical with the principles for which he contends.

I witnessed for the first time the performance of division of the ciliary muscle on a casual visit to the Westminster Ophthalmic Hospital on Friday, June 1st, 1860, exactly a week after a notice of my treatment of near-sightedness by intraocular myotomy had appeared in the BRITISH MEDICAL JOURNAL, and on the same day that the London edition of the *Medical Times and Gazette* drew attention to the subject, and to certain particulars wherein intraocular myotomy differs from division of the ciliary structures, as practised by Mr. Hancock.* The procedure which I witnessed was as follows. The patient being seated in a chair, the eyelids were held widely apart by an assistant, who stood behind him. Mr. Hancock, having placed his left hand on the patient's face, plunged with his right a large sized Wenzel's cataract-knife into the eyeball near to the rim of the cornea, and cleft the ciliary structures by an incision which radiated from the cornea in the space between the external and inferior pectus muscles. This sudden stab, as a matter of course, excited spasm in the external muscles of the globe, and consequently an emission of the aqueous and vitreous humours. In the case of a much enlarged eye, the vitreous body was so exceedingly firm, that none escaped, although the opening was extended to nearly half an inch in length; the

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* "In this operation, the incision does not radiate from the lens and ciliary attachment of the iris, as it does in Mr. Hancock's operation for acute glaucoma; hence the diameter of the globe behind the diaphragm (iris) is not increased." (*Medical Times and Gazette*, June 2nd, 1860, page 548.)

diameter of the globe being enlarged, and *the vitreous acting as a tent in the wound.*

It is remarkable that the advocates of the operation, having in view the reduction of ciliary spasm, do not avail themselves of the use of chloroform, and limit the operation to a slow, methodical division of the sclerotica and ciliary muscle, taking care to avoid disturbance of the vitreous humour.

Mr. Hulke, after having witnessed this proceeding, publicly expressed the opinion that it differed in no respect from paracentesis of the sclerotica, as practised by Desmarres and others, with a view to lessen the contents of the globe. In reply, Mr. Hancock vindicated his treatment of acute *glaucoma* by publishing a case of *recurrent iritis*, or irido-cyclitis, which he had benefited, although *no fluid* was noticed to follow the incision.

This attempt to prove the value of an operation in a certain and peculiar disease (glaucoma), by showing its utility in one of an entirely different nature, must be admitted to be more plausible than conclusive. The following summary of the case to which reference has been made (*Lancet*, 1860, Case 15) is here given, as it exhibits in a striking manner the sort of clinical reports upon which Mr. Hancock founds his practice and commends it to the judgment of the profession.

A lady, aged 26, was treated during three years by mercury, tonics, and an issue in the arm, for an iritis of the *left* eye, which, notwithstanding, terminated in "*a progressive opacity of the lens* and capsule, *a contracted and irregular pupil*," and the "*utter extinction of vision.*" Subsequently iritis attacked the *right* eye. It recovered, and remained well for two years, when it became the seat of asthenic irido-cyclitis (inflammation

of the iris and ciliary body of the choroid). Mr. Hancock, on being consulted, divided the ciliary muscle. No fluid was discharged, and vision was restored.

In the *Lancet* for September 13th, 1862, p. 279, and under the heading of Case 22, some additional particulars of this lady's case are given, which deserve attention as bearing upon the credibility of the papers under review. "Soon after September 5th, 1860, the *left* eye became less satisfactory; the vision rapidly failed; the pupil became insensible to light, and occupied with fragments of pigment."

Inasmuch as the *same* organ had been already reported (*Lancet*, 1860, Case 15) as having been affected with "progressive opacity of the lens and its capsule" (capsulo-lenticular cataract), and "utter extinction of vision", the reader is puzzled to understand in what way it could possibly "become less satisfactory", unless from a general disorganisation of its tissues; and the process whereby "the utter extinction of vision" was converted into a "rapid failure of vision" is equally mysterious.

In October, iridectomy was proposed to the patient, and rejected by her. All medical treatment was now dispensed with; and, by Christmas, the eye in which there was cataract and "utter extinction of vision" had so far recovered itself that small print could be read with it! So brilliant and marvellous a result having been got without the aid of the doctors, we are startled on reading that medical advice was again sought, and a constricting band placed upon an hæmorrhoid which had bled much (indeed, apparently during the several years the eye was under treatment). Misfortune, however, still remorselessly pursued this unfortunate woman; for

the cataractous eye, which read small print on Christmas Day, 1861, again failed. Division of the ciliary muscle was performed at the beginning of 1862. "Notwithstanding," says the report, "the attack was very obstinate; but she was ultimately restored to sight." The degree of impairment of vision is not stated.

It is upon such clinical evidence as the preceding that Mr. Hancock asks his brethren to adopt division of the ciliary muscle as a cure for acute glaucoma, in preference to iridectomy.

I have given the method a very extended trial in public and private practice, and I regret to say that it has uniformly disappointed me as a means of *permanent* relief in glaucoma. My experience fully corroborates that of Desmarres and Bader, that it is merely a palliative. In many cases it has not even this merit, but proves positively detrimental to the interests of the patient, by preventing the adoption of a really useful plan of treatment at the outset of the disease.

The accidents which I have witnessed to follow its employment are ophthalmitis, and atrophy of the globe. The latter event occurred to a patient who, from being blind, was enabled to count fingers immediately after the turbid humours were discharged from the eye.*

If a close investigation be made of Mr. Hancock's method, the claims he has made to originality must be seen to have been anticipated by other ophthalmic surgeons.

He cuts the ciliary muscle; so did Whyte and Desmarres.

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* As a remedy for myopia, it is deceptive and dangerous. In the course of a few months, the patient finds his myopia to have returned, his adjustment destroyed, and that spectacles are no longer of any service to him.

His incision is made in the space between the inferior and external rectus muscles; so was that of Desmarres.

He plunges with force a large lance-shaped knife into the globe, and extracts vitreous: Desmarres did likewise, and published his results years before Mr. Hancock discovered (?) "division of the ciliary muscle".

He repeats the paracentesis on the same eye for the same disease; so did Desmarres, and moreover publicly avowed the necessity of the practice, which his imitator has not done.

Mr. Hancock asserts that the operation *cures* glaucoma. Desmarres candidly admits it produces no more than a beneficial check to the disorder ("detente salutaire").*

Desmarres sometimes pierced the sclerotica behind the insertion of the ciliary muscle, without apparently obtaining any appreciable difference in his results. Whyte, as has been already remarked, always cut the muscle for the relief of tension.

These facts having been laid before the Society, its members will find no difficulty in deciding whether Mr. Hancock is in a position to claim originality for the slight modification, if any, which he has made in the mode of performing sclerotic paracentesis in cases of acute glaucoma—a measure of relief which was first suggested by Mackenzie, extensively practised by Desmarres, and which, in the hands of every surgeon who has given it an extended trial, has failed to cure idiopathic glaucoma.

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* "On pourra faire tomber la douleur et disparaître l'accès, par des ponctions pratiquées de temps en temps au travers de la sclérotique; il en résultera de cette façon une detente salutaire." (*Traité des Maladies des Yeux*, p. 767. Paris: 1847.)

Intraocular Myotomy. I entered upon a clinical investigation of the value of incision of the ciliary structures in certain diseases of the eye and disorders of the optical accommodation, on March 1st, 1860. During the first three months, I always pursued one method, which was as follows. The patient being seated, or in the recumbent posture, I entered a small Beer's cataract-knife (Sichel's) at the corneo-sclerotic union, and then pushed it through the pillars of the iris into the ciliary muscle,* making an incision in the latter of about one-sixth of an inch, on a line parallel with an equator of the eye. (See Diagram, *d*—1860.)

The employment of chloroform is not necessary; but I recommend it whenever it can be conveniently applied.

The operation should be done slowly, and the knife cautiously withdrawn, so as to avoid a sudden escape of the aqueous humour or prolapse of the iris; or the entrance of vitreous humour into the lips of the wound which is apt to excite ciliary vascular irritation. Moreover, the more sudden the escape of the humours of the eye, the greater likelihood will there be of the occurrence of hæmorrhage from a diseased choroid or retina.

Such an incision as I have described, causes a division of some of the radial and other fibres of the ciliary muscle in a transverse direction; also of branches of the nerves which are distributed to the

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* For an account of the anatomy of the ciliary muscle, the reader is referred to my papers in the *Medical Times and Gazette*, vol. i, 1861, entitled "An Experimental Inquiry into the Value of Incision of the Ciliary Muscle in the Treatment of Certain Diseases of the Eye and Disorders of its Accommodation."

part from the ciliary ganglion (ciliary and third pair). It is scarcely necessary to remark, that the ciliary are vaso-motor as well as sensory nerves. And I am informed by Dr. Argyll Robertson, that Dr. Struthers considers it to be highly probable they are also musculo-motor nerves.

My observations incline me to the opinion that, in some if not in all subjects, a branch of the cervical sympathetic is distributed to the ciliary region opposite the insertion of the external rectus tendon; and, therefore, section of this part should be carefully avoided.

By intraocular myotomy the anterior chamber is penetrated; and although the diagrams contained in the works of Bowman and Nunneley* do not countenance the opinion, I believe, from repeated observation, that the posterior aqueous chamber is either entered by the knife, or its outermost wall so much weakened that it ruptures, and so gains communication with the external wound.

Ecker, in his *Icones Physiologicæ*, gives a depth to the floors of the two chambers which is corroborative of my views. The relative sizes of some of the other parts in the same plate are very far from accurate. Indeed, the chief object of those who have published plates of the parts concerned in accommodation would appear to have been rather to give a magnified view

* I believe that the difficulty of obtaining an exact representation of the relative extent of the two chambers, arises from the cornea and off-shoots of its elastic lamina to the iris and ciliary muscle undergoing but little contraction after *post mortem* section and preparation for the microscope, while the soft tissues (iris and ciliary processes) which bound the posterior aqueous chamber must suffer considerable contraction and alteration of form.

of the minute structural anatomy of the tissues—especially of the cornea, sclerotic, and ciliary muscle—than an accurate representation of their comparative size and relative position.

In estimating the direction which the knife would take in the operation of *intraocular myotomy*, it should be remembered that the cornea is elastic, and, consequently, structures can be cut without difficulty in a direction which would seem impossible, if we take up one of the published diagrams and draw a perfectly straight line through the corneo-sclerotic union pillars and the iris and ciliary muscle. Those who have frequently operated for cataract will appreciate the force of this remark.

The amount of hæmorrhage, when the eye is not inflamed or the ciliary processes congested, is generally limited to a few drops. Whatever the quantity effused into the anterior chamber, it will generally make its escape upon the introduction of one of Anel's tear-probes in the line of the incision. In the same way, a prolapse of the iris—which, as with hæmorrhage, is an infrequent occurrence—may be easily reduced. When the vitreous humour has been rendered diffluent by disease, a very efficient paracentesis of it and of the aqueous may be effected by the operation under consideration.

The performance of it, when chloroform has not been used, is not painful, but only momentarily disagreeable. And if proper precautions are taken, before and afterwards, it is devoid of all danger.

Where the digestive organs are deranged, from causes quite independent of the ophthalmic disorder, or when there is evidence of constitutional syphilis,

intraocular myotomy is not advisable. But if the eye be in a state of acute inflammation, the operation may be done. Upon a healthy state of the digestive organs I lay great stress.

The *after treatment* of intraocular myotomy is very simple. It consists of complete rest of the eyes and exclusion of strong light, the use of an abstemious diet, and mild aperient medicine. The operated eye should be kept closed for five or seven days with plaster, and cool with a wet linen shade. In the early period of my experience, I was induced to prescribe for the out-patients, as a preventive of inflammation, a blister behind the ear; and although I am far from believing such treatment to be an essential element of success, I am sufficiently prejudiced in its favour to advise the adoption of it as the rule rather than the exception.

In the event of ciliary vascular irritation (*cyclitis*) succeeding the operation, it must be treated as an acute iritis; and if it *become subacute* or chronic, a section of the ciliary structures at a right angle with the cornea (*phlebotomy of the choroid*) will prove curative. I consider this plan is almost a specific when the inflammation is subacute or chronic, and not the result of an escape of vitreous after a cataract extraction by a full section of the cornea. In the acute stage, it is less *certain;* and where there is extensive synechia posterior, iridectomy should be preferred, provided the patient can obtain a proper after treatment.*

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* We possess in paracentesis of the cornea a certain amount of antiphlogistic power; the increased secretion of aqueous humour probably unloads the gorged ciliary processes; but, according to my

Physiological Effects of Intraocular Myotomy. I have already explained my reasons for believing that one of the effects of the operation under consideration is upon the ganglionic nerves of the eye, and, therefore, need not here repeat the same arguments. The *ophthalmoscope* has shown a decrease of congestion of the veins of the retina, and an increase in the size of its arteries, to follow the operation, when performed for the relief of myopia, and glaucoma. The subsidence of red flashes and the appearance of white stars is commonly remarked upon by patients in a day or two after treatment, indicating that the choroid and retina are resuming a more healthy condition. Muscæ volitantes are also noticed to disappear or diminish, and the vision to be clearer.

An improved intraocular secretion is proved by the turbid vitreous humour regaining its transparency, and a tense globe its normal elasticity. I have never employed the operation for the relief of asthenopia or presbyopia, as has been stated in Mr. Haynes Walton's work on the *Surgical Diseases of the Eye.*

Diseased States in which the Operation has proved Useful. On March 1st, 1860, I operated upon a much disorganised and tense eye; and on the 31st, upon a case of near-sightedness (myopia), complicated by choroido-retinitis. The pupillary margin of the iris "was drawn slightly towards the lens, the other part of the membrane being arched forwards, except at its ciliary origin."

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experience, it is far less effective in *cyclitis* than *choroid phlebotomy*, and, moreover, is liable, if great care be not observed, to induce irritation by pressure of the lens on the iris, and consequently an augmentation of the ciliary congestion.

The effect upon the accommodation of the eye and congestive symptoms proved so remarkable, that I was encouraged to submit other myopic patients to a similar plan, and obtained markedly beneficial results.

The theory of treatment in this class of cases was based upon the opinion, at the time generally prevalent in England, and taught in the best text-books of physiology; namely, that the ciliary muscle consisted of a single set of fibres, which in direction were radial, and that the adjustment of the eye to near objects was effected by contraction of the muscle drawing the lens towards the cornea.

I argued thus: if I cut some of these fibres *across*, the muscle of the lens will be weakened, and the far point for reading will undergo an increase.

As my views upon this subject, with clinical illustrations, have been already given in the *Medical Times and Gazette* (vol. 1861-62), and will shortly appear in a separate form, it is unnecessary here to do more than notice that, in cases which I have had opportunity of following since the year 1860, the increase of accommodation for large and distant objects, as human features and landscape, has been most completely maintained*; while a very slight contraction has taken place in the reading distance.

In other words, the myopia, as regards distance, has been permanently improved and *arrested*; a slight

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* Many writers consider the eye to be passive when viewing landscape, and that *accommodation* or adjustment only comes into play when near objects are viewed. They therefore object to speak of *accommodation* for distance.

progress only having occurred in respect to near objects.*

Another point of interest was presented in two cases of extreme myopia, who, having been much improved by the operation, resumed, after a time, the use of their deep concave spectacles for looking at near and far objects. In each instance, the near-sightedness returned to what it was before surgical treatment.

Do not these facts obtain importance from their relation to the mechanism which accommodates the eye to different distances? Are they not suggestive of the existence of some active agency by which the organ is adjusted for objects placed beyond twenty feet? The time, we would fain believe, is not remote, when a solution of some of the several problems connected with the subject of optical accommodation and refraction will be attempted by a recourse to intraocular myotomy in suitable cases.

A word of caution on the selection of cases. Instances of hypermetropia and astigmatism, diseases which are sometimes relieved by concave glasses, and which might, on cursory examination, be confounded with near-sightedness, must be carefully excluded from operation.

To proceed with the narrative. In the same year and month, I operated upon a case of *acute* choroiditis, complicated by great tension and myosis. The first two conditions were reduced by the treatment, and vision restored; and I would here repeat the opinion expressed at the meeting of the British

* According to Donders, the natural tendency of myopia is to advance.

Medical Association in London (1862); namely, that I am unacquainted with any "surgical measure, equally safe and easy of execution, which exerts the same amount of curative power in cases of subacute and chronic posterior choroiditis," as intraocular myotomy.

In April 1860, I treated instances of glaucoma, with very satisfactory results. In the glaucomoid tension well known to practical ophthalmic surgeons, as occasionally following the operation of cataract extraction, where vitreous, even though small in quantity, has been lost, and the iris obliterated from view at the centre of the cicatrix, the operation under consideration removes the tension and restores clear vision. In one case, the tension was not completely overcome until after the incision was repeated, and slightly extended in length.

Previous to adopting this method, I made trial of division of the ciliary structures at a right angle with the cornea, selecting the point where they were continuous with the coloboma. In none, were the symptoms ameliorated; in two, so much aggravated as to suggest the expediency of an immediate enucleation of the globe.

I recommend that the intraocular myotomy should always include the base or pillars of the widest part of the iris. Mr. Teale (British Medical Journal, April 9th, 1864, page 404) appears to have practised, at the suggestion of Mr. Bowman, a somewhat similar, if not an identical, plan of treatment, in two cases in which exalted tension was consequent upon a needle operation for cataract. The first of Mr. Teale's cases occurred nearly a year *after* my papers had appeared in the *Medical Times and Gazette.*

In the glaucomoid state, which sometimes forms a sequela of violent injury to the eyeball, when complicated by dislocation of the lens deeply into the vitreous, no surgical treatment can be relied on as curative of the tension and prophylactic of the occurrence of sympathetic ophthalmia.

Discouraged by the results which I had witnessed in my own practice and that of others, I withheld all surgical interference in the last case that came under my care. The irritation subsided, and no serious sympathetic mischief followed in the fellow organ. The patient was nearly 60 years of age.

In May 1860, the operation—by removing tension from an eye in which the pupil was closed and the iris bossulated (synechia annularis)—cured a sympathetic irritation of the fellow organ, that had existed a year, and which, at the time of treatment, rendered the reading of small type impossible. (*Vide Medical Times and Gazette,* vol. 1861, p. 327.)

The case derived additional interest from showing that the irritation due to an exalted intraocular tension may be imparted to a sound eye.*

In the next year (1861), instances of conical cornea were submitted to treatment. "The sides of the cone became more flat; when opacities were present, they underwent rapid absorption, and if superficial, disappeared. The vision was much improved. These results appear to point to an improved nutrition of the cornea, and a diminution of the secretion of aqueous humour, which, it will be remembered, is derived from the surface of the iris and tips of the ciliary processes

* This fact is, I believe, now (September 1864) conceded, *quoad* glaucoma, by the iridectomy school.

—parts that are immediately implicated by the operation." (*Medical Times and Gazette.*)

In regard to the treatment of nearsightedness by the procedure under discussion, I cannot, Mr. President, close this paper, without referring to certain statements, which were set forth in a letter in the *Lancet* (vol. ii, 1862, Sept.), upwards of two years after the journals and retrospects had given publicity to my method of treating myopia.

In this letter, it is asserted: 1. That I wrote to Mr. Hancock *a few days after* the publication of his paper on Division of the Ciliary Muscle in Glaucoma, in the *Lancet* of Feb. 11th, 1860, inquiring whether he had any *new facts* to communicate. 2. That Mr. Hancock and his colleague Mr. Power wrote to me in reply; and that *very soon afterwards* I visited the Westminster Ophthalmic Hospital, and *had explained to me the application of division of the ciliary muscle to cases of myopia.* 3. That, on my return to Birmingham, I prepared the notices of my cases of myopia which appeared in the BRITISH MEDICAL JOURNAL and *Medical Times and Gazette,* of the respective dates of May 26th and June 1st, 1860.

Very fortunately, the letters to which reference is here made are in my possession; and as Mr. Hancock has allowed, without notice or permission, the publication of a private letter of mine to him, I need feel no delicacy in placing them in your hands, and of my colleagues in the Society, for perusal.

You will observe, sir, that Mr. Hancock's letter is dated May 17th, 1860, is in answer to one from me,*

* I had never before written to either Mr. Hancock or Mr. Power.

and concludes with a request that I would publish my cases.

[It was in the following week I performed for the first time in my life "division of the ciliary muscle", for a knowledge of which I was entirely indebted to the drawing which Mr. Power so courteously and considerately sent me.]

Unable to understand Mr. Hancock's operation, I carefully studied the anatomy of the ciliary muscle, making dissections of the part; I then considered how it would be possible to myotomise, and so relax it. Intraocular myotomy was the result; and until the receipt of Mr. Power's note, I had imagined that Mr. Hancock and myself were working the same procedure.

The letter of Mr. Henry Power is dated, as you see, May 18th; and contains no more than a minute description of the operation of division of the ciliary muscle; and a drawing of conical cornea, showing the direction which the knife should take.

Here, then, are the letters which the writer in the *Lancet* asserts were written in February, and interchanged previously to my visit, "*shortly* afterwards", to the Westminster Ophthalmic Hospital; which visit was followed, he says, by an announcement, in the BRITISH MEDICAL JOURNAL, of my cases of near-sightedness treated by intraocular myotomy. I hand you that JOURNAL; it bears the date of May 26th;*

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* "Mr. J. V. Solomon has hit upon an operation by which the focal range of short-sighted persons, whose corneæ are not conical, may be doubled in length."..... These results have been obtained by dividing in a *transverse* direction some of the fibres of the muscle of the lens—the ciliary muscle."..... "On another occasion, we shall direct the attention of our readers to Mr. Hancock's operation for

just one week later than the letter of Mr. Power, and eight days later than that of Mr. Hancock. In the next week, June 1st, the *Medical Times and Gazette** drew attention to the same subject; and on that day I visited the Westminster Ophthalmic Hospital, and not before since 1850.

If reference be made to the cases published by me in the last mentioned periodical (vol. 1861, January), it will be found they were operated upon in March, April, and May, 1860; therefore, in order to give a colour of probability to Mr. Hancock's claim of having originated the idea of treating near-sightedness by section of the ciliary muscle, it became absolutely necessary to place back the date of that gentleman's letter, and his colleague Mr. Power's, to about February 14th; and my visit to their institution to early in March or the end of February. It was also essential that the date of my letter should be omitted.†

The evidence in refutation of the statements to which allusion has been made, admits of being carried much further. It will suffice, however, to refer

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glaucoma, and point out wherein it differs from the procedure adopted by Mr. Solomon; also, to the latter gentleman's theory of the curative action in glaucoma of Gräfe's and Hancock's operation." (JOURNAL, May 26th, 1860.)

* "In this operation (intraocular myotomy), the incision does not radiate from the lens and ciliary attachment of the iris, as it does in Mr. Hancock's operation for acute glaucoma; hence the diameter of the globe behind the diaphragm (iris) is not increased." (*Medical Times and Gazette.*)

† It has been recently stated that my letter was without date; but it is not asserted that my letter to Mr. Power, and the envelopes, and the notes which have been preserved of the replies, are without dates. Hence there was no excuse for asserting, in October 1864, that the correspondence took place in February.

to Mr. Hancock's organ (the *Lancet*), for a notice that succinctly announces the nature of the cases to which that gentleman and his colleagues had applied their modification of Desmarre's practice. The *Lancet* for July 7th, 1860, p. 7 (six weeks after the notice of my operation appeared in the BRITISH MEDICAL JOURNAL, and five weeks after the distinctive differences of intraocular myotomy and division of the ciliary muscle had been pointed out in the *Medical Times and Gazette*), contains the following :—

"The cases in which division of the ciliary muscle has been resorted to are, hydrophthalmia, sclerotic staphyloma, and acute and chronic glaucoma. It has also been performed in conical cornea by Mr. Power."

There is yet one other operation which has been devised for the relief of glaucoma. "Mr. Nunneley punctures the sclerotic coat with the point of a cataract-knife, not less than one-eighth of an inch behind its junction with the cornea, and carries it on to about the same extent through the cornea, making altogether an incision about one-third of an inch long. Care must be taken to pass the knife sufficiently deep to completely divide these textures, and yet not so deep as to touch the lens." (Vide *Lancet*, January 19th and 26th, 1861.) It is to be regretted that Mr. Nunneley has not published any cases in illustration of the value of his method.

If a retrospect be taken of the operations that have been performed for the relief of eye-tension, which implicate more or less the ciliary muscle, it will be found that Whyte divided some of the fibres of the

muscle *transversely* and *behind* the iris; that Dr. von Gräfe, in the performance of iridectomy for glaucoma, divides the muscle *transversely* and in *front* of the iris; that Dr. Desmarres punctures the muscle in the direction of its radial fibres, and near to its choroid end. Mr. Hancock follows his example, commencing the incision a little nearer to the cornea. In neither of these two operations is the muscle myotomised in the sense in which orthopædic surgeons use the term.

The pretensions of the operation called "division of the ciliary muscle", as a means of relaxing ciliary spasm, etc., will only be admissible when convergent strabismus and wry-neck are proved to be curable by the making of an incision in direction parallel, instead of transverse, to the fibres which are contracted.

Intraocular myotomy differs from the preceding methods by its embodying all the principles of a subcutaneous myotomy. The wound in the corneo-scleral union is valvular;* the ciliary is myotomised at a distance from this opening and behind the iris; the latter membrane is cut close to its origin—in fact, in the same situation and direction as in iridectomy. An important neurotomy is effected by the division of the ciliary nerves, and perhaps filaments of the fifth pair, at the point where they pass from the ciliary muscle into the iris.†

The diagrams on the next leaf show the direc-

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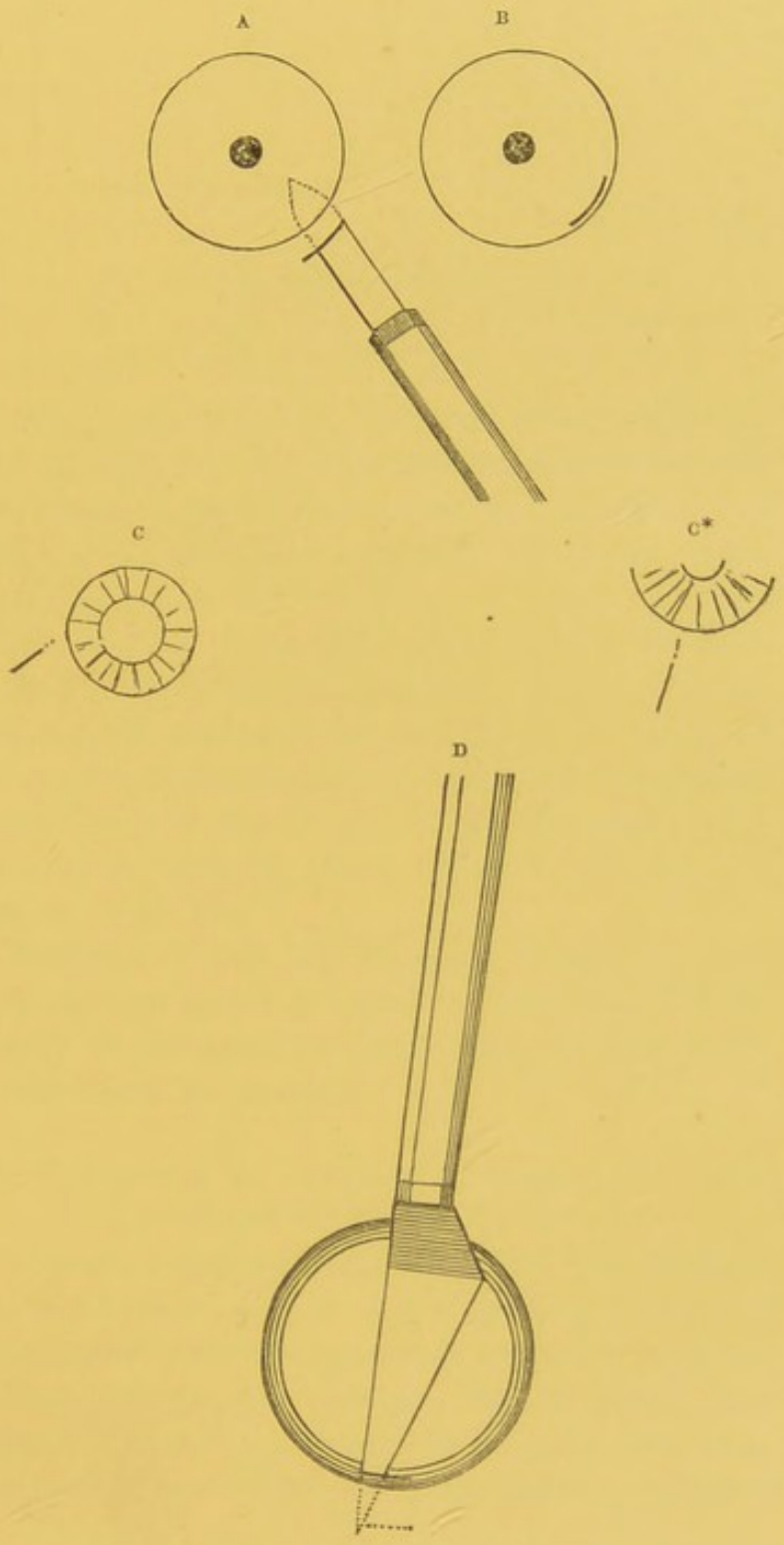
* The opening in iridectomy is sometimes valvular.

† For a reply to the question, "who is to be considered the originator of *division of* the ciliary muscle", *vide* JOURNAL, 1864, page 479.

tion in which, I believe, from the study of their writings, the incision was made by Whyte, Wardrop, and Desmarres; also, the direction in which the tissues are divided in the performance of intraocular myotomy. The diagrams, c c*, have been copied, by tracings, from the first and second editions of Desmarres' work. The dotted lines have been added by me to indicate the sole addition made by Mr. Hancock to the method of incision practised by Desmarres. It will be observed that the obliquity of incision so much insisted upon by that gentleman, as peculiar to his procedure, has been borrowed from Desmarres. The exact distance of the commencement of the puncture from the cornea in the woodcuts of the latter, is three *millimètres*, or about one-tenth of an inch.


A
B
C
C*
D

APPENDIX.

Note to page 8, *line* 14. Since this was printed, Mr. Bowman has conceded that iridectomy is not needful in all cases of exalted eye-tension; but that operations of lesser magnitude are sufficient. (JOURNAL, vol. i, 1864, page 54.)

Note to page 10, *line* 13. If the incision be made with Von Gräfe's bent triangular knife, and proper precautions employed, the number of accidents will be materially diminished. I have done nearly forty operations with this knife in the present year (1864), without any after ill effect, except in one case—an opacity of the lens.

Note page 11, *after line* 14, read "Among the more eminent men who now entertain similar views of the nature of glaucoma as myself, may be named Dr. Donders and Mr. Bowman."

The Rationale of the Treatment of Glaucoma by Iridectomy and Intraocular Myotomy.

"In an interesting letter which Mr. Vose Solomon lately addressed me, on the surgical treatment of short-sight by his new operation *intraocular myotomy*, he says: 'I apply the operation, also, in cases of glaucoma, and find the globe loses its hardness, even when the incision is not followed by an effusion of aqueous

humour. My theory is, that iridectomy and intraocular myotomy cure glaucoma by, in the first instance, cutting away, and, in the other, by dividing some of the ciliary nerves (neurotomy), thereby bringing about a more healthy action in the ciliary ganglion; or, in other words, a more normal nutrition. After intraocular myotomy, as after iridectomy, an atrophied globe becomes plump. My theory appears to explain everything that iridectomy effects, which the theory of exosmosis fails to do.'

"This theory deserves investigation, and, indeed, appears to me as plausible, and even more so, than any other theory with which I am acquainted, which attempts to account for the curative influence of iridectomy." (Extracted from Mr. Square's Address in Ophthalmic Surgery, delivered at the meeting of the British Medical Association at Torquay in 1860. *Vide* JOURNAL, vol. 1860, p. 762.)

Glaucoma a Disease of Secretion.

In October 1860, I forwarded to the editor of the *Medical Times and Gazette*, a series of papers, on Incision of the Ciliary Muscle, etc., to which publicity was given on January 19, 1861.

From the first article, the following is extracted :—

"I proceed to offer a few remarks on the effect of the operation (intraocular myotomy) *on the internal circulation and secretions of the eye.*"

"The subjective appearance of light (*photopsy*) commonly subsides in the evening of the operation, and does not recur."

"I have witnessed this result in choroido-retinal congestion of four years' duration."

"The circulation in the choroid being regulated, we shall be prepared to find that the stony hardness of the globe in glaucoma is cured or relieved."

"Having ascertained these to be facts, and that improvement takes place in the size and tension of atrophied eyeballs after they have been submitted to enocular myotomy, I am led to the conclusion that the secretory functions of the eye assume a more healthy action; or, to speak more comprehensively, the nutrition is improved."

"Moreover, conical cornea—a disease which is not permanently improved by (mere) paracentesis—derives considerable benefit from incision of the ciliary muscle. The sides of the cornea become more flat; etc..... These results appear to point to an improved nutrition in the cornea, and to a diminution of the aqueous secretion; which, it will be remembered, is furnished by the iris and tips of the ciliary processes —parts that are immediately implicated in the operation."

"Intraocular myotomy exerts a marked influence upon the circulation of the choroid, quite irrespective of any loss of vitreous or aqueous humour which may attend its performance..... If I can succeed in establishing this proposition, it will follow that the operation must influence the condition of the vitreous humour and lens, which depend upon the choroid for their nutrition, and which suffer in so marked a manner in glaucoma and choroiditis."

"*The existence of ganglion cells in the choroid,* and the arrangement of its vessels, indicate its importance in the nutrition of the eye."

I submit, the preceding extracts prove that at the

time they were written, I considered glaucoma to be a disease of the ganglionic nerves and of the secretions of the eye; consequently, neurotomy of the nerves in fault became a rational and physiological proceeding. I had thought of more fully stating my views; but was advised by a friend, in whose judgment I placed reliance, not to do so, lest an objection to my theory might deter any one from dispassionately considering my operation.

In acute glaucoma, the vitreous humour is in greater, and the aqueous humour in less quantity than in health; the vitreous humour, at the same time, being much firmer. Any one who has performed paracentesis in acute typical glaucoma, must have been struck with the larger volume and greater resistance of the vitreous humour after the aqueous humour has been drawn off, as compared with a tolerably healthy eye after paracentesis.

Histological Anatomy of the Ciliary Muscle from Donders.

"The fibres arise in great part from the outer layers of vitreous fibres, in which the membrana Descemetii subdivides, while the innermost layers of these fibres spread as ligamentum pectinatum on the iris. The muscular fibres form fasciculi, of which the most external, connected in long-extended networks, run backwards parallel to the upper surface of the sclerotic and pass into the several laminæ of the choroid. Internally, the meshes of the nets become gradually shorter, and, finally, mostly spread out in a circular direction, so that the fasciculi here acquire rather a circular than an antero-posterior direction.

This innermost portion of the ciliary muscle is connected with the choroidal tissue in the place where the corpus ciliare passes from without inwards. If we cut out a piece of the conjoined membranes, and with forceps seize the whole breadth of the portion of the iris near its insertion and tear it off, the innermost part of the ciliary muscle remains attached to the outer surface of the ciliary process, while the most external portion continues lying on the sclerotic and connected with the extreme outer layers of the choroid, which are not torn off. We can thus divide the muscle into two parts, as is described in Von Reeken's dissertation. The networks of the fasciculi of the innermost portion possess, as is there also represented, a more circular direction. H. Müller has subsequently described these as a separate muscle. He has the merit of having thereby directed attention to this innermost part. That it does not, however, deserve to be considered as a separate muscle, is clearly shown by the above-described gradual transition from the one direction to the other. It seems most probable, that no contractile elements, except those of the iris and of the ciliary muscle, can come into play in accommodation."

This account of the anatomy of the ciliary muscle is given as being the most recent. I do not know that it is the most accurate.

CASES ILLUSTRATIVE OF THE TREATMENT OF GLAUCOMA; TENSION OF THE EYE-BALL, &c., BY MEDICINES; AND BY VARIOUS SURGICAL OPERATIONS.

Case I. *Incipient Glaucoma cured by Medicines.* Mrs. H., aged 38, married, an artificial flower (black crape) maker, was admitted March 8th, 1864.

For the last six months, she had noticed a red ring round the flame of a candle. When at work, her sight sometimes gave way, and returned after closing the eyelids. If she read, the lines of print (not the letters) almost immediately ran into one another. The smallest type she could read was small pica (Jaeger's No. 8). There was almost constant dull heavy pain in the forehead. There was no photopsy. The pupils were not dilated, but sluggish. The iris presented a normal plane. The choroid veins on the surface of each sclerotic were numerous and much enlarged. The tension of the right eye, which was the worst, was augmented (T + 1); that of the left T + ? The temporal and nasal field of vision was contracted; the vertical field being normal. There was no cupping of the optic nerve-entrances (discs); the

venous systems of the retina and choroid were much gorged.

℞ Liquor. hydrargyri bichloridi ʒiss ; tincturæ ferri sesquichlor. ʒij ; tincturæ conii ʒiv ; infusi quassiæ ad ʒviij. M. Sumat ʒj ter die statim post pastum.

Sumat pil. aloës cum myrrhâ ℈ss alternis noctibus. Mitte doses iii.

The eyes were ordered to be rested.

On the eighteenth day of this treatment, the tension in both eyes was normal. It had been distinctly augmented in the left, as well as the right, after the first visit. The zone around the candle-flame had disappeared. The field of vision was enlarged. She could read five or six lines of No. 8 without apparent coalescence of the lines. The mercury was now discontinued, and a mild aperient and alkaline bitter mixture taken by the patient.

On the thirty-third day of the treatment (April 15th), the patient could read pearl type (No. 2), and forty-eight lines of small pica without experiencing confusion. The veins on the sclerotica were diminished much in size and number. Tension was normal, and the field of vision nearly so.

May 4th. She considered her eye to be quite well; the scleroticæ were of good colour and bright in both eyes. They were free from vascularity, except at two or three limited points in the right, in which were some old varicosities (muscular veins), which had a flattened appearance. Tension was normal.

This patient is *embonpoint*, of florid complexion, good general health, and of hopeful disposition. So soon as her complexion began to pale, the bichloride

was discontinued. She has never worn spectacles, nor been affected with presbyopia or intercurrent obscurations.

I consider this case to be of the nature which I have designated it, because there were present, increased tension; contraction of the field of vision; a halo around a candle-flame; congestion of the anterior ciliary and muscular veins; and impaired vision; with a dull heavy pain in the forehead.

Under a treatment purely medical and hygienic, the whole of the symptoms have been subdued.

Case II. *Glaucoma; Complete Loss of Sight of the Right Eye; Reduction of Tension and Recovery of Vision from a purely Medical Treatment; Iridescent Vision in the Left, with Normal Field, and Acuteness of Vision.* A young lady, single, aged 19, of excellent general health, who had recently experienced some anxiety of mind, was seized with aching pain in the right brow and side of the head, accompanied by dimness of vision of the right eye, which gradually ended in blindness.

In seven days from the commencement of the disease (Oct. 6th, 1863), I was consulted. The vision at this time was abolished, so that the brightest light failed to impress the retina. The pupil was slightly dilated and motionless. The globe, which was devoid of congestion, was very tense (T 2). The fundus of the eye was clouded; the retinal vessels were not enlarged, and could be traced only a very short distance over the choroid; they were curved abruptly at the margin of the optic disc. The patient, a very intelligent girl, had never experienced iridescent vision. The tension of the left eye was slightly augmented

(T 1—1½); but, with this exception, and the presence of iridescent vision, which commenced at the onset of the attack in the right, the organ was perfectly normal in all respects. Its accommodation for brilliant type, its field of vision, and ability to bear fatigue, and the condition of the fundus, were healthy.

I directed four leeches to be applied to the right lower eyelid; and a blister to the nape of the neck, which was to be kept open; also perfect rest of the eyes, in a moderated light. Internally, mercury was given in two forms. The bichloride of mercury, with tincture of sesquichloride of iron, in a mixture, and grey powder in combination with henbane, as a pill, and a diet of milk and beef-tea, were ordered.

On the 8th, shadows were perceptible.

On the 10th, the retinal artery, where it lies on the optic disc, appeared to be empty, without any pressure by the finger.

On the 12th, features could be discerned, but not with anything like distinctness. The mouth became sore, and the depression which commonly attends that state manifest; for the relief of which, sherry negus was added to the diet, and the quantity of mercury diminished.

On October 31st, the twenty-fifth day of the treatment, the patient read two-line great primer (Jaeger's No. 16).

On November 6th, great primer (No. 12) was read.

On December 16th, the sixth week of treatment, the pupil was more dilated than normal. I therefore applied a small bit of Calabar bean paper; the contraction from which being excessive (myosis), I placed

a concave glass of 48" positive focus before the eye, and the patient read brilliant type (Jaeger's No. 1) with facility.

This young lady resided nine miles from Birmingham; consequently, I saw her only two or three times in eight or nine days. The family practitioner, Mr. Haden of Sedgley, most kindly carried out my views in the intervals. On two or three occasions previously to the vision becoming distinct, I found the progress of the case arrested, and the tension greater than at my last visit. This condition was met by the application of a single leech to the lower lid, which had the effect of putting in motion the powers of repair.

As the vision and tension gradually improved, the patient became sensible of the presence of iridisation in the *right* as well as in the left eye. For a time, the nasal field of vision was abolished, there being good perception of large objects on the temporal side.

The group of symptoms upon which I based my opinion, that the preceding case was one of glaucoma, was the blindness, the augmented tension, and the cupping of the optic nerve-entrance. The presence of iridisation in the companion organ from the first onset of the disease, and its occurrence in the one first affected so soon as the retina began to recover its power of receiving impressions from external objects, together with the abolition of the nasal field of vision, afforded confirmatory evidence, had such been needed, in order to make the diagnosis clear. In proportion as we obtain our information from clinical sources—from the book of nature—so

do we find how comparatively rare are typical portraits of disease, as given in our manuals and handbooks, to be met with in practice. In this instance, for example, the disorder was not preceded by far-sightedness (presbyopia). The external veins of the choroid were not congested, and the retinal veins were not gorged; nor did the artery present that rare and beautiful phenomenon—spontaneous pulsation. Moreover, iridisation, or the appearance of a rainbow or halo round the flame of a candle, instead of preceding, followed the blindness.

Case III. *Chronic (non-inflammatory?) Glaucoma of Left Eye treated by Paracentesis of the Cornea: Vision much Improved. Enucleation of the Right Globe, which was staphylomatous, disorganised, and blind.* (From notes by Mr. Arthur Bracey, House-Surgeon.) Jas. Dixon, aged 42, a plumber, was admitted October 18th, 1863, suffering from chronic glaucoma; and cachexia, a result of asthma, which has been persistent for many years. The right eye has been disorganised by glaucomatous degeneration. It is blind, hard as a stone (T 3); the sclerotic is thin, and bulged in the centre. The disease commenced Christmas 1862, with dimness of vision and iridescent vision. The eye got gradually worse, and in six or eight months ("the following summer") all perception of light was lost. The left showed symptoms of disease soon after the first was affected. The vision was dull; a halo surrounded a candle-flame; and, on dark afternoons, he was practically blind, all objects appearing as shadows only. The tension was great (T 2½). The left optic disc was of a slate or grey colour; the sclero-choroid foramen was much widened

out; cupping was not apparent; but there was a deep shadow on the disc. The retinal veins were large, more especially the upper branch; the arteries were very small. He could not see to read or write. The temporal field of vision was nine inches.

On October 24th and November 17th, paracentesis was performed; and on the 24th, the patient consented to the removal of the right globe. Neither chloroform nor ether was administered, in consequence of the general emphysema of the lungs.

Dec. 1st. He read minion type (Jaeger's No. 4). The patient attributed his improvement to the removal of the disorganised eye. He read and wrote for his amusement.

Dec. 18th. Paracentesis of the cornea was performed.

Dec. 20th. There was much tension.

Dec. 24th. He read pearl type (Jaeger's No. 2) with ease.

Jan. 15th, 1864. Tension was reduced to 1. He read No. 2, and, with a convex glass of 16", brilliant type (or Jaeger's No. 1). The lateral field of vision on the temporal side was more than three feet; on the nasal side, it was eleven inches. He complained of a musca interfering with the field of vision.

Feb. 2nd. The tension had increased the last few days. The musca, which was of the size of a small fly, was now, he said, as big as a butterfly. He read No. 2, and No. 1 with a convex glass. When standing at a distance of eighteen inches from the patient's eye, the nasal field measured fourteen inches, and the temporal more than three feet.

Feb. 15th. He read, unaided by glasses, No. 1 imperfectly; No. 2 with facility.

May 13th. Tension is as on admission; viz., T $2\frac{1}{2}$. The field of vision is the same as on February 2nd. With a thirty-inch double convex, he reads brilliant type (No. 1) without difficulty. Although considerable attention has been given to his asthma, and he has been taken into the hospital from time to time for the advantages of temperature and diet, etc., his general appearance is as shattered as on his first admission.*

This man, with two cases in which iridectomy had been performed, was presented to the Midland Medical Society.

Case iv. *Sympathetic Internal Ophthalmia, with Glaucomoid Tension (T $2\frac{1}{2}$). Intraocular Myotomy, followed by Cure.* T. B., a brass-founder, aged 58, had the left eye destroyed by a traumatic ophthalmitis, which excited a sympathetic choroido-iritis in the right. The disorganised globe was enucleated on July 9th, 1861.

July 23rd. The right eye was very tense (T $2\frac{1}{2}$), but not of stony hardness. He could not distinguish features, or see to cut his own food. The iris responded freely to atropine. Under the ophthalmoscope, the lens-capsule exhibited a granular and speckled appearance from exudation into its intracapsular cells; the vitreous humour was too turbid to admit of the fundus being seen.

Intraocular myotomy was at once performed; and, in seven days afterwards (July 30th), the patient

* Since this date, the tension became normal, and the musca so small, that he could follow his trade as a painter.

read small pica (Jaeger's No. 8) with a sixteen-inch convex glass. In two days later (August 2nd), he was submitted again to an ophthalmoscopic examination, when the vitreous humour was found clear, and the optic disc and retinal circulation were readily focused. The lens-capsule had still a granular aspect, although perhaps less so than before the operation. On the 9th of August, the patient, with the aid of the spectacles which it had been his habit to wear for the last twelve months, read bourgeois type (Jaeger's No. 4).

Among the early effects of the treatment was a restoration of the natural elasticity of the globe, which has, I believe, proved permanent. At the end of August, the man resumed his work.

It is curious that, after the intraocular myotomy, his old spectacles occasioned no inconvenience whatever, presenting, in this respect, one of the several paradoxes which meet investigators of optical accommodation.

In the following case, the state of the optical accommodation, before and after section of the ciliary structures, has been noted.

Case v. *Glaucomoid Tension* (*T* 2½) *of the Right Eye; Intraocular Myotomy; Cure. Synechia Posterior of the Left. Iridectomy; Cure. State of Accommodation and Vision before and after Operation.* Emma B., aged 39, was admitted with subacute corneitis and irido-choroiditis (specific) of the right eye, on February 28th, 1862. In the left were numerous and broad adhesions of the iris to the lens (synechia posterior), but no inflammation. She was suffering, at the time of her admission, from severe ptyalism and great

physical weakness. The right eye had been diseased since two weeks after Christmas 1861; and the left, two weeks before. After the employment of tonics and chlorate of potash, with residence in a pure air, she could read, on May 23rd, Jaeger's No. 12, or great primer, with either eye; nothing smaller. She was highly presbyopic. The right globe was very tense (T $2\frac{1}{2}$); and the ophthalmoscope showed the vitreous body to be diffusely turbid, and the vessels of the retina very minute. *Intraocular myotomy* was performed on May 31st, with a view to reduce tension, and to improve the state of the vitreous body, and the circulation of the choroid and retina. A small bit of the left iris was removed in an outward and downward direction, so as to restore the communication between the two chambers to a more physiological condition.

In six days (June 6th), the tension of the right was normal, and brilliant type (Jaeger's No. 1) read by it at seven inches. No. 4 (Jaeger's) was the smallest type read by the left. No. 12 (great primer) was now comfortably read at twelve inches instead of twenty-one, indicating an increase of the curve of the cornea.

June 18th. The limits of distinct vision were, for No. 1, six and eleven inches respectively; for small pica (Jaeger's No. 8), five inches and twenty-one respectively. With the right eye, which was the best, a fine needle could be threaded. Features were clear at a normal distance.

I have not heard of this patient since the end of 1862, at which date no deterioration had taken place in her visual power. There was no relapse of tension when she last was seen.

Case vi. *Traumatic Cataract; Choroiditis and Great Tension Unrelieved by the Extraction of the Cataract; Intraocular Myotomy, followed by Cure.* Edward A., aged 40, was admitted an out-patient in June 1861, with traumatic cataract of the left eye, from a blow received four weeks before. The soft lens matter was removed by Gibson's operation (the linear extraction of Von Gräfe), and the pupil maintained well dilated by atropine. Nevertheless, the choroiditis and great tension which existed on his admission continued. On June 11th, the tension was very great, and the vitreous humour was turbid. A convex glass rendered the vision worse. Intraocular myotomy was performed to-day, and fluid discharged from the eye. In ten days (June 21st), the tension was normal. With a two-and-a-half-inch glass, the patient reads a few words of great primer (Jäger's 12). On August 2nd, three weeks after operation, the eye was normal as respects tension and choroiditis. Minion type (Jäger's No. 4) could be read with ease. No relapse occurred.

Case vii. *Subacute Glaucoma Supervening on the Depression of the Nucleus of a Cataractous Lens; Intraocular Myotomy, followed by Relief to Pain and Tension; Cure.* Mrs. T. was operated upon by solution for cataract in the left eye, and the small hard nucleus was depressed, in August 1859. Her health was, and had been, very feeble.

On May 4th, 1860, the globe was hard; the choroid veins were enlarged; and vessels extended over the margin of the cornea, which membrane presented scattered opacities. The vitreous humour was turbid; yet, in the absence of the neuralgic pains, from which

she suffered severely, the vision was reported to be good. Intraocular myotomy was performed to-day. The muscle, or a false membrane, behind the iris, cut like ligament. A full discharge of straw-coloured fluid followed the incision. In four days (May 8th), the eye was easier than it had been for the last six weeks. In consequence of the illness of her husband, the patient failed to attend again till August 28th, 1860. On that day, the enlargement of the ciliary vessels was nearly gone; in place of a ring of broad dilated vessels, a few of small calibre only remained. The tension had given place to elasticity. With a two-and-a-half-inch double convex lens, she read pica type. The neuralgic pains have been less severe and frequent ever since the operation; they were relieved by the use of atropine drops. On November 7th, the eye was normal, and possessed clear vision for small type, when aided by a cataract-glass.

This case is not altogether conclusive, as very severe irritation, occurring after depression, sometimes completely subsides on the absorption of the lens, and excellent vision is obtained. But I have never seen such a result where the cornea had become opaque and vascular, as in this patient.

In two years afterwards, I extracted, through a full section of the cornea, the lens of the right eye. She left the hospital in a fortnight, with an eye as perfect as is possible after such a surgical operation.

Case viii. *Myopia; Subacute Glaucoma; Intraocular Myotomy, followed by Improvement; Relapse at the end of two years.* A cane-splitter, aged 38, who had been near-sighted all his life, was admitted June 1862. The right eye had always been very imperfect;

and since an accident which occurred to it about eighteen months before, the vision had been gradually lost. The left, which had been growing more near-sighted, was rendered dim and still more myopic by the accident. When he moved his eyes quickly, flashes were seen. In about six months from the occurrence of the injury, he ceased to be able to read; and experienced so great difficulty in getting about in the dusk of evening, that sometimes he inadvertently ran up against persons in the street.

On his admission, a thin, diffused opacity occupied the middle third or fourth of the cornea. It appeared to be of old date. The eyeballs were of stony hardness; the pupils were dilated; intercurrent obscurations and iridisation were experienced. The field of vision was much contracted. He suffered from constant frontal headache, and saw objects like stars during the day. He could see to cut his nails at about five inches; but not his dinner. Roman type (Jäger's No. 20) could not be read. Most of these symptoms were observed by the patient to occur about six weeks after the injury to the right eye.

On June 7th, 1862, intraocular myotomy was performed on both eyes.

June 21st. For several days he had been able to read No. 20 at sixteen inches with clearness, and could cut his finger-nails at seventeen inches.

July 1st. The optic discs were gray and slightly cupped. The vessels on the right were much curved, on the left very attenuated. A narrow staphyloma posticum surmounted the upper circle of each disc. The tension of the left globe was much diminished. He could now see finger-nails at twenty-four inches,

instead of five only. The frontal headache, flashes, etc., subsided immediately after the operation.

July 29th. Features were distinct at two yards. With a concave eighteen-inch lens, vision was much improved.

The necessities of the poor man's family obliged his return to work almost immediately after these notes were taken. At the end of two years (I had occasionally seen him in the intervals, and found the reduced tension maintained), he returned to me with hardness of the eyeball and impaired vision.

Remarks. The supervention of glaucoma, or even exalted eye-tension, upon the myopic condition, is a most serious complication, and should be at once met by a surgical operation that is competent to remove the intraocular pressure. For the relief of this state in some, I have performed iridectomy; in others, "division of the ciliary muscle", as it has been called. The results have not been very satisfactory, although no accident marred the operations. With one exception, the disease was far advanced. Among the illustrations of the treatment of glaucoma by iridectomy, instances will be related in which the relief following the operation was not maintained. Indeed, it seems unreasonable for surgeons to have anticipated that it should be otherwise, when we consider the great tendency to atrophy of the tissues which marks the progress of the disease under consideration, and, moreover, that atrophy of the optic nerve-fibres will occasionally precede the occurrence of eye-tension. If my theory be correct, that the operation beneficially affects the nutrition of the eye through the ciliary ganglion, the early application

of intraocular myotomy or iridectomy in certain carefully selected cases of atrophy of the optic nerve, would be sound practice.

Case ix. *Chronic Glaucoma; Intraocular Myotomy; Cure.* Mrs. B., aged 40, was admitted March 31st, 1860, has had symptoms of glaucoma in the right eye for nearly four years, and in the left for fifteen months. The right eye presented chronic glaucoma, opacity of the lens, and stony hardness of the globe. There was complete amaurosis. The left eye was of stony hardness; tension, T 3; the cornea was of normal curvature; its sensibility below par; the sclerotic was white, like porcelain; the ciliary vessels were enlarged, tortuous, and pink; the pupil was dilated and motionless; the iris was bright and convexed, so that the anterior chamber was shallow. The humours were pellucid. She read, with convex glasses, small-pica (No. 8 Jäger); but it was not clear at any time.

Intraocular myotomy was performed, April 10th, on the right eye; on April 14th, on the left. Both eyes lost their hardness, and the vision of the left became clear and steady. She wrote on June 17th, "the mist through which I used to see objects has vanished away." When last heard of (Nov. 29th, 1860), the improvement was retained.

Case x. *Amaurosis (T 3); Excavation of the Optic Disc; Intraocular Myotomy; Temporary Restoration of Vision.* J. O., aged 70, was admitted July 23rd, 1861. He was exceedingly deaf, and was sent to me by my friend Dr. Warden. Both eyes were of stony hardness. The left had been blind two years; the right about six months. His face was livid, and the integuments of the nose were highly hypertrophied. He

denied having been other than a sober man. In the right eye, there was atrophy of the optic nerve. The retinal arteries were very minute; the veins, which were very irregular, indicated cupping by being interrupted at the lower rim of the disc. Intraocular myotomy was performed as a *dernier ressort*. He was ordered to have a blister behind the ear. In seven days (July 30th) tension was diminished; the patient recognised shadows of fingers and the window-frame. In fourteen days after the operation, he counted fingers, and made out a word of No. 18 (Jäger's). The tension was too great, but not excessive.

September 9th. He read Roman type (Jäger's 20). Features were clear to him at two feet distance.

October 14th. There was a relapse. He could not read No. 20, although the tension was normal. The optic nerve exhibited advanced atrophy; the vitreous humour was more clear than heretofore. Spectacles did not relieve him.

Case xi. *Chronic Glaucoma; Objective Symptoms and Pain removed by Intraocular Myotomy.* L. H., aged 65, admitted May 15th, 1860. She had been stone-blind and suffering great pain for eight months. The eyes were hard as stones; the corneæ rough and vascular; the conjunctivæ injected; the pupils widely dilated; the lenses opaque and green; the irides were of a dull lead hue.

On May 15th, intraocular myotomy was performed on both eyes, for the relief of pain. On the 25th, it was repeated on the right eye.

July 30th. Tension was moderate; there was no pain; the corneæ were clear. The patient's vision was as on her admission.

Case xii. *Chronic Sclero-choroiditis; Eyeball soft; Vision and Normal Tension restored by Intraocular Myotomy, aided by Medicines.* Mary M., aged 48, was admitted Feb. 26th, 1861. The right sclerotic was covered with minute vessels; the conjunctiva was healthy. The cornea, at its inner and lower fourth, was clear; the remainder was covered by thin patches of opacity. There was no pain. She could not see features; all objects were slate-coloured. She had iridescent vision; no flashes; the globe was soft. The symptoms had existed a month. Medical treatment was employed.

April 2nd. All objects were of a slate colour; the vitreous humour was turbid. Features were not recognisable. The eye was of normal size, but soft. The cornea was more arched than in the opposite eye. Intraocular myotomy was performed to-day; and was followed by a free discharge of watery fluid. In seven days, features were clear.

From April 16th to April 30th, a little grey powder, with conium, was given twice a day; afterwards, cod-liver oil for a month.

On June 4th, two months after the operations, the eyeball had acquired a normal tension. The sclerotic had a yellow shade; no vascularity. With a 16-inch double convex spectacle, the patient read small pica with ease. The optic nerve appeared tumid, blanched, and dull; the retinal vessels on the disc were normal, but their branches were short, and the one which passes towards the yellow spot was very slender.

Past History. She stated that fourteen years previously, the eye became suddenly red and painful;

every object appeared as in a cloud. The vision went and came; rainbows surrounded a candle-flame. There were no flashes. After six months' medical treatment, vision was nearly as good as in the healthy eye. Six years ago, she had similar symptoms—recurrent obscurations, rainbows. She could not see the features of her baby.

Case xiii. *Right Eye Amblyopic. Left Choroiditis. Tension not Excessive (?). Intraocular Myotomy. Great Improvement.* Mrs. K., aged 47, had worn 7-inch double convex glasses since the age of 10 (hypermetropia?). The right eye exhibited signs of a past choroido-iritis. The whole of the lens, except the middle third, was covered by black pigment. The sclerotic was white and glassy, from atrophy of the subconjunctival areolar tissue. The field of vision was contracted. The sight was so imperfect that features could not be distinguished. Eight years previously, she consulted an ophthalmic surgeon, who declared the back of the inner eye to be inflamed. Since this, the sight had gradually failed, and the field of vision became contracted.

For the last four months, similar symptoms had affected the left eye, as led to the loss of sight in the right; all objects were enveloped in a mist. Reading was impossible. When the patient attempted to use the eyes, shooting pains affected them; even when at rest, they felt tired, and tight, as if covered by starch. Dark clouds and flashes were present. The pupil was dilated and sluggish; the sclera white and glassy looking (choroiditis).

Aften ten days of medical treatment, intraocular myotomy was performed on April 20th, 1860, for the

relief of pain. It was followed by enlargement of the field of vision and clearer sight.

On May 4th, 1860, the left was submitted to a similar operation. Very little aqueous humour escaped. In seven days, vision was clearer. On July 10th, the patient could read two pages of an octavo volume, thread a needle, and sew a little. On Nov. 23rd, the right eye could distinguish features at three yards, and on bright days at five. The left eye bore more work than in July; and the vision was sharper. The pupil was larger than normal, and the expression of the eye was languid. The surgical treatment was supplemented by tonics. The patient stated that previously to the operation, the eyes grew worse daily.

Case xiv. *Choroido-Retinal Irritation. Tension Diminished. Intraocular Myotomy. Great Improvement.* Mrs. E., aged 36, florid and healthy, came under treatment on April 24th, 1860. She had worn 10-inch double convex spectacles since 8 years of age (hypermetropia?). During the last seven years, she said, she had been near-sighted; and for four years —the last twelve months especially—the sight had diminished in vigour (amblyopia and hypermetropia). Bright objects occasioned great distress; light and the movements of the eyeball excited pain. Muscæ volitantes were present. There were no flashes. She could not read or sew with or without spectacles. The sight sometimes left the eyes for a quarter of an hour. The eyes were softer to the touch than natural. The pupils were of medium diameter; the external tissues and iris appeared healthy.

Intraocular myotomy was performed upon the left

eye on May 4th; and on the right eye on May 15th. In a month, she could read and use her needle with comfort. On Nov. 30th, 1860, she wore 14-inch convex glasses, and could work her eyes on minute and near objects for long hours without distress. The features of persons were stated to be clear across the street.

These two cases illustrate the effect of my operation upon the general nutrition of the eye. The circulation in the choroid and retina was regulated, and the secretion of the vitreous and aqueous humours improved. Whatever the *rationale* may be, it will be admitted that the grand practical result desiderated in all treatment of disease was attained; namely, the restoration of a disabled and, in these instances, important organ to a state of usefulness and pleasurable enjoyment in the exercise of its function.

Case xv. *Much impaired Vision from Chronic Choroid Disease; no Tension. After Intraocular Myotomy, Pearl Type was read; after Tenotomy of the Inner Rectus for the Relief of a Squint, the furthest Limit of near Accommodation was curtailed.* (From notes by Mr. A. Bracey, Clinical Assistant, now House-Surgeon.) E. F. aged 17, florid, healthy, and hysterical, although the catamenia had been regular since the age of 13, was admitted an in-patient on May 13th, 1862. Six years ago, her left eye became affected with a spasmodic internal squint and dimness of vision. In the course of two years, she suffered from flashes in the dark (photopsy), and pain in the eye and orbit.

When she squinted, the ocular pain was so great that she had to lie down. She could not face bright

light, because it excited so much pain and dimness of vision. These symptoms lasted for a quarter of an hour.

In April 1862, the photopsy yielded to medical treatment.

May 20th. At whatever distance objects were viewed by the left eye, they appeared dim. She could pick out a few words of small pica type (Jäger's No. 8), but they were not clear. The choroid was much congested; it presented a narrow insulated patch of pigment at the outer side of the optic disc. The right eye was healthy. Intraocular myotomy was performed to-day on the left.

On May 30th, pearl type (Jäger's No. 2) was read with distinctness. The limits of distinct vision for small pica (Jäger's No. 8) were respectively four and a half inches and eighteen. In the right, they were four inches and thirty respectively. The squint remained just the same as on admission, which proved the impaired vision was not dependent on its presence. Subconjunctival tenotomy was now performed. In eight days afterwards, brilliant type (Jäger's No. 1) was read at three and a half and seven and a half inches, and No. 8 at three inches and fourteen inches.

Resumé. From a state of practical blindness as regards small type, the left eye was enabled by the operation to read pearl type.

The removal of the squint had the effect of increasing the acuteness of vision in the operated eye, and of diminishing its near and far point of distinct vision for pica type.

Before the squint-operation, the limits of accom-

modation in the left were, for small pica, four and a half inches and eighteen inches respectively; afterwards, three inches and fourteen inches respectively.

It is remarkable that the removal of the convergent squint should curtail the accommodation, inasmuch as it is generally held by authorities on optical adjustment that contraction of the ciliary muscles and the associated convergence of the optic lines conduce to an increased refraction of the eye. I may remark, it has been recently asserted that the cure of convergent squint is sometimes a cause of hypermetropia.

Case xvi. *Glaucoma. Division of Ciliary Muscle. Temporary Relief. Relapse.* James Taylor, aged 22, a strong and healthy labourer, admitted into the Eye Hospital on Dec. 4th, 1860. Three weeks previously, he went to bed quite well; towards morning, severe aching pain, attended by lacrymation, seized the left eye. At daylight, the eye was found blind, even to firelight. He had not had rheumatism, or gout, or syphilis.

Present State. There was acute external congestion of the globe, attended by a copious serous discharge. The humours were turbid, more especially behind the iris; the pupil was moderately dilated. The eye was blind to the light of day. The eyeball was hard; but not of stony hardness. He had no pain. The light of a lamp, reflected by the ophthalmoscope, failed to penetrate the pupil.

The ciliary muscle was divided at a right angle with the rim of the cornea. A little vitreous humour escaped; the chambers became clear; and the patient could see features.

December 6th, 4 P.M. The eye was examined; the patient said he could distinguish features.

December 9th. The tension of the left was the same as that of the right eye.

December 13th. Vision had improved up to this date. To-day, it was more dim; the humours were turbid. He was ordered to take quinine.

December 21st. There was still considerable turbidity of the humours. Vision was very misty.

December 24th. He was made, at his own request, an out-patient. He attended for several weeks. The hardness returned to the eye; with confirmed amblyopia.

These notes have been abridged from voluminous records taken by Mr. Sidney Proctor, at that time house-surgeon of the hospital, who, like myself, took the greatest possible interest in the case. Unhappily, the result, to our serious disappointment, was precisely the same as in a parallel case which had been recently treated by one of my colleagues with medicines alone.

CASE XVII. *Partial Staphyloma of the Cornea cured by Division of the Ciliary Muscle. Relapse. Iridectomy. Permanent Relief.* James Dews, aged 34, collier, was admitted into the hospital on Nov. 20th, 1861, with a large staphyloma of the cornea, the result of an injury thirteen weeks previously. It was at once removed by the knife, and the patient discharged cured on December 4th. At this date, the surface was flat, and there was a good deal of clear cornea above it; behind which it was designed, at a future day, to make an artificial pupil.

On December 21st, he returned to the hospital with

the eye much inflamed (catarrho-rheumatic ophthalmia). The new corneal material had yielded to the pressure from the increased secretion, and a large staphyloma was again present. Leeches, and calomel and Dover's powder at bedtime, were ordered.

December 22nd. Division of the ciliary muscle was performed; much vitreous humour escaped.

December 25th. The staphyloma was cured.

Vitreous humour protruded through the wound up to Feb. 5th, 1862, when it had healed; and the cornea was flat.

Feb. 8th. He was made an out-patient.

Feb. 16th. The staphyloma had returned; and on the 20th, iridectomy was performed.

Feb. 25th. The staphyloma was gone. He had perception of light.

There was no relapse after this date.

Case xviii. *Acute Choroido-iritis in a Diabetic Subject. Division of the Ciliary Muscle: no Relief. Iridectomy: Relief to Pain and Tension, etc.* A feeble young woman, aged 26, who was suffering from diabetes (urine of specific gravity 1035), applied at the hospital May 28th, 1861, with acute choroido-iritis. There were great tension and considerable external congestion; the ciliary veins were large; the iris and chambers dull. She had agonising pain. Division of the ciliary muscle was performed. Bark was administered internally; and atropine drops used.

In three days (May 31st), the pupil was of medium size; the chambers were dull; the globe of stony hardness; the conjunctiva thickened. She had great pain. Iridectomy was performed. The forceps brought out a sheet of lymph; after which, the

chambers, pupil, and iris, became clear. The conjunctiva cut like brawn. Hot fomentations were applied for a few hours. Beef-tea, eggs, and milk, were ordered.

June 1st. There was less tension; but trifling pain since the operation. The external congestion was gone. No vomiting occurred from chloroform.

June 3rd. There was no pain. The tension of the eye was below normal. The wound was healed. The vitreous humour and iris were turbid. She recognised fingers.

June 4th. The chambers were filled with turbid lymph as on admission. At the upper part of the coloboma, there was a communication between the two chambers. She had no pain; the globe was flaccid. She perceived the shadow of fingers. At her own request, she was permitted to return home. On that day, the iris was recovering its lustre; a sheet of greenish-brown lymph filled the whole of the coloboma, except at the upper part.

June 15th. The iris and humours were bright. Tension was nearly the same as in the fellow eye. She had perception of shadows.

Case xix. *Myopia complicated by Glaucoma. Division of the Ciliary Muscle. Blindness and continued Tension. Left Iridectomy. Tension Reduced.* I saw, in June 1861, in consultation with the late Dr. Skerrett, Mrs. B., aged 58, who had been near-sighted all her life. For the last eight months her vision had been failing; it was worse at one time than another. Everything was in a mist. With the right eye, small pica was read at six inches, not beyond. The pupil was dilated and fixed. The left eye was blind, except

to shadows. Both globes were hard. The irides were dusky grey. The conjunctival rim of each cornea presented patches of redness. In the right eye, the vitreous humour was turbid; the optic nerve was white. The retinal vessels consisted of two short branches; one extended to the nasal side, and one to the inferior part of the fundus. A small staphyloma posticum bordered the lower rim of the right optic (inverted image). The fundus of the left eye did not admit of illumination.

July 1st. Division of the ciliary muscle was performed on the right eye, and iridectomy on the left.

At the end of twenty days, there was slight enlargement of the field of vision of right eye. Vision was much the same, but more steady. It did not go and come. Tension was as on day of operation. It then relapsed; and, while I was from home in July, subacute inflammatory glaucoma attacked the eye, and it became hopelessly blind. The tension was as before operation. In the left, the tension was normal.

Case xx. *Glaucoma: Division of the Ciliary Muscle. No Relief: Amaurosis.* T. W., aged 42, of Dudley, was admitted October 2nd, 1863. The right lens was dislocated into the lower part of the vitreous humour. Tension 2½. On the 13th, the lens was extracted; some vitreous humour escaped. On October 29th, he was made an out-patient. Tension 2½.

November 10th. Tension was diminished.

November 17th. A pea-issue was placed in the right arm.

November 24th. Tension 3. "Division of the ciliary muscle" was performed.

December 8th. He was readmitted with glaucoma of the left eye. Its conjunctiva was injected. Tension 2. He had iridescent vision. The right eye was excised.

December 13th. Iridescent vision was gone. The iris was convexed; the pupil dilated, but not widely. Tension 2. There was no cupping of the optic nerve. A large paracentesis corneæ was performed.

December 31st. The medical treatment (leeches, and mercury to slight ptyalism) had had no effect. Tension 3. The conjunctiva was injected; the pupil dilated and muddy; the iris dull and of leaden hue; the ciliary vessels much gorged. In order to relieve them, "division of the ciliary muscle" was performed. A free discharge followed, but little blood. The vitreous humour was still firm.

January 8th. There was no remission of tension; nor improvement of vision, which was limited to perception of shadows. He refused iridectomy, and returned home.

October 1864. He has amaurosis, and is unable to earn his living, or take care of himself in the street. He has not done a day's work since the accident.

Case xxi. *Congenital Myopia: Glaucoma (choroido-sclerotitis?) after Fever: T 2½. Iridectomy: Relief. Recurrence of Tension.* Sarah Emery, healthy, aged 8, of Shenstone, near Lichfield, was admitted August 16th, 1864. She read Roman type (Jäger's No. 20) when held at from four to five inches from the eye; nothing smaller. She experienced flashes and iridescent vision. Tension 2—2½. The optic discs were uneven, and of a greenish grey colour. The retinal circulation was anæmic. On the inner side of the

discs was a staphyloma. The value of the vision in the two eyes was equal.

August 19th. Iridectomy of the upper circle was performed on both eyes, in the presence of Dr. Anderson and others, without the slightest accident.

August 24th. The wounds were healed; the eyes free from irritation. She was allowed to leave her bedroom for the day-ward.

August 28th. She made out No. 16. The photopsy was undiminished. *Tension was normal.*

September 2nd. She was made an out-patient.

September 13th. Tension 2½; there was less photopsy. She read canon type (No. 18), and a few words of 16 (Jäger's two-line great primer). On examining to-day the patient's sister, aged 14, I found that she was myopic, and her eyes presented tension 2. She had a small staphyloma posticum in each eye. The optic discs were of a yellow shade. Photopsy was present. With concave 36″, brilliant type (No. 1) was read with facility. My operation would greatly improve her.

September 27th. The patient read 16 well. Double pica, or No. 14, was impossible.

October 25th. Tension 1½—2. She read with difficulty 16. For the last month, the photopsy had diminished. The retinal circulation was improved (?).

Case xxii. *Glaucoma of the Right Eye, of three years' duration. T* 3. *Iridectomy in* 1858. *Vision the same in* 1864 *as before the Operation. Glaucoma of the Left, of seven years' duration, ending in Disorganisation. Enucleation of the Globe on the same day as the Iridectomy.* Mr. Jas. C., aged 59, an ornamenter of papier

maché, was operated upon on Whit Monday, 1858, for chronic glaucoma, by iridectomy. A broad piece was removed from the upper part of the iris. The left globe, which was blind, hard as stone, cataractous, and disorganised, was enucleated at the same time; chloroform being used. By this treatment, the iridisation, recurrent obscurations, photopsy, and stony hardness of the globe, which were present on admission, were removed. The right eye had been declining for three years, and the left seven years, before the iridectomy. He could not fix the date of loss of useful sight in the left eye.

November 7th, 1864. The patient has been obliged since the operation to wear a fourteen-inch convex glass, which is blackened over, except for a space in the centre of two lines' diameter. The eyeball being prominent, and the lids very wide apart, the upper part of the cornea is not covered. Hence circles of dissipation are formed on the retina; and vision is confused, without the use of stenopœic spectacle.* The field of vision, on the inner or nasal side, is obstructed by a dark cloud; on the outer, by "a gloom". A little above and below the horizontal meridian, the field is obstructed by "a red shade". Consequently, it is only just in the centre that he sees clearly; and it requires a little time to bring the axis of vision on a line with the transparent circle (pupil) in his spectacle-glass; but, having attained this, minion type

* It is under these circumstances that I recommend a portion of the coloboma should be-covered over by "gliding" the conjunctiva, and so making an artificial pterygum. If it be deemed desirable to obtain adhesion of the conjunctiva to the cornea, it is only necessary to denude the epithelium of the latter.

can be read fluently. He reads small pica (Jäger's No. 8) for half an hour before fatigue ensues. All these symptoms were present before operation. On testing his field of vision in the usual way, I find he can see only the tip of the finger, which is held in front of the eye. His field of vision is limited to a single spot, of not more than one inch in diameter. The patient, who is an intelligent man, remarked that he considered the vision to be about one-third what it was when perfect. His mode of progression in the street resembles very much that of a blind man.

The lens presents, all round the margin of its anterior surface, circular patches of opacity (pigment ?), of similar size, figure, and density. They have been stationary six years. The optic nerve is small, and of the same colour as the surrounding choroid, except at the blind spot. The retinal veins are small, of good length, and few in number. Arteries invisible. No cupping apparent. The pupil is very large, the greatest width of the iris being not more than three-quarters of a line.

The patient has not done an hour's work since the iridectomy. He considers his visual power to be exactly as it was previous to operation. He is now sixty-three years of age.

Case xxiii. *Great Tension: Contracted Field of Vision: Engorgement of the Choroido-retinal Venous Systems. Glaucoma? Iridectomy. Relief not permanent.* Edward V., aged 33, a clerk from Cumberland, was admitted December 19th, 1863. He was fair, florid, and perfectly healthy, except in his vision. The tension of the right eye was great, but suscep-

tible of some compression (T 2). The field of vision on the temporal side was good; on the nasal, *six* inches. He read brilliant type (Jäger's No. 1); and with ease No. 2. He accommodated for small pica (No. 8) from seven to fourteen inches. The optic nerve was grey. The retinal vessels, which apparently emerged from the nasal rim of the optic disc (inverted image), were much gorged; also the choroid, but less so than in the left eye. The retinal arteries were rather small. There was no pulsation; no cupping. The left eye presented tension 2. The ophthalmoscopic appearances were the same as in the right, but the congestion was much greater. The vessels were of normal length and number. On the temporal side, features were seen as shadows; on the nasal, the form only of the head and face could be discerned. Vision was best when he powerfully converged the globe.

His sight was perfectly good up to seven months previously, when he first noticed aching in the globe from work. Four months before admission, he could read only for twenty minutes at one time. The left eye was most dim. He had had supraorbital pain occasionally, but not severely, for three months. A candle-flame presented a halo. There was no iridescence; no vertigo or headache. It occurred to me, that the ophthalmoscopic appearances were indicative of obstruction in the venous sinuses of the brain. I therefore ordered a seton in the neck, and the administration of iodide of potassium.

On December 25th, while reading, sight failed him altogether.

January 2nd, 1864. The symptoms were as on ad-

mission. The patient had come nearly two hundred miles for treatment; and iridectomy might assist in clearing up the diagnosis; and, if the symptoms were not ameliorated, no harm would accrue by performing it on the left eye. Would tension be reduced? A broad iridectomy was made on the upper and outer circle of the iris; fully one-sixth of that membrane was removed close to its origin. The bent triangular knife was passed obliquely through the sclerotic, close to the front of the origin of the iris. No accident occurred.

January 7th. He had acute sclerotitis.

January 14th. He saw face and features more distinctly, when opposite to his nose, than he had yet done. The nasal field was from four to six inches. Tension was diminished, but still *plus;* it was decidedly less than in the right eye. I removed the seton.

January 15th. He was ordered to go out of hospital for a few days, and was re-admitted on the 23rd.

February 16th. In the left eye, the nasal field was 5½ inches; the temporal nearly a yard. With an 18" convex glass, he could make out letters of Jäger's 16, or two-line great primer.

February 20th. He was discharged.

August 16th. With the left eye he read letters of No. 20, assisted by an 18" convex lens. The eye was blind unless he greatly inverted it. The engorgement of the veins and of the choroid was much diminished. Tension 1½. Vision was reported to be more steady. The right eye could not now read minion (No. 4); but, with an 18" convex lens, No. 2 was read.

The nasal field was four inches; temporal, three feet.

The right eye is now (October 1864) under treatment, and will be duly reported.

CASE XXIV. *Inflammatory Glaucoma of Two Weeks' Duration: Blindness: Iridectomy; Reads Pica, or Jäger's No.* 12. Eliza Spencer, aged 40, was admitted January 14th, 1864, with blindness from inflammatory glaucoma of two weeks' duration. The tension was of the second degree (T 2). Owing to the patient being very excitable, intractable, and "deaf as a post", no ophthalmoscopic examination was attainable, either on admission or subsequently. There was external redness of the eye; a much dilated pupil. The humours were too cloudy to admit of illumination.

Operation. A broad iridectomy of the upper circle was at once performed. The portion of iris removed was more easily separated from its origin than in any case in which I have operated. No untoward accident followed the treatment. In three weeks (February 16th), the tension was rather below the normal standard. At this date, the patient could see features plainly, and read Snellen's xx. Examination at a later period in the year proved that, with a ten-inch convex, she could read pica, or Jäger's No. 12. The tension was normal.

This and the preceding case were examined by the members of the Midland Medical Society, during the presidency of Mr. Langston Parker.

CASE XXV. *Subacute Choroido-iritis of Five Weeks' Duration: Eyeball hard (T 3): Perception of Shadows only: Iridectomy. In Thirteen Days, Pica was read*

with Ten-inch Convex Glass. John Reynolds, aged 52, was admitted February 14th. He was in excellent health. The left eye presented the usual signs of subacute choroido-iritis. The pupil was not dilated more than the right, which is healthy, and presents a diameter of about three-quarters of a line. The sensibility of the cornea was good; the eye as hard as a stone. The right globe was also hard (T 2½). Vision was limited to the perception of the shadow of two fingers at nine inches—not further. He has never had much pain. He became aware of his disease from having, five weeks since, accidentally closed the right eye; after which, iridisation and much variation at times in the visual power were noticed. For two weeks previous to admission, he received medical treatment; when, in consequence of no progress having been effected, Dr. Harrison of Walsall sent him to me as a proper case for operation.

A moderately broad iridectomy was immediately made at the upper and outer circle. No accident occurred; no blood entered the chamber. The eye was dressed with cotton wool, and a few turns of a bandage made of "domet". In three days, features could be seen, and fingers counted. On the thirteenth day of operation—viz., February 27th—Jäger's No. 12, or pica, was read at nine inches, with the aid of a ten-inch convex glass. In doing this, the eye was much everted, and required time for fixation. The globe continues to be hard. He was allowed to return home to Walsall.

March 28th. The temporal field of vision is upwards of three feet; the nasal is nine inches. With

a sixteen-inch convex glass he reads minion type, though better with fourteen. T + 1.

A most interesting phenomenon is revealed by the ophthalmoscope. Numerous minute and round musca of a bright pale yellow colour, are seen floating in the vitreous humour; yet the patient is insensible of their presence in the field of vision.*

In concluding this series of cases, I would fain believe there is no necessity for apologising on account of their not being more numerous; inasmuch as in a recent controversy on the value of iridectomy in glaucoma, carried on in the pages of the BRITISH MEDICAL JOURNAL, which would, if bound up, make a fair sized volume, the clinical evidence adduced in reference to a pure matter of fact, was on one side entirely wanting; and on the other, very slight and not always novel in regard to publication.

* For an account of these shining bodies (cholesterine), as seen in the lens, the reader is referred to a paper of the author's in the ASSOCIATION MEDICAL JOURNAL, volume for 1855. In two of eight cases, the vision was good; and, as in the present instance, the vitreous humour was the seat of the brilliant bodies.

T. RICHARDS, PRINTER, 37, GT. QUEEN STREET.