

**Remarks made in opening a discussion on the treatment of chronic glaucoma at the Annual Meeting of the British Medical Association, August, 1900 / by F.R. Cross.**

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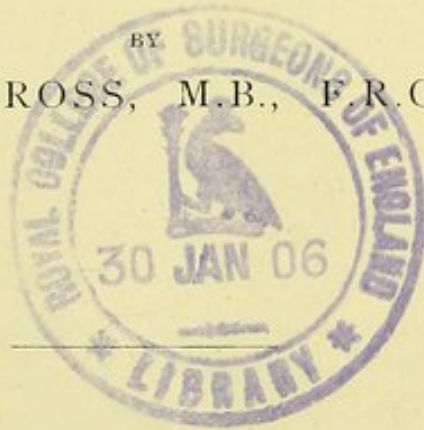
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REMARKS  
MADE IN OPENING A DISCUSSION  
ON  
THE TREATMENT  
OF  
CHRONIC GLAUCOMA

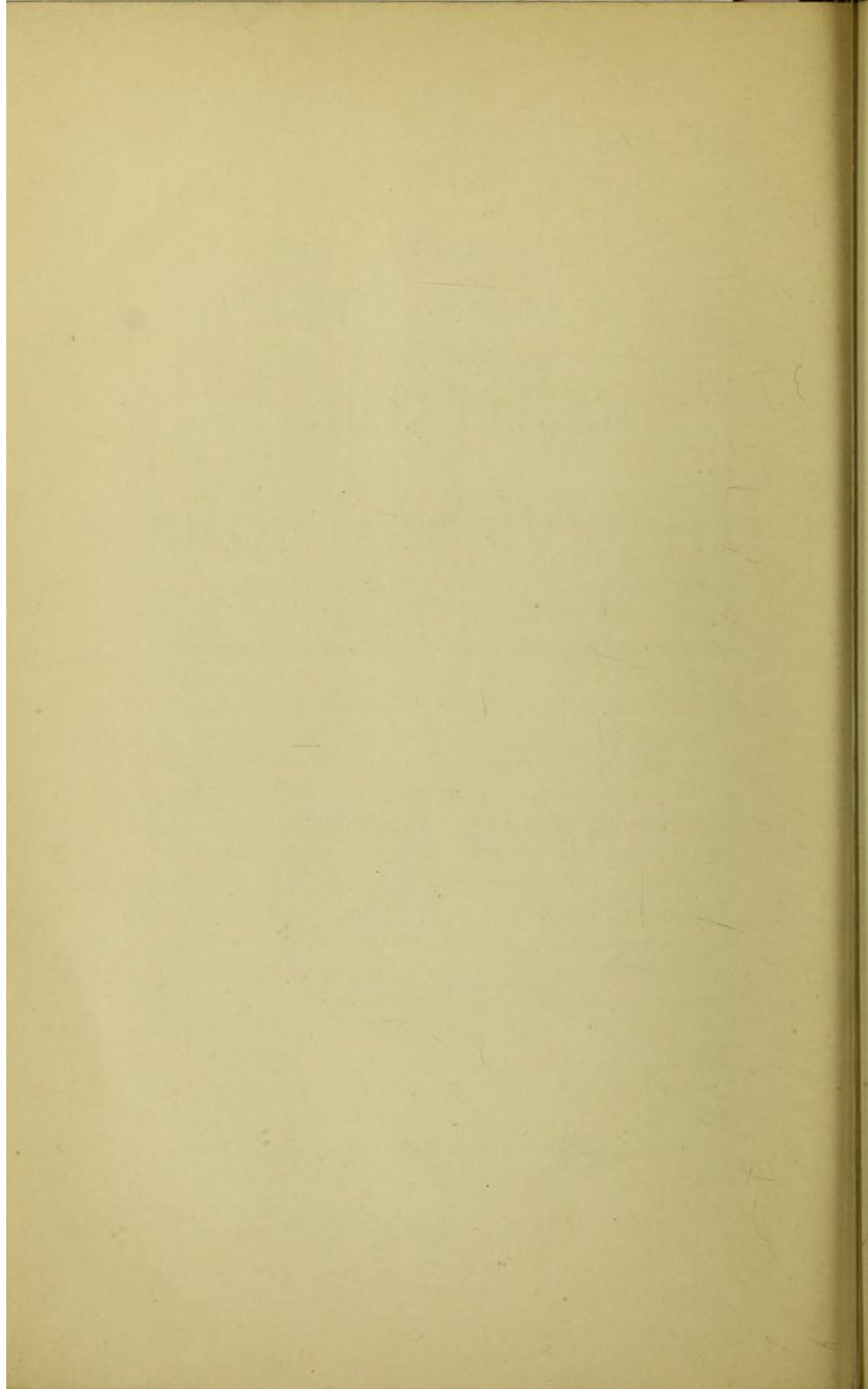
AT THE  
*Annual Meeting of the British Medical Association,*  
*August, 1900,*

BY  
F. R. CROSS, M.B., F.R.C.S.



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1901.





*The Treatment of Chronic Glaucoma.*

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I MAY perhaps be allowed to take the opportunity which this annual meeting of the British Medical Association affords to draw attention to the fact that a large number of cases of inflammatory glaucoma are still mistaken for iritis, or other forms of inflammatory eye disease, and to insist on the necessity for fully considering in the diagnosis of such cases the possibility of glaucoma being present, particularly before active treatment by the use of atropine and mydriatics is recommended. We are, no doubt, agreed that the only reasonable prospect of recovery or improvement in "inflammatory glaucoma" (hæmorrhagic glaucoma to be an exception) is to relieve the strangulation of the eyeball by means of surgical interference, and that even the use of myotics is merely of temporary value, until the services of a competent operator can be obtained.

In "simple glaucoma" the danger lies in the insidious and very gradual progress of the complaint. No definite symptoms enforce themselves on the attention of the medical man, and the patient himself scarcely recognises in the early stages that his sight is becoming defective. When he has done so, an incompetent adviser may possibly have satisfied him with the opinion that he is suffering from incipient cataract, and that he must

patiently await the development of the disease until a degree of blindness has been reached which justifies extraction of the lens.

Ophthalmic surgeons (though fully aware of the serious nature of chronic glaucoma) are not unanimous as to what is best to be done for patients under the different phases of the disease.

For the purpose of this debate on "The Treatment of Chronic Glaucoma," which I am invited to open, I have examined such notes as I possess of hospital and private patients, but I find it impossible to draw from them deductions based on statistics; some have paid only one or two visits; of some the notes are brief **and** incomplete, and I can only use them as records of facts upon which my experience and opinions are based. Forty - seven cases of chronic non - inflammatory glaucoma from my private case-books give more definite information than a much larger number which have been noted in my hospital practice.

Chronic glaucoma, in which the manifestations of increased intraocular pressure are indefinite, and their progress very gradual, may be associated with a distinct increase in eyeball tension or with a degree of fulness that is quite imperceptible.

The disease is usually discussed under two headings :

(1,) Chronic inflammatory glaucoma—progressive, with occasional exacerbations of congestion, which may be very temporary or of longer duration.

(2,) Simple glaucoma.

There may be varieties that seem intermediate between the simple and inflammatory forms of the disease.

A case that has been clearly diagnosed as one of

chronic inflammatory glaucoma requires immediate operation by sclerotomy or iridectomy as imperatively as does an inflammatory case with acute or subacute symptoms. It is in "glaucoma simplex" that the difficulties arise in regard both to accuracy of diagnosis and to treatment. In it many of the objective symptoms of glaucoma are absent. There is no pain or inflammation, and no peculiar appearance of the eyeball. The scleral veins are little if at all enlarged, the pupil is normal or but slightly dilated or sluggish, the aqueous chamber is but slightly shallowed, and the eyeball tension may be scarcely raised. Subjective symptoms of defective eyesight may be absent, and central vision is often practically normal.

A closer investigation, however, with the help of the perimeter and of the ophthalmoscope, will enable us to clearly recognise the real nature of the disease.

Ophthalmoscopic examination may show the presence of a pulsating artery (noted in  $\frac{19}{47}$  of my cases) or of a deep and typical cupping of the optic nerve, but the appearances may be less characteristic, merely some degree of anæmia or atrophy of the disc, with possibly slight pushing of the vessels towards its nasal side, and may leave us in doubt whether the case is essentially an insidious glaucoma or an optic atrophy. Even a shallow cupping over the whole papilla may be due to the degeneration of atrophy and independent of any increase in the intraocular tension. Moreover, we commonly find that simple glaucoma, especially in its later stages, is complicated by atrophy. Thus, of the forty-seven cases quoted, twenty were associated with definite atrophy, and in four the presence of glaucoma was scarcely recognisable. There was no note made of

atrophy in the remaining cases, but it may have been present in some degree.

The perimeter is of special value in helping to distinguish between the two diseases. Defect in the nasal portion of the field of vision, though it is occasionally associated with uncomplicated atrophy, is strong presumptive evidence that the case is a glaucoma. A trustworthy observer has recently stated that from a study of the charts taken in some sixty cases of chronic glaucoma, he finds that the field may first become defective in other directions, but my experience, based upon the careful chart-taking of my assistants for several years, has satisfied me that diminished vision on the nasal side (or in the upper or lower quadrant of the nasal side) is the most important evidence that we can obtain for the early detection of chronic simple glaucoma, while the retention of vision in the temporal and infero-temporal portion of the field is equally characteristic as the disease progresses. In the latest stages, where atrophic changes are well marked, the characteristic appearances of the glaucoma field are lost, and there is found to be a general concentric contraction round the fixation point, but even where this is narrowed to within  $5^{\circ}$  or  $10^{\circ}$  the central vision is often well maintained.

The colour sense is said to be usually retained in glaucoma until late in the disease; while it is early impaired in optic atrophy.

I may have detained you too long on these points, but it is essential to realise the close association between optic atrophy and simple glaucoma (which has been designated "optic nerve atrophy with excavation") and to estimate accurately the relative importance of each

of them in cases where both are present together before we can form an opinion as to the probable value of operative interference.

Progressive simple glaucoma sooner or later becomes complicated by atrophy, and if operation is to be of service it should be done before the limitation of vision approaches dangerously near the centre of the field. When the patient is nearly blind, the atrophic changes are not likely to be arrested by the relief of the slight amount of excessive eyeball tension present; on the other hand, if there is sight worth saving, the best chance of doing so is by relief of the glaucoma.

As bearing on the prognosis in a case of simple or chronic glaucoma if left to itself, I would remind the meeting how often in acute or subacute glaucoma insidious symptoms of increased eyeball tension have been present for a longer or shorter period, prior to the onset of inflammation. In ninety-two of my cases of acute or subacute glaucoma, I have it noted of fifty that definite prodromata had been present for some time. The notes were not taken with any special intention of marking this point, so that we may be assured that premonitory symptoms had occurred also in many of the others. The prodromata in such cases are analogous to the symptoms of a simple glaucoma, from which I find it difficult to distinguish them: and just as an inflammatory glaucoma is often preceded by prodromata, so may any case of simple glaucoma become suddenly blinded by an acute inflammatory attack, or converted into a chronic inflammatory glaucoma by occasional temporary congestions. Moreover, the serious nature of even the most insidious cases is evident from the effect produced on them by the



action of mydriatics, or even by such moderate dilation of the pupil as is associated with anxiety or with mental or bodily fatigue.

The cases of increased eyeball tension which are eventually operated upon with acute symptoms or under unfavourable conditions, have nearly all passed through a less evident but no less real condition of glaucoma which might have been easily and effectually operated on at an earlier stage. It is comparatively easy to do a good operation on an eye that is painless and not congested, but much more difficult on one that is inflamed and strangulated.

While on the one hand pain and inflammation demand relief (if necessary by operative interference), there does not appear to be such urgency during the indefinite symptoms of incipient or simple glaucoma. Not everyone will face the risk of an operation upon an eye with practically perfect vision, of which no definite complaint is made: however well executed, it may be followed by at least temporary deterioration of sight, and the patient and his friends may think that more harm than good resulted from the interference. It is comparatively simple to temporise with myotics and medical treatment, but will these effect a cure, or what is really the proper course to pursue as a remedy against the disease?

A slight simple glaucoma may perhaps occasionally be cured by the use of myotics, under comfortable surroundings, with rest and avoidance of worry. I last week saw a lady forty years of age in whom I could detect no symptoms whatever of a glaucoma tendency, even under prolonged dilatation by cocaine. She had until the past month or so been continuously using

for two years pilocarpine drops for "hardening of the eyeball," under the advice of an oculist on whose diagnosis I should put absolute dependence. Personally I do not remember to have ever effected a cure by drugs of simple glaucoma where the symptoms were definite, though one has often had suspicious cases in which the symptoms have disappeared, and others where slight definite symptoms have continued in abeyance.

Mrs. E. F., aged 30, consulted me in June, 1889. There were hyperæsthesia of the retina, haloes, fogs, and slight subjective symptoms of glaucoma, with wide deep physiological cups and the vessels pushed aside; central vision and fields were perfect. She was ordered eserine gr.  $\frac{1}{6}$ , ad.  $\bar{3}j$ , which relieved the rainbows and discomfort. I saw her once or twice up to August, 1891, when she was in the same condition, using the eyedrops from time to time as symptoms seemed to suggest. I have just ascertained that Mrs. E. F. has had but little trouble with her eyes, and has consulted no one since her last visit to me nine years ago.

Mrs. T. H., aged 51, came in April, 1892, complaining that for three years she had seen haloes in both eyes when looking at any lights (candle, fire, or match). Fogs and mists often accompanied the haloes.

V. =  $\frac{5}{5}$ , H.m. 50. Fields perfect; large full eye; anterior chamber shallow. Nerve not definitely cupped, but central vessels on it pushed a little sideways; indistinct arterial pulsation. T+?

This patient has been using pilocarpine drops ever since 1892, seeing me once a year. June, 1900: She still has V =  $\frac{6}{7}$ . The fields are quite full. The haloes and fogs are at times troublesome; otherwise she has no marked discomfort, but undoubtedly has simple glaucoma. T+? I have put the question of operation before her; but she declines it until she is distinctly more inconvenienced or until some development of the disease takes place.\*

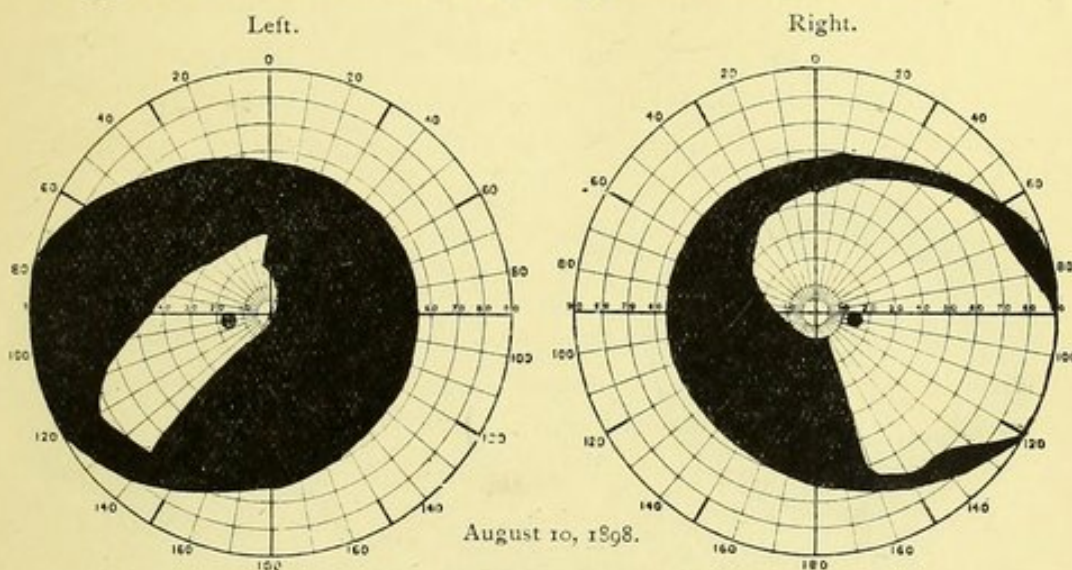
\* Dec., 1900. A recent visit shows the sight of the left eye to have become slightly impaired both in the nasal portion of the field and for central vision.

Where, as in this case, the glaucoma remains in the incipient stage, it may be justifiable to continue the treatment by myotics until there is definite evidence that despite their use, symptoms of tension are increasing — but then something further must be attempted.

A retrospect of my cases shows conclusively that progressive deterioration of sight is the rule, sooner or later, in simple glaucoma under medical treatment alone. A number of patients pay each a single visit, at which we can infer from the symptoms present, and from the past history of the sight, how little is the chance of improvement unless operation is resorted to. In many cases I have wished to operate, but the patient has declined; in others, atrophic changes seemed too far advanced to promise any good prospect from such interference, while an unfavourable condition of the general health is urged against operation in a certain number. I append a few notes of cases, some of which have done fairly well for a long time under the treatment with myotics, while some indicate the close association of atrophy of the optic nerve with simple glaucoma. In one patient the tendency to increased eyeball tension seems to have been kept in abeyance by the progressive development of myopia.

CASE I. *Very Gradual Impairment of Sight for Six and a Half Years.*—Mrs. W. H., aged 60, came in February, 1894, complaining of discomfort and “dryness” of left eye and of seeing worse towards the nose—V.R.  $\frac{6}{8}$ , L.  $\frac{6}{8}$ ; nasal field reduced by  $10^\circ$ . Both nerves were pale and depressed, not fully cupped, but the vessels were pushed aside and the arteries pulsated indefinitely. The patient was delicate, and much inconvenienced by a very large uterine fibroid. I ordered pilocarpine drops. In August, 1898, there was still general eye discomfort, particularly in the conjunctivæ—

V.R.  $\frac{6}{7}$ , L.  $\frac{6}{18}$ . There were atrophied nerves in both eyes, with indefinite pulsation of the vessels, which were somewhat pushed aside. T + 1. July, 1900. This patient says she still sees very comfortably, and has continued the use of the drops for the past six and a half years. Theoretically, I ought to suggest operation, but the patient is quite satisfied, and I know that such interference would be declined, while the suggestion of its necessity might aggravate the glaucoma.

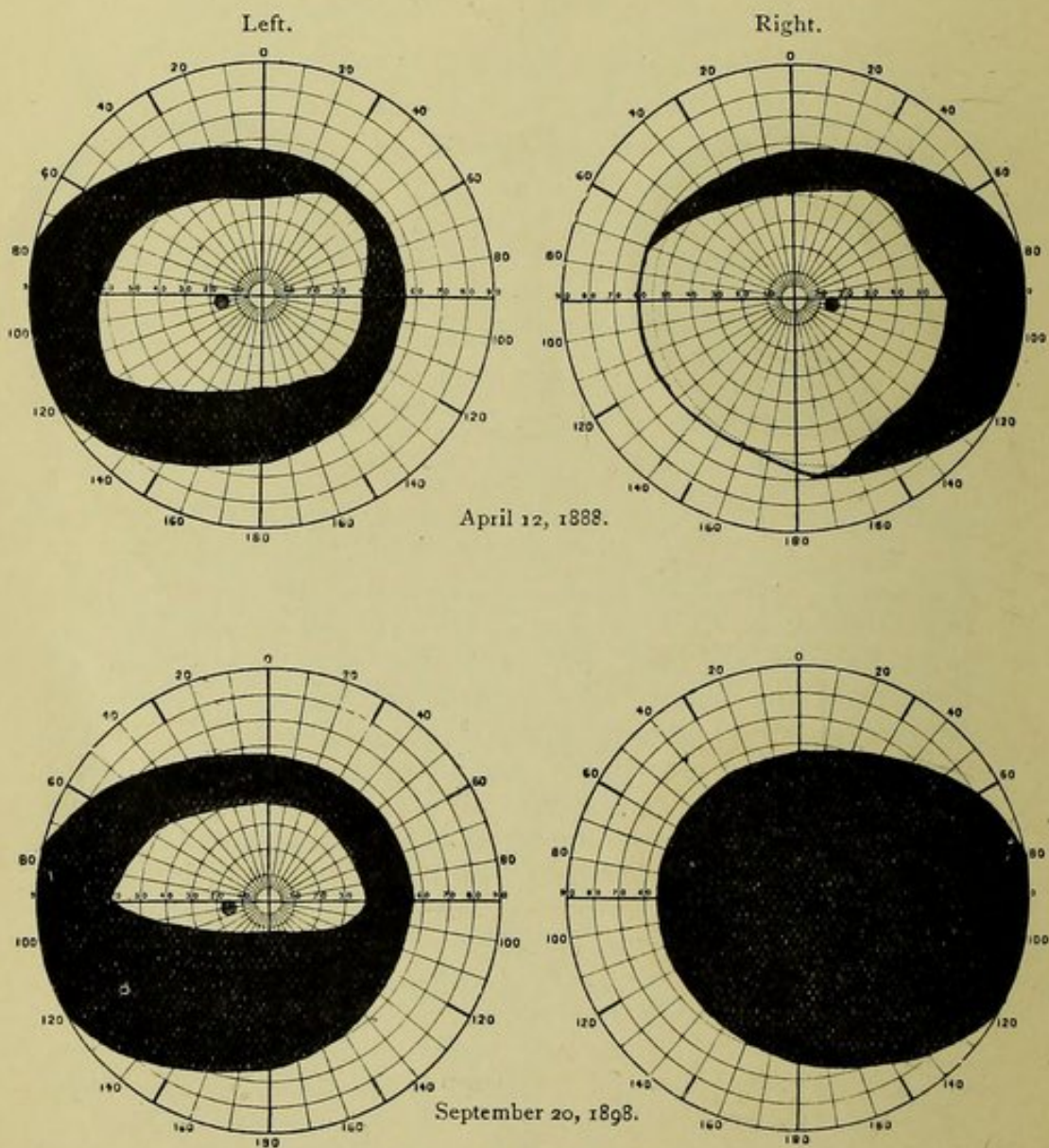


FIELDS OF VISION—MRS. H.

CASE II. *Gradual Loss of Central and Peripheral Vision in a Patient under Treatment by Myotics for Twelve Years.*—Miss B., aged 70, came on April 20th, 1888, complaining of misty sight and haloes. No evident congestion of sclera, nor any narrowing of anterior chamber; eyeballs healthy; iris a good colour; nerves white; vessels pushed outwards; arteries narrow and slightly pulsating. T + 1. Diagnosis: Simple glaucoma with atrophy. Ordered eserine drops, gr. j ad.  $\bar{3}$ j. November 14th. Sight better; no haloes nor pain.

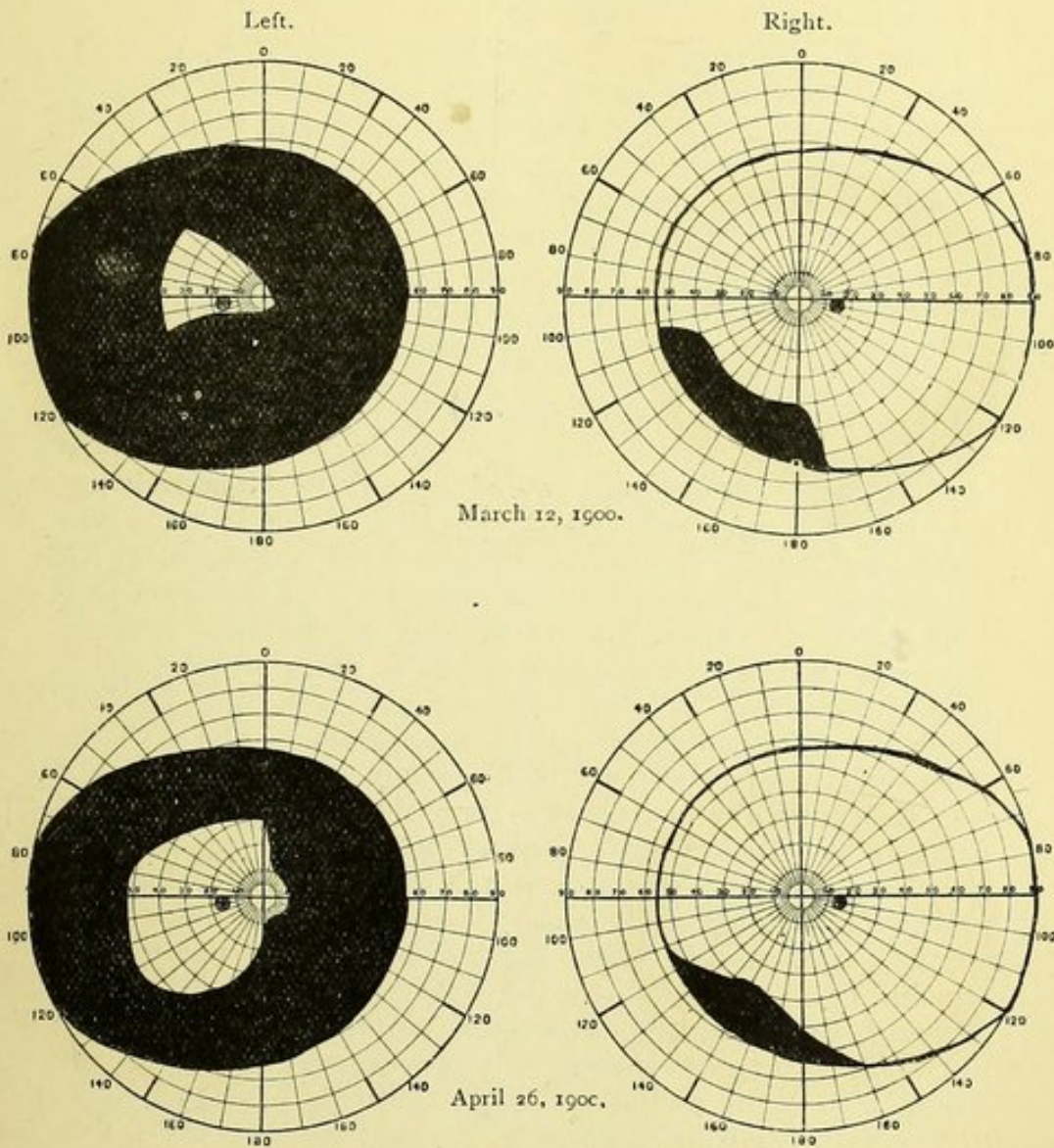
Vision	{	April, 1888.	Jan., 1890.	March, 1893.
		R. $\frac{6}{15}$ - I $\frac{6}{12}$ .....	- I $\frac{6}{12}$ .....	$\frac{6}{24}$ J. 1
		L. $\frac{6}{15}$ - I $\frac{6}{12}$ .....	- I $\frac{6}{12}$ .....	$\frac{6}{20}$ J. 2
		Oct., 1894.	Jan., 1896.	Sept., 1898.
		R. $\frac{6}{80}$ .....	$\frac{6}{0}$ .....	fingers
		L. $\frac{6}{24}$ .....	$\frac{6}{36}$ .....	- I $\frac{6}{36}$

Iridectomy was suggested to Miss B., but declined as she was deaf, suffered from headache, and did not feel at all equal to any operation. No doubt there was a considerable complication of atrophy in this case, but the glaucoma was quite definite, though no active symptoms or congestion exhibited themselves. She has used eserine or pilocarpine throughout the whole twelve years she has been under my observation.



FIELDS OF VISION—MISS B.

CASE III. *Improvement with Myotics.*—Miss M. B., aged 65, has simple glaucoma of the left eye with much impairment of vision, central and peripheral. During eight months' treatment by pilocarpine there was marked improvement, particularly in central vision (namely from  $\frac{6}{18}$  to  $\frac{6}{9}$ ), but also to some degree in the field. The right eye has no symptoms of defect excepting a blur on the nasal side of the field.



FIELDS OF VISION—MISS M. B.

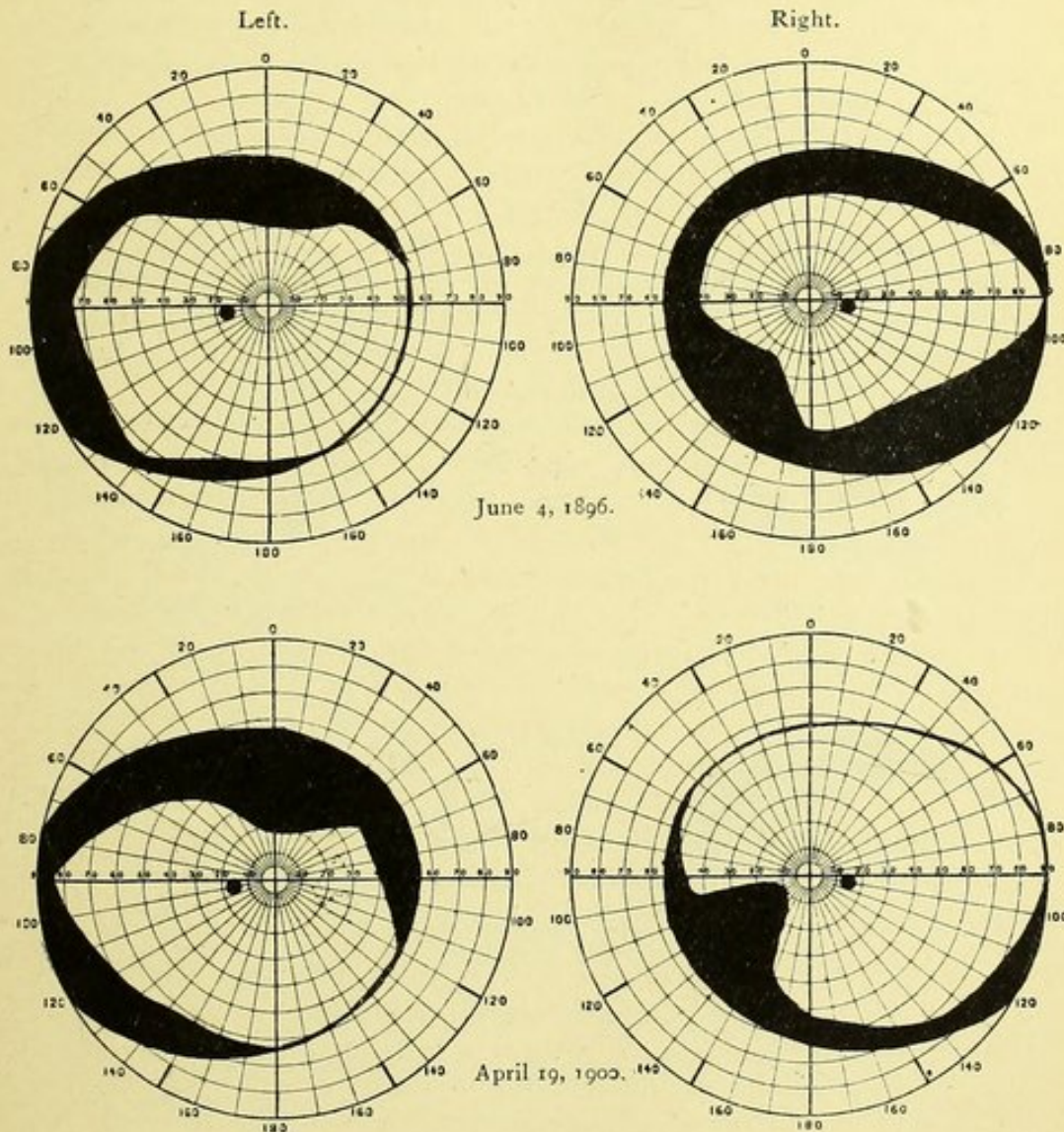
CASE IV. *Improvement of Peripheral Sight.*—Rev. W. L., aged 76, came on April 6th, 1899, complaining that his sight (particularly for reading) had been failing much for the past year. He had slight incipient cataract and simple glaucoma, with pallor of the nerves, and narrowing of fields of vision, particularly in the upper nasal quadrants. After treatment by pilocarpine, the peripheral sight improved, although central vision continued to fail from R.  $\frac{6}{12}$  to  $\frac{6}{20}$ , L.  $\frac{6}{9}$  to  $\frac{6}{15}$ ; this was probably on account of progress of the cataract, while the glaucoma element had somewhat abated.

CASE V. *Atrophy with Slight High Tension.*—R. H. P. S., aged 61. Essentially optic atrophy with deep cupping of the nerve and dipping of vessels on its nasal side. T + 1. The patient smoked more than moderately, and his central colour vision was defective. In July, 1899, no glaucoma was suspected, spectacles gave R.  $\frac{6}{9}$ , 1 J.; L.  $\frac{6}{20}$ , 4 J. A deep white physiological cup was noted. In May, 1900, vision was reduced to R.  $\frac{6}{24}$ , 6 J.; L.  $\frac{6}{30}$ , 16 J.; this improved a little under pilocarpine drops and strychnine injections. Operations were judged to be useless.

CASE VI. *Atrophy with Doubtful High Tension.*—Rev. G., aged 60, came in March, 1895, complaining of failing vision in the left eye for the previous two or three years. The right eye saw well 1 J, and with  $-2.50 - 1$  cyl.  $\frac{6}{7}$ . The left eye saw badly 14 J,  $-4 \frac{6}{0}$ . Peripheral fields both perfect for white; the left narrowed for red and a little more hazy on the nasal side. Left nerve not cupped; a small speck of choroidal atrophy. The case was diagnosed as monocular optic atrophy. The patient continued to work with the right eye until January, 1898, when he returned complaining of it. The left was practically blind; the right with spectacles saw  $\frac{6}{8}$ , but its field was concentrically narrowed. Both nerves were white and cupped, with the vessels pushed aside and suggestive of simple glaucoma. There was no appreciable tension, but probably an abnormally weak lamina cribrosa allowed of cupping from a very slight degree of pressure, not definite enough to be detected by the finger. The condition got progressively worse, both in central vision and impairment of the field, but the evidence of glaucoma was never certain, although sections of the eye might perhaps have proved its presence by showing contact of the ligamentum iridis with the periphery of the cornea at the angle of the anterior

chamber. In December, 1898, the patient could still read moderate print, but was getting worse.

CASE VII. *Insidious Chronic Glaucoma under Myotics for seven years, in which definite progressive development of Myopia seemed to have a beneficial effect as against a rise of Intraocular Tension.*—No alteration in the cornea or aqueous chamber has been observed throughout, nor has there ever been marked haziness of the vitreous humour. Miss J., aged 51, came in May, 1893, complaining of rapid loss of vision in right eye,



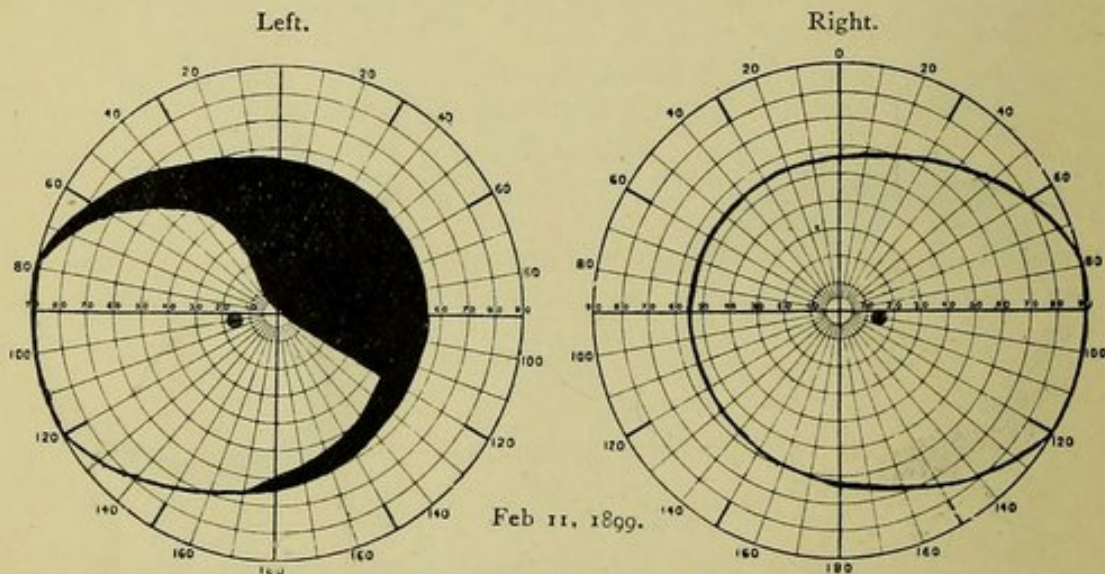
FIELDS OF VISION—MISS J.



which saw only letters of 16 J. Nothing was noticed to account for the sudden failure. The tension was slightly high, and there was a rather deep physiological cup. Left eye saw 1 J. -  $3.50 \frac{6}{9}$ . Pilocarpine was ordered. In a month, R.V. 6 J. -  $3.50 \frac{6}{12}$  and shortly afterwards 1 J. and -  $3.50 \frac{6}{9}$ . Both eyes seemed to have a tendency to simple glaucoma, and pilocarpine was continued for them. This lady has been continuously under observation ever since; she has throughout had indefinite symptoms of chronic glaucoma varying much in degree; at times well-marked pulsation of the central artery and slight rise in tension were present; at other times these were absent: there have never been pronounced symptoms or congestion, and no nerve cupping could be detected.

In June, 1895, the myopia had slightly increased in amount from 3.50 to 4.50 in the left eye, while that in the right was 6 D.; in December, 1897, it was 10 D.; and in April, 1900, the vision was, R. -  $11 \frac{6}{9}$ . L. -  $12 \frac{6}{9}$ , and 1 J. in each. The visual fields have continued in much the same condition for the past four years. Possibly here I should have done better by operation, but reasons make it difficult to do more than suggest that this may become necessary.

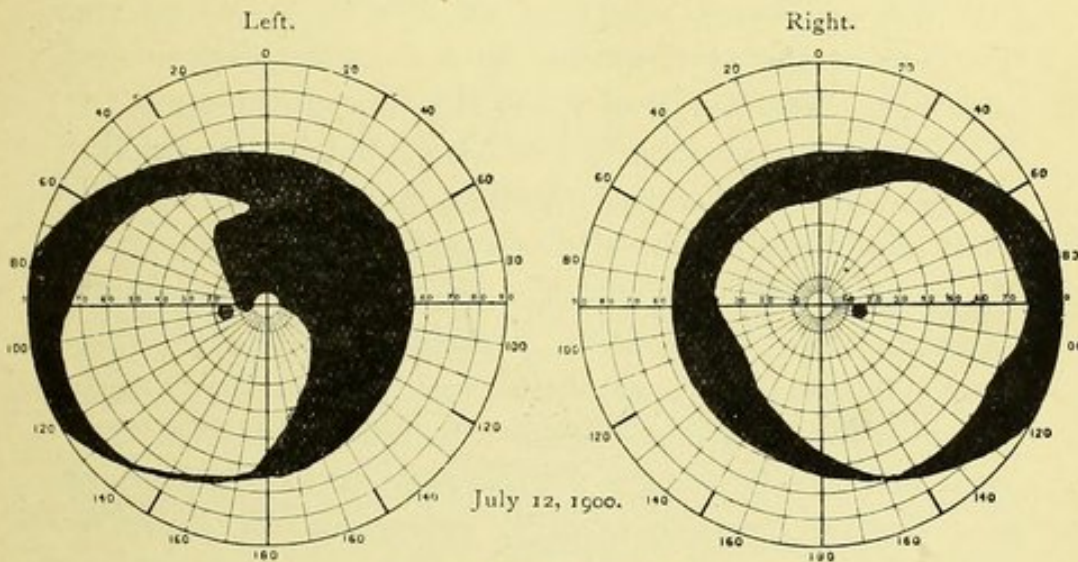
CASE VIII.—*High Myopia with Simple Glaucoma.*—Under observation for eighteen months; at first improving, but lately getting worse. J. C. S., aged 42, a solicitor's clerk,



FIELDS OF VISION—MR. S.

came February 11th, 1899. For several months his eyesight had become very uncomfortable without known cause. He had worn strong concave lenses for many years. V.R. - 13 - 1 cyl.  $\frac{6}{38}$ ; L. - 13 - 0.50 cyl.  $\frac{6}{38}$  - 10 1 J. each. Well-marked cupping of both optic discs and symptoms of chronic glaucoma which vary. Pilocarpine drops were ordered.

July, 1900. Spectacles give  $\frac{6}{15}$ ; both fields of vision are more defective and suggestive of atrophy as well as of glaucoma, but the optic discs clearly indicate slight excessive intraocular tension. He is to have iridectomy or sclerotomy done in October.



FIELDS OF VISION—MR. S.

\* \* \* \* \*

Having endeavoured to show that a chronic glaucoma, however indefinite and insidious its early symptoms may be, will eventually destroy the sight, either from gradual atrophy of the nerve elements or by the accession of inflammatory strangulation, I must now consider how the prognosis is modified by surgical interference.

The causation of chronic glaucoma is probably

analogous to that of the other more acute forms of this disease. The heightened tension is generally due to local mechanical interference with the excretion at the filtration angle of the eye rather than to some more central nerve irritation which may cause dilatation of the pupil, contraction of the intraocular blood vessels with heightened blood pressure, and increase of the intraocular secretion.

On the latter hypothesis Jonnesco, of Bucharest, has recently advocated resection of the superior cervical ganglion of the sympathetic as a cure for all kinds of glaucoma. He has performed this operation on seven patients, and says that in each case the ocular tension has been immediately and permanently reduced and the pupil has become markedly and permanently contracted. He considers that the resection is particularly applicable to quiet chronic forms of the disease in which iridectomy seems to give only doubtful results. Demicheri, of Monte Video, reports brilliant results from this treatment in two other cases of glaucoma, and the operation is a well recognised surgical procedure for thyroidal and other diseased conditions. But even though the patient willingly submits to such a heroic measure and the effects produced on the eye prove to be satisfactory and permanent, the surgeon could not undertake it without great anxiety as to the wide ultimate effect on the control of the sympathetic nerve that might be likely to result.

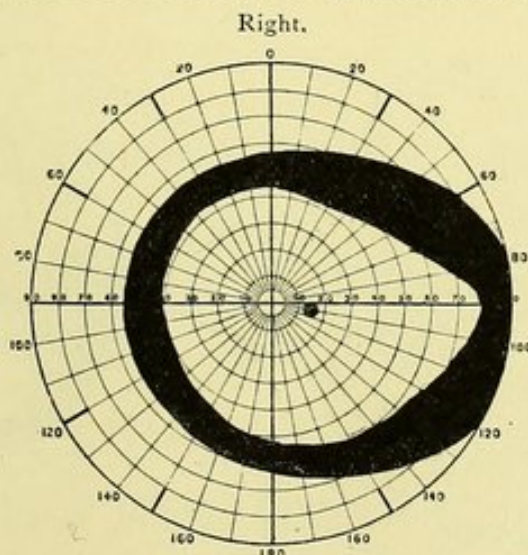
We all admit the great value of a good iridectomy for opening the filtration channel in ordinary glaucoma; if it fails us in "simple" cases it is probably either because we hesitate to operate until degenerative changes are too far advanced, or because a nerve atrophy

has been the essential element in the case throughout, and continues to impair the sight despite the relief that has been given by the operation to the slight increase of tension that has accompanied it.

In my experience the results of iridectomy in simple glaucoma have been satisfactory, particularly when compared with those that follow non-interference. Improvement after operation is not always immediate, especially if there is considerable atrophic complication, but it will ultimately take place; in some cases this improvement is permanent, in others it definitely prolongs the period during which the patient retains his sight.

I append notes of some of my private cases in which iridectomy has been performed:—

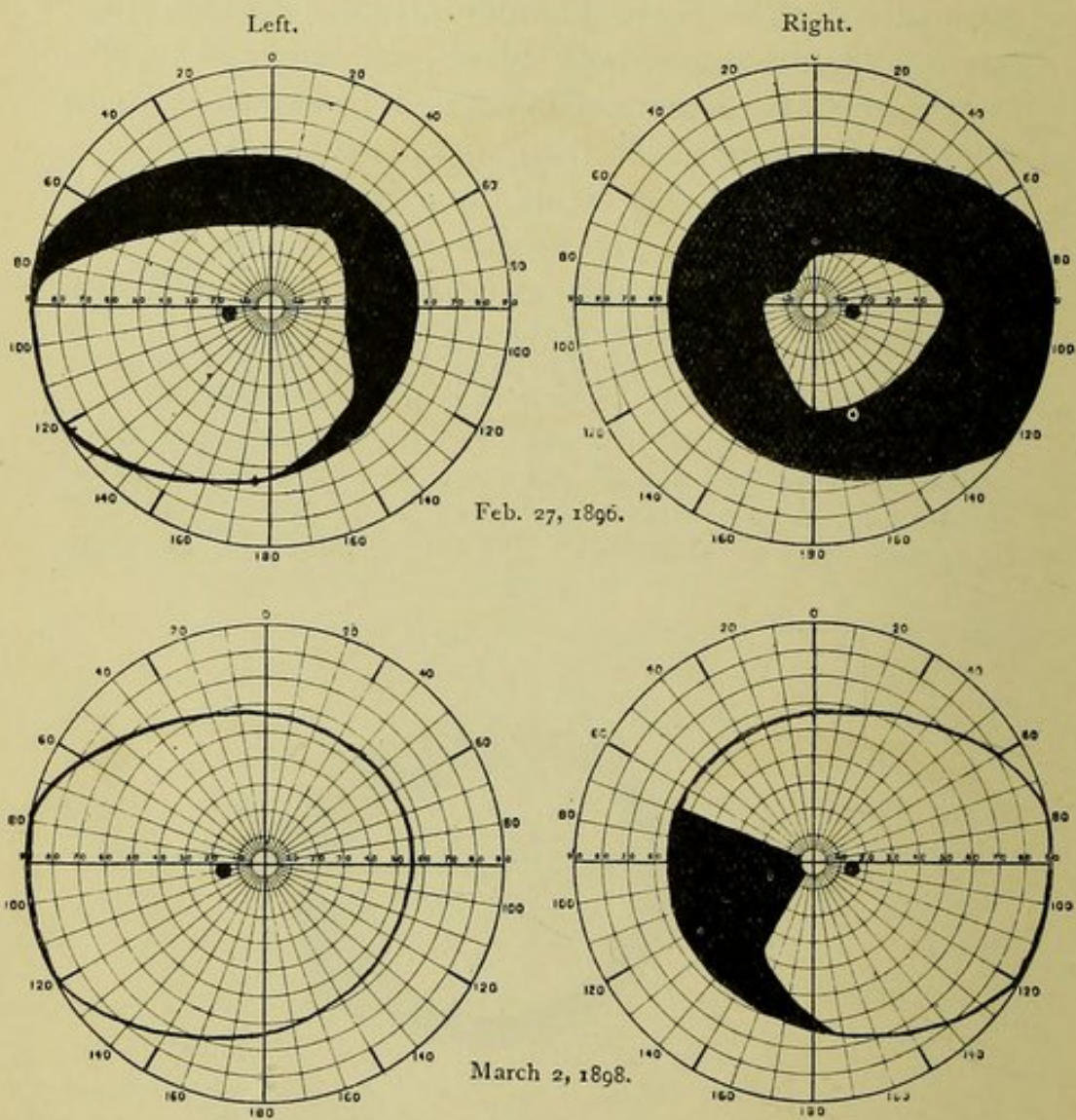
CASE IX.—Miss B., aged 41, came on May 20th, 1889, complaining of continuous discomfort in the right eye with ophthalmic neuralgia, and with fogs and haloes when tired. Vision R. —  $1.50 \frac{6}{12}$ , L. — 1 cyl.  $\frac{6}{8}$ ; R. field narrowed concentrically. The next visit paid was on January 14th, 1892, when both eyes had simple glaucoma, the right being worse, and its field more contracted peripherally. A week later iridectomy was done on both eyes; this gave comfort, but the sight



May 20, 1889.

FIELDS OF VISION—MISS B.

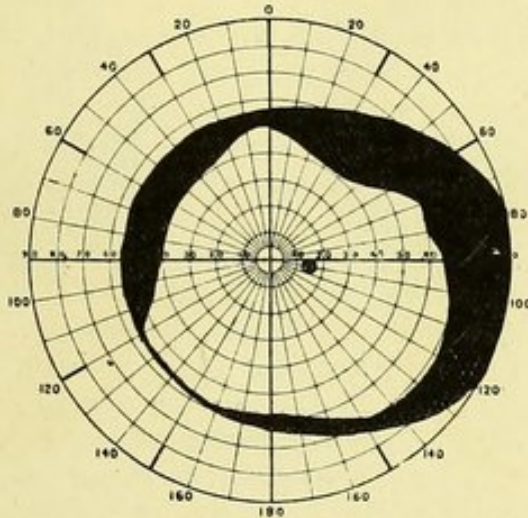
continued defective for several years, during which the patient was passing through the menopause. In March, 1898, she was very much better, the left eye practically perfect, but the right field of vision still defective in the lower nasal portion. Although the fields of vision were narrowed, and even got worse for a time after the operations, the condition of the eyes was ultimately much more satisfactory. The patient has now perfect vision in the left eye, and almost normal vision in the right. Without the operations her condition would before this have been very critical.



FIELDS OF VISION—MISS B.

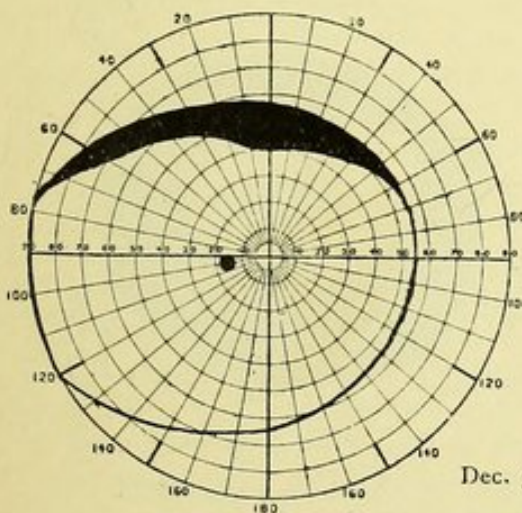
CASE X.—Mrs. B. came in March, 1885, complaining of long continued worry in the left eye. Fifteen months previously she had temporarily lost the sight of that eye; it gradually improved but remained always foggy. Right eye vision good. Left eye  $\frac{6}{9}$  1 J. badly; deep white cupping of papilla, not up to disc margin; T + 1. In June an attack of haze, recovering in a few days; V.  $\frac{6}{18}$ . November 23rd, 1885.—Iridectomy on left eye. March, 1886.—In the menopause; both eyes are uncomfortable; no definite symptoms of glaucoma; vision in

Right.

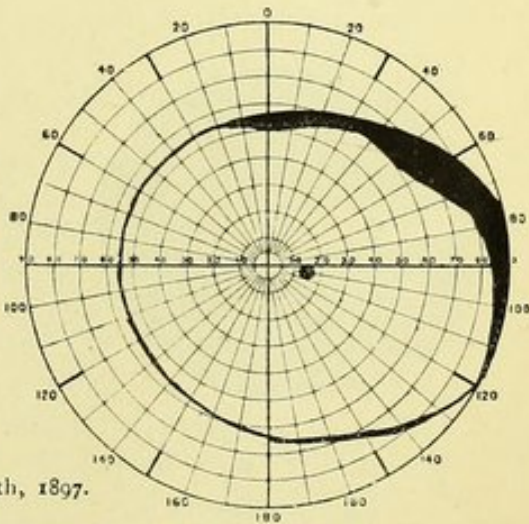


March 23rd, 1891, and November 10th, 1894.

Left.



Right



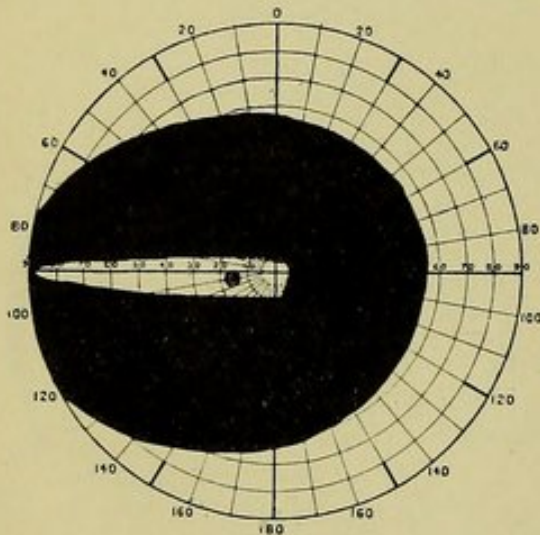
Dec. 30th, 1897.

FIELDS OF VISION—MRS. B.

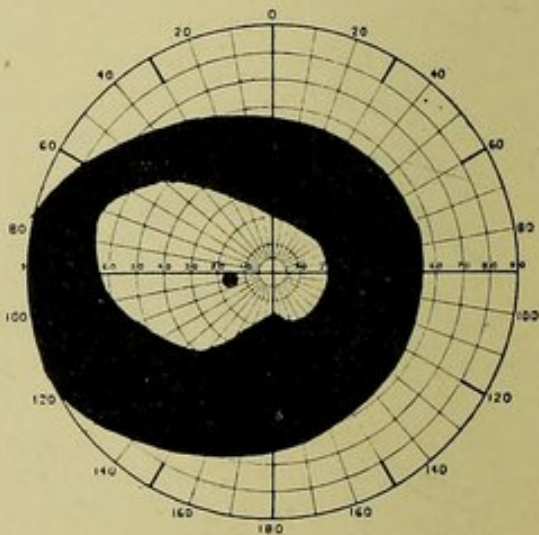
each eye with lenses  $\frac{6}{9}$  1 J. The patient uses weak myotics as required. December, 1886.—Haloes over right eye. May, 1888.—Continued symptoms of insidious glaucoma in both eyes, but vision  $\frac{6}{6}$  and  $\frac{6}{9}$ . March, 1891.—Still good vision in both, but increasingly liable to haloes and fogs; no conjunctival congestion; anterior chambers not definitely shallow; no arterial pulsation; fields both narrowed; R. T. +1. December, 1896.—R. glaucomatous, no congestion; vision in each with lenses is  $\frac{6}{8}$ . January, 1897.—Right iridectomy. February, 1899.—Has used no drops for a year, during which time she has had no symptoms in either eye. Both see perfectly with suitable lenses, and the fields have been practically full since the last operation. The patient now has no anxiety regarding her eyes.

CASE XI.—Miss D., aged 67, seen in April, 1893, for left herpes frontalis, apparently not affecting the eyeball. Vision R. + 0.50  $\frac{6}{7}$  + 3 J. 1; L. + 0.50  $\frac{6}{9}$  + 3 J. 1. Central guttate choroiditis in both. R. media clear, optic nerve normal. L. media hazy, optic nerve pale and cupped. T. + ? In August the eye was better, but pilocarpine was ordered. Miss D. next came in March, 1897; she had used pilocarpine every second day for four years. The right eye was good. The left eye V.  $\frac{6}{18}$  + 1  $\frac{6}{12}$  + 3.5 4 J., with narrowing of the field. September 27th, 1897, L. V. + 1  $\frac{6}{18}$ ; field much more narrowed. Iridectomy

Left.



September 27th, 1897.

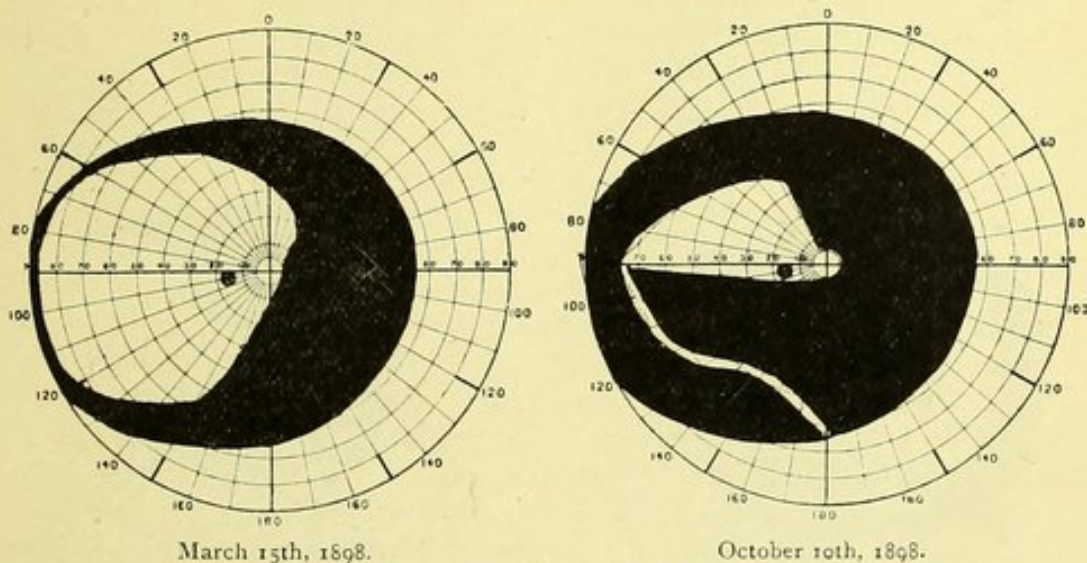


November 15th, 1897.

FIELDS OF VISION—MISS D.

on left, with marked improvement of field and of central vision; but in October, 1898, the eye was less well and the field more contracted. I have not seen her since. The right eye was free from glaucoma throughout.

Left.

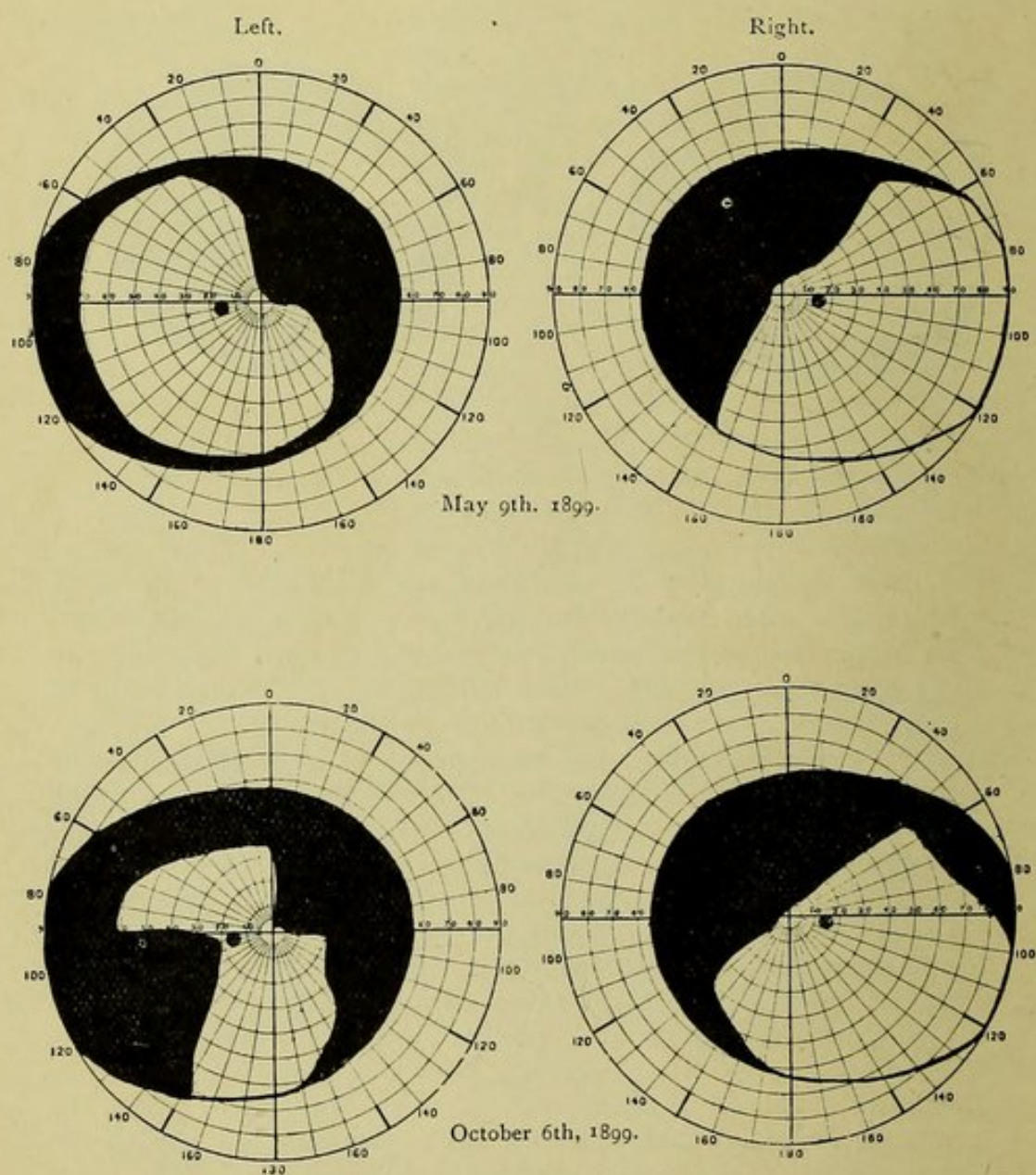


FIELDS OF VISION—MISS D.

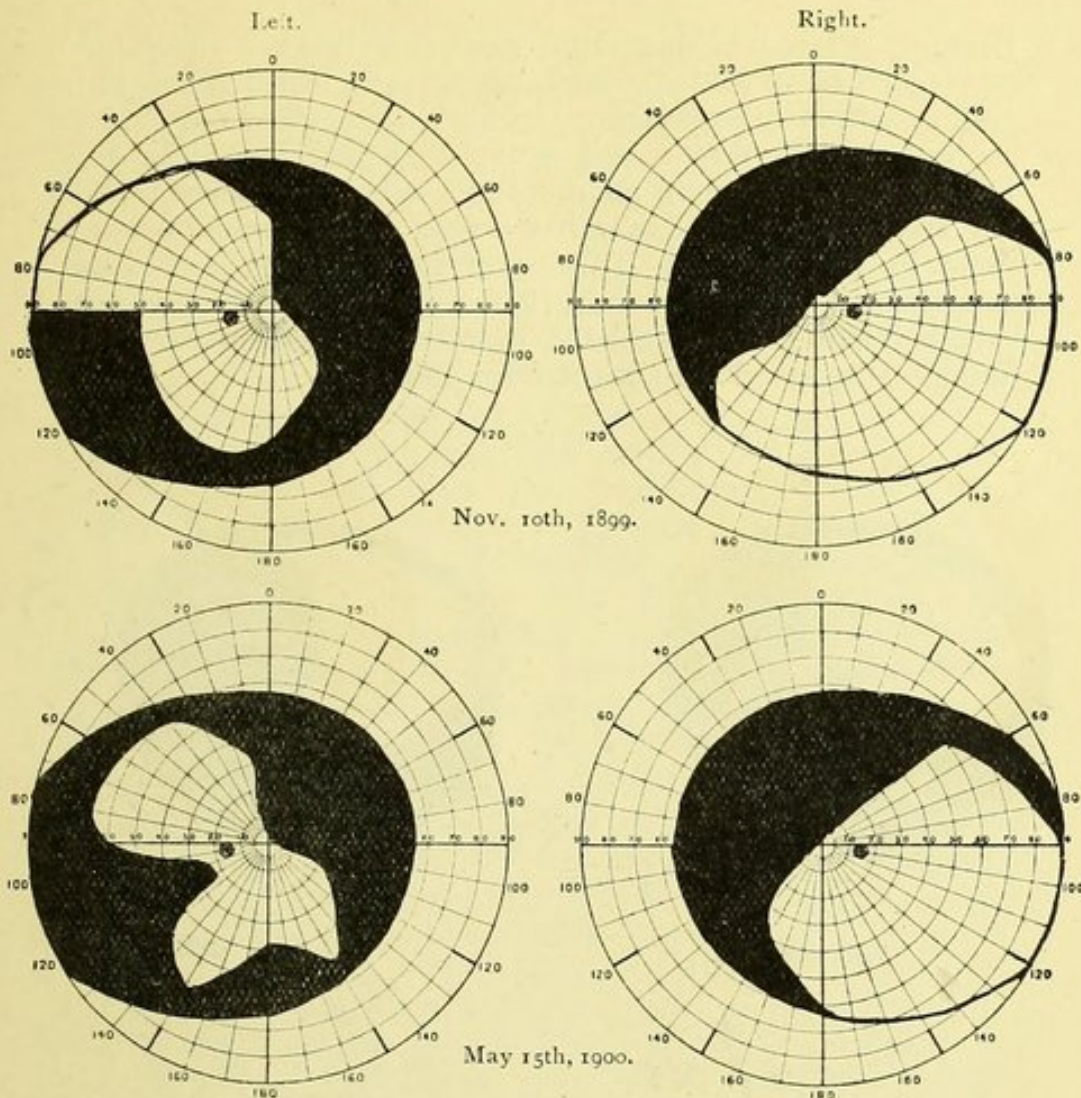
CASE XII.—Miss P. consulted me February 16th, 1893. She had myopic astigmatism and saw well with suitable lenses. In May, 1899, she returned, complaining of great discomfort in the eyes since January. The left eye was the worst, and she had noticed she could see with it in the temporal field only. The perimeter showed the nasal sides of both fields equally narrowed, but in addition the left field was affected on the temporal side. Vision R. with spectacles  $\frac{6}{9}$ ; L. with spectacles  $\frac{6}{18}$ , more clearly towards the temporal side. Both discs showed definite glaucoma cupping; no other objective symptoms were present. After using pilocarpine for a few weeks the vision and fields somewhat improved; but the patient returned again in October with the sight more confused and uncomfortable. On October 16th I did double iridectomy under chloroform. Since this the vision has been much more comfortable, but it is still at times confused. On May 18th, 1900, the central vision of each eye with spectacles was  $\frac{6}{9}$ , but with the left eye, only the letters in the left field were seen. The fields



of vision, which improved after the iridectomies, have somewhat deteriorated since, but judging from Case IX are likely ultimately to enlarge, as when the patient was last seen the tension of her eyeballs was quite normal and she made no complaint of her vision.



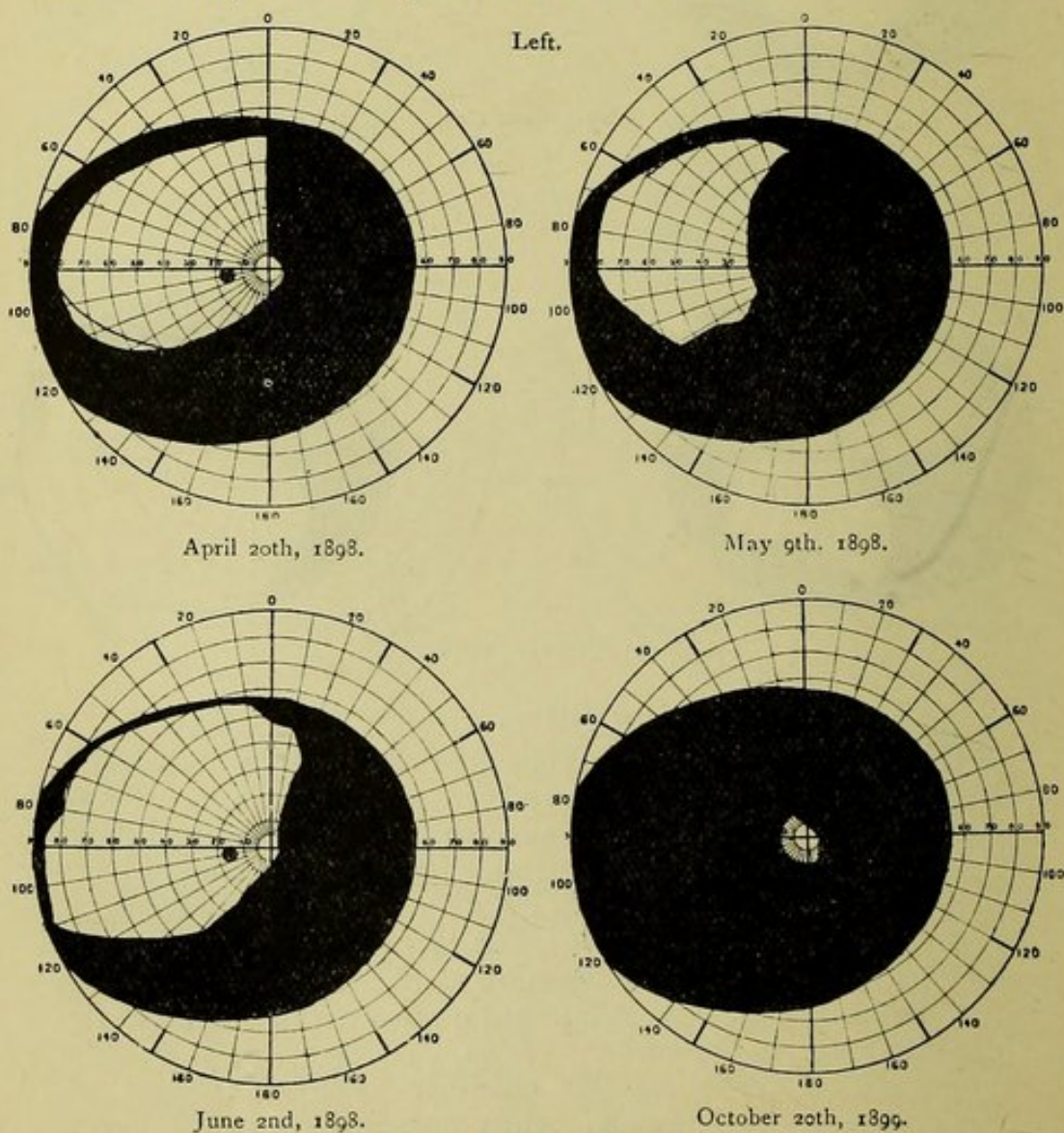
FIELDS OF VISION--MISS P.



FIELDS OF VISION—MISS P.

CASE XIII.—Mrs. F., 72, consulted me on April 20th, 1898. The right eye had been removed ten years previously after an unsuccessful iridectomy for glaucoma. The left eye had given no trouble until an attack of influenza with congestion of the lungs a year previously, when for a time the sight was foggy, and she saw occasional haloes, but recovered. In December, 1897, another attack of congestion of the lungs was associated with renewed subjective symptoms of defective vision, and the eye continued to get worse. Vision,  $\frac{6}{18} + 1\frac{6}{9} + 4.50$  J. 2 badly. Pupil rather large; anterior chamber shallow: T + 1: no congestion: scleral vessels slightly enlarged: pale flat nerve.

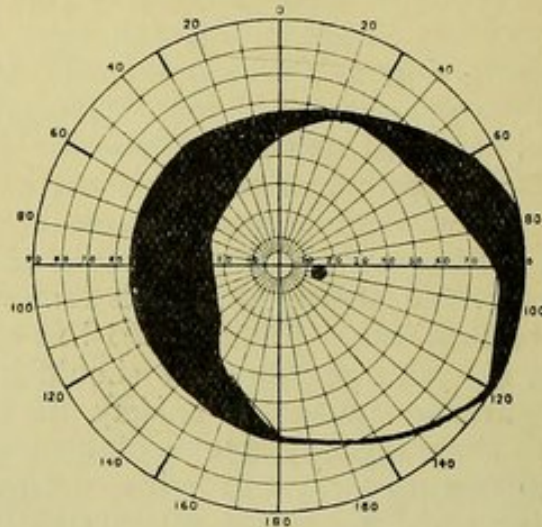
Eserine ordered. May 9th, 1898, condition worse; field of vision lost at fixation point. May 14th, iridectomy. June 2nd, central field regained. October, 1899, sight returned to  $\frac{6}{12}$ , but there is now a very diminished field extending only  $10^\circ$  around the fixation point. June, 1900, the patient retains her sight; but periodically has a course of strychnine injections in the temple. The nerve in this case was never cupped, but was white and flat; glaucoma was, however, very distinctly present, and the iridectomy done two years ago undoubtedly saved the patient from blindness.



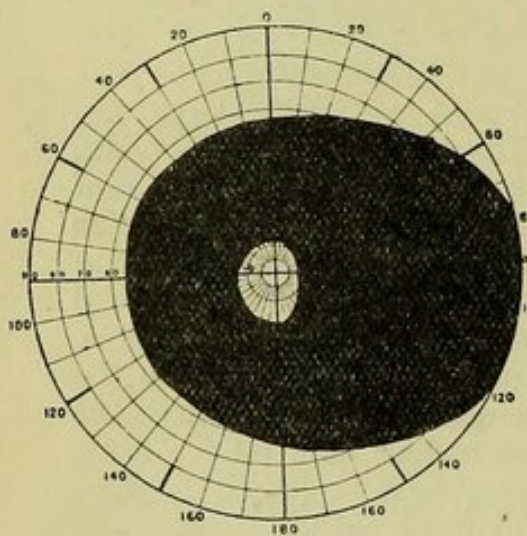
FIELDS OF VISION—MRS. F.

CASE XIV.—Captain B., aged 63, consulted me in July, 1889, for peculiar and misty vision in his left eye. R.  $\frac{6}{6}$ , 1 J.; L.  $\frac{6}{12}$ , 6 J. Left optic nerve pale, not cupped; artery pulsated doubtfully. Pilocarpine was ordered. November, 1890.—L. V.  $\frac{6}{18}$ . Field narrowed up to  $10^\circ$  round the fixation point. T. + 1, no cup nor pulsation at the optic nerve. September, 1892. Left eye blind, right normal. December, 1895, while shooting, acute inflammatory glaucoma attacked left eye. I did an iridectomy, and shortly afterwards removed the globe for intra-ocular hæmorrhage. Probably if I had operated when the eye saw  $\frac{6}{12}$ , six years previously, I should have saved it. The right eye gave no cause for anxiety till March, 1897, when it began to show slight symptoms of incipient glaucoma. Captain B., who was now 71, and gouty, declined operation unless I urgently wished it. Slight cataract had reduced the vision to + 0.75  $\frac{6}{7}$ , the field was full, and there was no objective evidence of glaucoma. The patient was given pilocarpine, and shot through the winter of 1899. His visual field was then narrowing, but his central vision was practically perfect; there was a marked pulsating artery. On January 2nd, 1900, he returned. Central vision was still good, but the field was narrowed to within  $10^\circ$  or  $15^\circ$  of the fixation point. There was no marked tension. The optic nerve was white and flat, but there was very definite pulsation of the main trunk and branches of the central retinal artery. A good peripheral iridectomy was done on Jan. 6th without trouble, but an unusual amount of hæmorrhage followed into the aqueous chamber. On the 7th a large blood clot occupied the aqueous chamber, and vision remained at bare p.l. for three days. On the 11th the patient could count fingers. Slight daily absorption of the blood with fresh scarlet hæmorrhage on the upper part of the older clot continued for three weeks, during the whole of which time the patient was kept quiet in bed and could scarcely see at all. Gradual improvement then commenced, and on February 20th a chart was taken showing much widening of the field. Central vision had also improved to  $\frac{6}{9}$  with - 2 cyl. and to J. 6; but there was still slight hæmorrhagic exudation into the aqueous chamber. On March 26th the sight was still improving and the hæmorrhage gone. The optic nerve was flat and white, and the central artery showed no signs of pulsation. In May the patient was comfortable and had no unsatisfactory symptoms. He continues to improve.

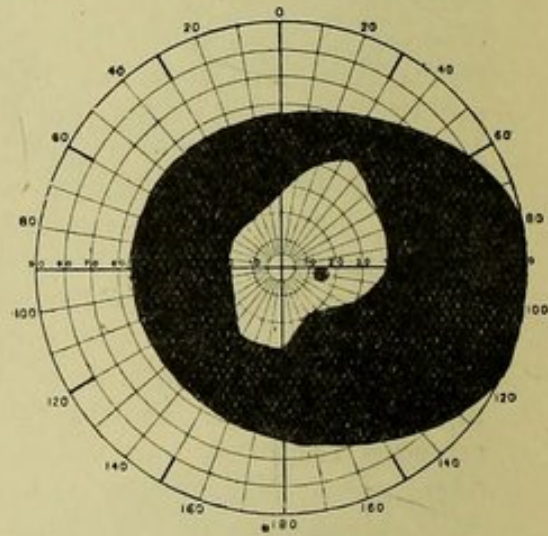
Right.



March 30th, 1899.



January 2nd, 1900.



March 26th, 1900.

FIELDS OF VISION—CAPT. B.

Sclerotomy seems likely to be of great value as a remedy in the earlier stages of chronic glaucoma, before the sight is much reduced or the eyeball damaged. I have been well satisfied with the results of this operation in a good many cases, and it is specially indicated when the disease is complicated by degeneration of the

intraocular fluids associated with any forms of uveal inflammation.

The sclerotomy I perform was, I believe, first suggested by Snellen. A broad keratome is passed—as in the first step for making an iridectomy—from a puncture point about 2 mm. outside the corneal margin into the aqueous chamber as nearly as possible at the corneo-iritic angle. The wound is made as peripheral and as wide as practicable, without touching the edge of the lens or its capsule. The knife is very carefully withdrawn to avoid prolapse of the iris, which has been further guarded against by previously having the pupil fully contracted under eserin, and may be still further assured by a hypodermic injection of morphine.

Sclerotomy, as usually done by a Graefe knife, appears to me to be more difficult of proper execution. It is less easy to control the absolute anatomical position of the wound, prolapse of the iris is more likely to occur, particularly near the point of counterpuncture, and more definite scarring of the eye is likely to result with the possibility of unpleasant sequelæ. Sclerotomy with a keratome can give a satisfactory result without any trace of the operation remaining.

The following are notes of cases where sclerotomy was done :

Mr. J. L., aged 64. Chronic glaucoma of four years' standing in right eye ; of one year's standing in left eye. The vision was, right eye, finger counting in the upper and outer field ; left eye,  $\frac{6}{24}$ . The right field was lost excepting a small area on the temporal side of the fixation point, and the left was reduced to  $5^{\circ}$  on the nasal side  $50^{\circ} \times 5^{\circ}$ . There was slight choroidal damage in each eye, with some synchysis. Tension R. and L. + 1. The right optic nerve was white and

cupped without strangulation of the vessels; no cupping was observable of the left optic nerve, but the main artery pulsated. After use of eserine for two or three days, sclerotomy was done on each eye and resulted in improvement in the vision of the left eye to  $\frac{6}{14}$ , with enlargement of the field, and also in some improvement of central and peripheral vision in the right eye. There were much increased comfort and power of using the eyes, disappearance of pulsation in the retinal artery and lessened cupping of the disc. The patient has lately written that his left eye continues to improve.

Mrs. K., with chronic non-inflammatory glaucoma and very severe discomfort in both eyes. Symptoms in the left eye of seven, and in the right of four years' standing. Vision: left hand movements; right,  $\frac{5}{9}$ , with markedly contracted field. Sclerotomy was done on the left eye, iridectomy on the right. The right vision gradually improved to  $\frac{5}{8}$ ; 1 J. with enlargement of the field. The left eye saw 19 J. Both were entirely relieved of discomfort, haloes, fogs, and subjective sensations. The improvement lasted for some months after the operations, and probably still continues.

Sclerotomy by the keratome is of great service at the coloboma when eyeball tension has recurred after having been temporarily relieved by an earlier iridectomy. The operation may be done again and again without danger to the eye and with repeated relief of the symptoms at intervals varying from a week or two to any period, according to the necessities of the case.

Thus in November, 1894, I did iridectomies for chronic glaucoma in A. E. W., aged 36. His left eye was blind; the right had V. - 1  $\frac{5}{8}$ . In December, 1895, the right eye had a full field and good vision, but occasional insidious symptoms of glaucoma. In January, 1897, sight was misty, V. with spectacles  $\frac{6}{18}$ . The media were somewhat hazy and T + 1. In February I did sclerotomy through the coloboma; a week afterwards vision had improved to  $\frac{6}{12}$ . The patient went on satisfactorily with his duties as a solicitor's clerk until November 30th, 1898, when he complained of fogs and haloes. T + 1, but the field of vision was full. I again did sclerotomy through the coloboma, with restoration of sight and comfort. He continues his work, and saw well in the spring of this year.

It would seem possible that a very few eyes in which symptoms of chronic glaucoma have appeared may right themselves ; a few others are cured by myotics ; but, in the large majority of the cases, the glaucoma symptoms progress with increasing damage to the eye tissues and deterioration of the sight. Many of the patients are old and out of health and may not consent to operation, but both on theoretical grounds and from the recent study of my cases I am of opinion that, as a rule, when a patient's symptoms lead to an undoubted diagnosis of simple glaucoma, even where sight is good and the field of vision scarcely narrowed, no matter how dangerous it may seem to subject an eye which some might consider devoid of serious symptoms to the risks of operative interference, we ought to advise that a peripheral incision should be made through the corneo-iridic angle to open the filtration channels, either with or without the removal of a piece of iris, according to the nature of the case, and that operation to be of advantage should be resorted to before the optic nerve is badly cupped, the retina seriously pressed on, or the iris jammed at the corneo-iridic angle, and before the tissues of the eyeball are permanently damaged or the power of vision definitely impaired.



