

CHAPTER X.

DISEASES OF THE CHOROID.

Hyperæmia—Choroiditis disseminata—Choroiditis diffusa—Suppurative Choroiditis—Extravasation of blood—Atrophy—Glaucoma—Posterior Staphyloma—Tubercle—Wounds and injuries of the choroid—Detachment—Sympathetic irritation—Tumours.

HYPERÆMIA AND INFLAMMATION.

HYPERÆMIA.

HYPERÆMIA OF THE CHOROID.—Among dark-skinned races, the pigmented hexagonal cells prevent our seeing the healthy choroid with the ophthalmoscope.

Symptoms very obscure.

Passive hyperæmia of the choroid may occur without the patient being at all aware of its existence. Moreover, the tension of the eyeball is generally normal, the iris responds to the stimulus of light, and the dioptric media appear healthy; but from time to time the patient suffers from what he calls weak eyes: there is then some intolerance of light, and slight pain on pressure over the globe of the eye; the sclerotic zone of vessels is probably somewhat congested, and conjunctivitis may also exist. A case of this description is not unfrequently put down as an instance of scleritis, when in fact it depends upon hyperæmia of the choroid.

Hexagonal cells first removed.

One of the earliest alterations observed in dark-skinned people in hyperæmia of the choroid is the removal of the hexagonal cells of that structure. This change is of course only noticeable among coloured people. Although, generally speaking, these cells thus become disintegrated and destroyed in passive hyperæmia, in some instances, it seems to me, they are simply pushed back, from over the course of the distended

vessels, and as the hyperæmia subsides, they recover their position, the parts returning to their normal state.

But in addition to these changes in the epithelial layer of the choroid, its pigment cells become compressed by the distended capillaries, and aggravated into dense masses; and from this condition they seldom seem to recover, remaining as patches of black pigment more or less closely adherent to the sclerotic. Whatever the office of these choroidal cells may be, we may be quite sure that changes, such as I have described, cannot occur without disturbance to the functions of the choroid.

Pigment cells of stroma compressed.

Causes.—Hyperæmia of the choroid appears at times to arise from exhaustion of the nerve fibres supplying its vessels, it may be from over-work or stimulation, or from debility. It is not an uncommon thing to be consulted by young men complaining of gradually increasing impairment of sight; they are weak, with a small irritable pulse, having pallid faces, and a nervous uneasy manner. On examining the eye with the ophthalmoscope, we notice under these circumstances that hyperæmia of the choroidal vessels is present, and some slight opacity of the vitreous may be observed, depending very probably upon exhaustion of the vaso-motor nerves.

Causes. Nervous exhaustion

In instances of this description it will be important to determine if over-work, disease, or venereal excesses are the cause of the hyperæmia, and our treatment must be directed towards the removal of any of these depressing influences, so as if possible to restore the tone of the nervous system, and thereby the contractility of the capillary network of the choroid.

from various causes.

Passive hyperæmia of the choroid may result from mechanical causes, as for instance, from pressure exerted on the veins of the part, or from more general disorder in the circulation, depending on disease of the heart. If from the former of these causes, the case will very probably be complicated with serous effusion into the retina, and a more or less extensive detachment of its nervous substance from the choroid, together with venous congestion. These changes most frequently follow syphilitic inflammation of the sheath of the vessels, or disease of the dura mater, or brain, and are very commonly characterized by intense head-

in vessels,

ache, and symptoms indicating derangement of the nervous centre. In instances of hyperæmia of the choroid arising from disease of the heart, we shall usually have further evidence of the latter, in the general symptoms from which the patient suffers, pointing directly to impairment of the cardiac functions; and any suspicions that may have been formed will be confirmed or removed by the aid of the stethoscope.

or heart.
Intestinal irritation.

Besides taking all these circumstances into consideration in attempting to determine the causes which give rise to hyperæmia of the choroid, it will be necessary to inquire into the state of the digestive organs; sympathetic irritation propagated from the alimentary canal to the eye being perhaps at the root of the mischief.

Disorders of accommodation.

Lastly, I may mention that hyperæmia of the choroid sometimes arises from defects in the accommodation of the eye, the patient making an unnatural effort when looking at near objects. The constant strain on the muscular apparatus of the eye which is thus kept up, induces passive congestion of the choroid.

Treatment.

Remove the cause.

Treatment.—I would strongly insist on the point, that a satisfactory opinion as to the cause of the disease must be arrived at, before we can safely prescribe any plan of treatment for its cure. Our duty will then be to select such measures as may seem best adapted to correct the more remote conditions of ill-health from which the patient may be suffering, and on which the choroidal affection depends. Any consideration of these would lead us too far from our present subject.

Counter-irritation, cold, rest.

As regards local treatment, the cold water douche, rest, and counter-irritation, will form very valuable adjuncts to any general remedial agents we may think best suited to the case. And where the hyperæmia is dependent on disorder of accommodation, the rational treatment will be, of course, to supply the patient with glasses adapted to correct it.

CHOROIDITIS DISSEMINATA. Subacute and latent character.

CHOROIDITIS DISSEMINATA depends upon partial or local changes going on in the choroid, often of a subacute character, so that the patient complains of no marked symptoms during the early stages of the disease, and, in fact, may be completely unconscious of its

existence. This may continue until the disease has advanced so far as to interfere with the due supply of blood to the choroid, when degenerative changes will be induced in the vitreous, and render the patient's sight more or less dim.

The pathology of this affection of the choroid seems to be analogous to that of plastic iritis, already described: neo-plastic elements form in the choroid, and as they become organized, the tissues among which they grow are compressed, the circulation through the vessels is impeded, and the part becomes atrophied. Although it is necessary to describe these various diseases of the choroid as distinct and separate affections, I need hardly observe that in practice we find the retina and iris almost invariably implicated, if the choroid is at all extensively diseased.*

Symptoms.—The patient usually complains of impaired sight, and complains of an appearance of cobwebs, or flocculent bodies, floating about in the field of vision. There is little or no pain in the eye, and the cornea, conjunctiva, and sclerotic are generally perfectly healthy; and unless in the advanced stages of the disease, the iris appears normal, and the pupil responds to the stimulus of light. At a subsequent period the iris becomes implicated, and we then have superadded to the symptoms of choroiditis those of plastic iritis. The sclerotic zone of vessels, which is often congested from an early stage of the disease, is sure to be well marked when the morbid action has passed to the iris.

On examining the eye with the ophthalmoscope we shall observe in the early stages of the disease generally towards the ora serrata, numerous small specks of a greyish-white colour; these gradually increase in size, and encroaching, or rather forming, towards the fundus of the eye, they appear as whitish patches behind the retina. As the disease advances the choroid becomes atrophied, and then the glistening white sclerotic may be seen in irregular-shaped patches, the retinal vessels coursing over them. The circumference of these white patches is generally surrounded with a border of black condensed pigment.

* "Maladies des Yeux," par L. A. Desmarres, tom. iii. pp. 405, 406.

If the disease advances unchecked, the patches of neo-plastic formation increase in size, until, as before remarked, by materially interfering with the circulation of blood through the choroid, the nutrition of the lens and vitreous is impaired.

Flocculi
seen in
vitreous.

The appearance of flocculi in the field of vision under these circumstances, may be due either to the presence of small particles floating about in an already fluid vitreous, or, in the early stages of the disease, to pressure on the retina, occasioned by the swollen choroid. Should pressure of this kind be limited to a part of the retina in or near the axis of vision, the patient often complains of a black spot being constantly present in the visual field, which is most troublesome to him when reading or writing—a *scotoma*, as it is called.*

Scotoma.
Causes.
Syphilis.

Causes.—The most frequent cause of this affection of the choroid is syphilis, either acquired or hereditary. The iris may be the original seat of the disease, the abnormal action spreading backwards from it to the choroid; under these circumstances the train of symptoms will be very complicated; but if the dioptric media are sufficiently clear to enable us to see the fundus of the eye with the ophthalmoscope, all doubt as to the nature of the case will be removed. This affection of the choroid has been observed to follow some of the low forms of fever.

Low fevers,

Prognosis.—The course pursued by choroiditis disseminata very much depends upon the progress the disease has made before it is brought under treatment; the damage once done to the choroid by neo-plastic growths can never be repaired; so that if the latter are extensive, and a considerable portion of the circulation through the choroid is impeded by them, it is more than probable that atrophy of the globe will ensue, in spite of all our efforts to stay the degenerative changes. Formations of this kind occurring in the choroid, of necessity impair the functions of the retina, consequently, the progress of a case depends to a great extent upon the position of the neo-plastic growths with reference to the axis of vision. If we are fortunate enough to see the case when the patches of

Damage
irreparable.

May cause
atrophy of
globe.

* Cases reported by Mr. Moon, from Mr. J. Z. Laurence's practice: *Ophthalmic Review*, April, 1867, pp. 280, 282.

neo-plastic tissue are inconsiderable, we may often stay the further progress of the disease, and thus preserve the eye.

Treatment.—In syphilitic cases the patient must be well fed, have plenty of pure air and exercise, so as to bring the nutritive functions into good working order; and in addition, bichloride of mercury and iodide of potassium should be perseveringly administered. The mercurial vapour-bath may often be employed with advantage. Counter-irritation, in the shape of a blister, or an issue opened in the skin of the temple, is often of considerable use. If the patient is recovering from fever, we must chiefly rely on iron and quinine, combined with a generous dietary, not neglecting counter-irritation. The pupil should be fully dilated with atropine in all cases of choroiditis.

Treatment.
Good food,
pure air.

Mercurials.

Tonics.

Atropine.

CHOROIDITIS DIFFUSA.—This affection of the choroid is described by M. Wecker as parenchymatous choroiditis, the disease resembling in every respect parenchymatous iritis.

CHOROIDITIS DIFFUSA

In the first instance, we may observe changes taking place along the outer walls of the larger choroidal vessels; they appear as if lined by a white streak when seen with the ophthalmoscope. This border surrounding the vessels consists of organized neo-plastic tissue, and is the product of the proliferating process, which usually commences in the cells of their adventitious coat. The diseased action thus set up in the part is apt, under certain circumstances, to extend itself rapidly in the neighbouring connective tissue, sometimes involving the whole fibro-cellular web of the choroid, in which condylomatous growths make their appearance. As these increase in size, they push the retina before them, advancing rapidly towards the vitreous chamber, so that ultimately the fundus of the eye presents a nodulated appearance of a greyish-white colour, over which the remains of the retinal vessels may be traced.

Commences
in the
vessels.

Condylomata appear in the choroid.

This form of disease is most commonly met with among young and delicate children, frequently the offspring of syphilitic parents. Under these circumstances the patient's eye probably presents the following appearances: The pupil is dilated, and of a greenish colour; the tension of the eyeball is increased,

Pupil dilated.

Globe enlarged, and tense; fundus nodulated.

Sight quickly lost.

Eye destroyed.

Symptoms.

No pain. Impaired sight.

Appearance of the eye.

Causes obscure.

SUPPURATION.

the globe being evidently enlarged. On looking through the pupil we may notice that the fundus is occupied by a nodulated greyish-white mass, with a few vessels coursing over its surface; by transmitted light these appearances are well seen.

The sight is, of course, speedily destroyed in the diseased eye, but the patient suffers from little, if any, pain in it, the distension of the globe being very gradual; moreover, the sclerotic undergoes fatty degeneration in consequence of the disease in the choroid, and so yields to the intra-ocular growth, preventing any considerable increase of tension.

Instances of this kind are likely to be mistaken for malignant disease. The patient's general health, however, remains unimpaired, and the advance of the disease is very slow indeed; moreover, the growth appears almost non-vascular; these characters are sufficient to exclude the idea of cancer.

As these pathological changes in the choroid progress, the lens and retina become hazy, and the whole eye may suppurate; or slowly-advancing degenerative changes occur, and the eyeball becomes atrophied and destroyed. It sometimes happens that these condylomatous growths in the choroid become metamorphosed into a true bony structure.

Symptoms.—As the progress of this affection of the choroid is usually very slow, its early stages are unaccompanied by pain, and gradually increasing impairment of vision is the symptom principally complained of by the patient. The eyeball slowly enlarges, and the whitish growth at the back of the eye, already described, may then be seen through the dilated pupil by means of the unaided eye, and still more clearly with the ophthalmoscope. Opacity of the lens and vitreous supervenes, and ultimately the eye is destroyed, either by general suppuration, or ulceration and destruction of the cornea.

Causes.—These are very obscure: probably inherited syphilis is the most frequent cause of the disease, but it has been observed to follow an injury to the eye in feeble and ill-nourished children.

SUPPURATIVE CHOROIDITIS.—Suppuration may result from either of the forms of inflammation already described, but more commonly comes on after wounds

or injuries of the eye. We meet with cases following the operation of reclinatio, the irritation of the lens exciting violent inflammation in the choroid.

The changes going on in the fundus of the eye, in instances of suppuration of the choroid, cannot be observed with the ophthalmoscope, because the diseased condition of that structure very soon impedes the circulation of blood through its vessels, and degenerative changes in the vitreous, lens, and cornea supervene, which entirely prevent any but scattered rays of light from reaching the fundus of the eye.

Symptoms.—Suppuration of the choroid is marked by the eyelids becoming swollen, red, and œdematous; there is intense pain in the eye and side of the head, greatly increased tension of the globe, deep injection of the conjunctival and sclerotic vessels, a muddy state of the aqueous, haziness of the cornea, lens, and vitreous, and insensibility of the iris either to the influence of light or to mydriatics. As the disease advances pus finds its way into the anterior chamber, and suppuration of the cornea generally supervenes; ultimately the cornea sloughs, the contents of the eye are evacuated, and the globe shrivels up and recedes into the orbital cavity.

Cases of this kind might in fact with propriety be called abscess of the globe of the eye, rather than suppuration of the choroid, for in truth the disease involves all the structures constituting the globe of the eye; but as the inflammatory action commences in the choroid, it may be well to consider these instances as examples of suppuration of that structure. Moreover, pus may appear in the choroid without the disease advancing to absolute destruction of the globe of the eye, though probably suppuration can hardly take place in that situation without being followed by atrophy and loss of sight.

Treatment.—This will depend very much upon the cause of the disease: if arising, for instance, from the presence of a dislocated lens or some other foreign body in the eye, it will probably be well to remove the lens, making a free opening through the cornea and excising a considerable portion of the iris. But if the inflammatory action has proceeded so far as to cause general inflammation of the globe, the most efficient

After wounds.

Progress concealed.

Pain, tension, injection.

Pupil inactive.

Pus in ant. chamber.

Cornea sloughs.

All the structures involved.

Eye or sight lost.

Treatment.

Remove a dislocated lens.

or the eyeball.

treatment we can then adopt will be to remove the eyeball at once.

I hardly think it likely that any general or local remedies will stay the progress of suppuration, when once it has commenced in the choroid; leeches, mercury, iced compresses, and lowering remedies are recommended by those who believe that these means control the suppurative process; but I have great doubts of their efficacy, at any rate in cases of this kind.

EXTRAVASATION OF BLOOD.

Distin-
guished
from retinal
hæmor-
rhage.

EXTRAVASATION OF BLOOD into the choroid frequently occurs in choroiditis, the clots passing through the same changes as those described in similar affections of the retina. The effused blood, if poured out in any quantity, generally collects in patches of various sizes behind the elastic lamina, and completely hides the vessels and pigment-cells of the choroid. The nervous tissue of the retina, however, can be traced over the patches, and more particularly the retinal vessels; these, together with the remains of the hexagonal cells of the elastic lamina, are sufficient landmarks to guide us in the determination of the seat of hæmorrhage, and in distinguishing extravasations of blood into the choroid, from those into the retina.

GLAUCOMA.

Before entering upon the subject of glaucoma, it may be advisable to make a few remarks upon the excavation of the optic disc, which so constantly attends this form of disease.

EXCAVATION OF OPTIC NERVE.

Vessels interrupted at margin of disc.

EXCAVATION OF THE OPTIC NERVE simply means that the optic papilla is thrust backwards from its normal position, and consequently, if with the ophthalmoscope the vessels at the margin of the excavated disc be brought into focus, it is evident that their continuation over the papilla cannot be distinctly seen till the accommodation of the observer's eye is altered, the vessels on the disc being on a plane posterior to those of the retina. Conversely, if the observer alters the focus, so that the papilla is accurately defined, the vessels passing over the retina of the eye will be indistinct, because the latter are on a plane anterior to those crossing the papilla. Again, if the retinal vessels be traced up to the margin of the disc,

they appear to terminate there in "beak-shaped points," and their continuation over the papilla will seem to be interrupted and displaced, as shown in Fig. 1, Plate VII.

The explanation of this is, that the vessels having arrived at the edge of the excavated disc, dip down over its margin, and in their course along the sides of the excavation cannot be seen by rays of light falling perpendicularly upon the disc; but as they pass over the bottom of the excavation they are again visible, although evidently on a plane posterior to the retina. If, however, the patient is made to turn his eye upwards or downwards, and the light from the ophthalmoscope be thrown obliquely upon the disc, so as to illuminate the sides of the depression, the vessels may be traced throughout their course; unless, as sometimes happens, the choroidal margin of the disc bulges very much inwards, like a rock overhanging a precipice, when the vessel, winding round the projection, must be entirely hidden from view till it reaches the bottom of the excavated papilla.

Causes.—Excavation of the optic nerve may arise from various causes, and First, from glaucoma, or pressure excavation; Secondly, from congenital malformation; Thirdly, from atrophy of the optic nerve.

1. In glaucomatous excavation, the whole of the disc is involved, and its sides

are precipitous; this condition of the parts is shown in section in the annexed figure. The vessels may be seen at the margin of the disc, terminating as it were in hook-shaped extremities, represented in Fig. 1, Plate VII. The

colour of the optic disc is changed, its central part is white and glistening, and this is surrounded by a shadow thrown by the walls of the disc into its excavated portion; the shadow varies with the depth of the excavation. In addition to these changes of the papilla, other conditions will be noticed hereafter in the fundus of the eye, which are pathognomonic of glaucoma.

2. In cases of excavation of the papilla arising from congenital malformation, the entire disc is never in-

Explana-
tion of the
appear-
ances.

1. Excava-
tion of
papilla in
glaucoma.

FIG. 32.



2. In congenital malformations,

volved. I have seen several congenital cases in which the whole of the disc was excavated with the exception of a narrow border at its circumference; so that its choroidal edge was normal, and within this was a rim of the papilla, the remainder of it being excavated; but these cases are rare, compared to those congenital cases in which only a small portion of the disc is involved in the excavation. The depression of the optic disc under these circumstances is surrounded by a reddish zone, and the edges of the cup are usually slightly sloping. And with the exception of the excavation of a portion of the disc, the fundus of the eye is healthy, and its tension normal. Malformations of this description do not give rise to any subsequent changes, though, of course, an eye in this condition is by no means exempt from an attack of glaucoma, or any other form of disease to which it is subject under ordinary circumstances.

3. In atrophy of papilla.

3. Lastly, excavation of the disc, arising from atrophy and retraction of the optic nerve, is marked by atrophy of the elements of the optic nerve and its vessels, so that the colour of the papilla is changed to a greyish-white tint. In the atrophic form of excavation there is a comparatively slight amount of depression of the papilla, its sides sloping down gradually from the circumference towards its centre. The vessels may therefore usually be traced throughout their extent; but when the branches coursing over the fundus of the eye are in focus, those passing over the disc will appear very slightly out of focus, until the accommodation of the observer's eye is altered; but cupping of the optic disc, due to atrophic excavation, can hardly be made out unless by means of the direct method of examination.

Glaucoma.

Glaucoma.—We may proceed to consider the two varieties of the malady:—1. Primary Inflammatory Glaucoma. 2. Glaucoma Simplex.

1. Primary Inflammatory Glaucoma.

1. *Primary Inflammatory Glaucoma.*—In this form of disease the morbid phenomena commence in the uveal tract; as this regulates the intra-ocular fluids, irritation of it may lead to excessive secretion and increased tension of the eyeball. We may perhaps best form an idea of the pathology of the disease by combining the views of Professors Stellwag v. Carion and Donders, as to the conditions which they suppose

Pathology.

to be fundamental in these cases. The latter holds that glaucoma depends on neurosis of the secretory nerves of the eye, and the former, that a primary rigidity of the sclerotic produces the feeling of hardness of the globe of the eye noticed in instances of glaucoma.*

It is a well-known fact that section of the fifth pair of nerves causes excessive softness of the globe of the eye, and on the other hand, that excitation of these nerves increases the serosity of the vitreous, and so augments the intra-ocular tension. Supposing, therefore, that from unknown causes excitation of the fifth nerve occurs, and augmentation of the contents of the vitreous chamber takes place; then if, as Professor von Carion asserts, the sclerotic at times undergo similar changes to those observed in the fibrous coats of arteries, by which they become stiff and atheromatous, it is evident that increased intra-ocular pressure from the former cause would, under these circumstances, induce the phenomena characteristic of glaucoma.†

Increase of vitreous from neurosis,

with rigidity of sclerotic.

Symptoms.—Glaucoma seldom attacks a person under forty years of age, and is more common among women than men.‡ In the first instance the patient complains of rapidly advancing presbyopia; he finds that month after month he has to increase the distance between his eye and the book he may be reading, in order to see the letters distinctly. The reason of this is, that the power of accommodation is in a great measure destroyed by changes going on in the choroid, which, though often hardly sufficient to cause any greatly increased tension of the globe, may, nevertheless affect the nerves of the ciliary muscle, so that the muscle can no longer act on the lens, and render its anterior surface sufficiently convex to bring divergent rays of light to a focus on the retina.

Symptoms.

Advancing presbyopia.

The patient also complains of defect of sight, which on inspection may be found to be partly due to con-

Impairment of the field of vision.

* "Illustrations of some of the Principal Diseases of the Eye," by H. Power, F.R.C.S., p. 414.

† Donders on Glaucoma, "Report on the Heidelberg Ophthalmological Congress;" *Ophthalmic Review*, vol. ii. p. 189.

‡ For statistics on this subject, *vide Ophthalmic Review*, vol. i. p. 234.

traction of the field of vision, generally commencing on the inner or nasal side of the eye. By carefully examining the state of the patient's eye we shall probably discover that not only is his field of vision contracted, but very probably that certain portions of the retina are insensitve to the stimulus of light.

On inquiry, we shall find that our patient has suffered from uneasiness, and often from a considerable amount of pain, of a periodic character, situated over the eyebrow and along the side of the nose. This pain, which is due to exacerbation of the choroidal congestion, and consequent augmentation of the tension of the eyeball, usually comes on towards evening, and lasts for a few hours, the patient's sight becoming misty during the paroxysm. The degree and character of this pain are uncertain; in some cases it is very intense, while in others it is trifling. Another symptom, noticed at an early period of the complaint, is that the patient sees a halo surrounding the flame of a candle, or any other luminous object in front of him.

In the early stages of glaucoma, the tension of the eyeball is only slightly increased, and this is most apparent towards evening; subsequently the increased tension becomes permanent, and varies according to the stage of the disease. We shall probably notice several enlarged vessels coursing over the sclerotic. The aqueous appears muddy, rendering the fibres of the iris indistinct. The state of the pupil will be found to vary according to the progress which the affection has made; at an early stage it acts sluggishly on the stimulus of light, but as the disease advances it gradually becomes less active, until at length it remains widely dilated and quite insensible to light.

On making an ophthalmoscopic examination, the vitreous will be discovered to be somewhat hazy, and the retina hyperæmic, with its veins tortuous and deeply congested. The arteries in the early stage of the disease are normal, and subsequently perhaps slightly contracted; in both sets of vessels a distinct pulsation will be noticed, or, if it does not already exist in the arteries, it may be induced by slight pressure with the finger on the eyeball. The only change observable in the optic disc at this period is,

Periodical pain.

Halo.

Tension increased.

Congestion.

Pupil inactive.

Retinal veins dilated.

Pulsation.

that its choroidal margin is rather prominent; except in cases complicated by congenital staphylocoma of the papilla, in which, of course, the excavation will be more marked in consequence of the bulging backwards of the lamina cribrosa. As the disease advances, the vessels of the choroid will be found uniformly congested, but blurred and indistinct, from effusion into its substance.

These symptoms having lasted for a longer or a shorter period, they all become perhaps suddenly augmented, it may be in a single night; more often, however, the severity of the premonitory symptoms gradually advances; the tension of the eyeball increases, the globe becomes hard, and the ciliary neurosis intense. The cornea is hazy, and its sensibility is diminished from compression of the ciliary nerves. The dimness of vision increases, the pupil is dilated and stationary; the lens is apparently of a green colour. This last appearance arises from the lens itself assuming a yellowish hue, while the aqueous becomes of a bluish tint, the combination causing the green colour, which at one time was supposed to be pathognomonic of glaucoma, and gave rise to its name. The episcleral tissue and conjunctiva appear thickly injected; the latter is often swelled and actually chemosed.

If now the eye be examined with the ophthalmoscope, the cornea and lens remaining sufficiently transparent to allow of the rays of light reaching its fundus, the retinal veins will be seen to be very tortuous and greatly congested; they are sometimes beaded. The calibre of the arteries, on the other hand, is contracted, and a pulsation may be noticed in both sets of vessels. The fundus of the eye is of a brickdust colour, owing to the capillaries of the retina and choroid being uniformly congested; and spots of extravasated blood are not uncommonly noticed both in front and behind the elastic lamina. As the disease advances the dioptric media become hazy, and it may be impossible to see the further changes that take place in the fundus of the eye. The nervous structure of the papilla becomes atrophied, and the disc is cupped, the lamina cribrosa protruding backwards, so as to occupy a plane posterior to that of the sclerotic. A few days, or even hours, may complete the picture of glaucoma. But, as a general rule, a remission in the symptoms takes

Papilla slightly cupped.

Progress: All symptoms intensified.

Cornea insensible.

Pupil dilated, greenish.

Venous congestion of fundus.

Further changes hid.

Disc deeply cupped.

place, and a succession of such attacks follow at longer or shorter intervals, until the eye is destroyed. But we must bear in mind the fact that one single intensely violent and continued attack of this kind may complete the mischief. The disease having run its course, the pain abates, but the eye is lost as an optical instrument.

2. Glaucoma
simplex.
Very in-
sidious.

2. *Glaucoma Simplex* is a very insidious disease. The external appearance of the eye is healthy, as is also the iris and refractive media. The patient complains of little or no pain, and the only constant symptoms noticed are the steadily increasing presbyopia, which after a time convex glasses fail to relieve, moreover there is contraction of the field of vision, together with augmented tension of the eyeball, which, though scarcely perceptible at the commencement of the attacks, becomes, after a time, a marked feature in the case.

The changes in the fundus of the eye progress at an equivalent rate, and frequently in both eyes at the same time; they are much the same as those observed in inflammatory glaucoma, and the termination of the disease is similar—namely, stony hardness of the globe, dilated pupil, opaque lens, a hazy anæsthetic condition of the cornea, and total loss of vision.

Consecutive
glaucoma.

Glaucoma, as I have before remarked, may follow various diseases of the eye; as, for instance, cases of irido-choroiditis, occlusion of the pupil, diffuse keratitis and anterior staphyloma of the cornea: it occasionally occurs after wounds of the lens, or from irritation induced by the presence of a dislocated lens in the vitreous chamber. The glaucomatous changes in the eye, under these circumstances, pursue precisely the same course as I have already described—the hardness of the globe of the eye and cupping of the optic disc being characteristic of the disease.

Prognosis.

Prognosis.—The prognosis in cases of glaucoma cannot be doubtful. In time it is sure to lead to blindness in the affected eye, and in all probability the second eye will follow in the same course if the disease be allowed to run on. Provided, however, the glaucoma is in its premonitory stage, and the intervals between the attacks of pain and other symptoms are well marked, we may, by means of an

iridectomy, stop the progress of the disease; but by no other method of treatment can we hope to arrest its advance. The question may arise as to when we are to perform iridectomy. I think, as a general rule, it may be said iridectomy should be resorted to as soon after we have diagnosed the disease to be glaucoma as possible. But provided the intermissions of pain are complete, and the patient's sight hardly impaired, we need be in no hurry to operate; nevertheless, under these circumstances, warning our patient that at any moment an operation may be necessary, if the pain in the eye and brow, together with the other symptoms, declare themselves rapidly and with intensity. In cases therefore of inflammatory glaucoma, we may give a favourable prognosis, provided an iridectomy is performed before the structures of the eye have been permanently damaged; it matters not how acute the symptoms may be. The effects of an iridectomy for the cure of glaucoma, are as regards the improvement of sight gradual, and do not reach their maximum until some two months after the operation. In the later stages of glaucoma, and in cases of glaucoma simplex, the curative action of an iridectomy on the diseased eye are very uncertain. And in instances of secondary glaucoma, the good effects of the operation are still more doubtful. In complete glaucoma, unless to relieve pain, an iridectomy is useless.

May be
arrested by
Iridectomy.

Treatment.—With regard to the treatment of glaucoma, there can be no doubt whatever that iridectomy, if practised sufficiently early, will cure the disease. In making this assertion, it must be clearly understood that by iridectomy I do not mean simply excision of a portion of the iris, however large it may be;—the operation consists in the successful removal of a section of the iris, together with its ciliary attachments. In certain cases of sloughing ulcers of the cornea, in which iridectomy is recommended, all that is requisite is to remove so much of it as will prevent the secretion of the normal amount of aqueous, and thus, by diminishing the pressure from behind, prevent the corneal tissue being stretched, and ultimately forced into a staphyloma. But in glaucoma more than this must be done; I was formerly in the habit of puncturing the cornea time after time in instances of this disease, and allowed the aqueous to escape, thus relieving the

Treatment.
Iridectomy
in early
stages.

The opera-
tion must
be com-
plete.