Diathesis and ocular diseases / by A. Maitland Ramsay.

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BY

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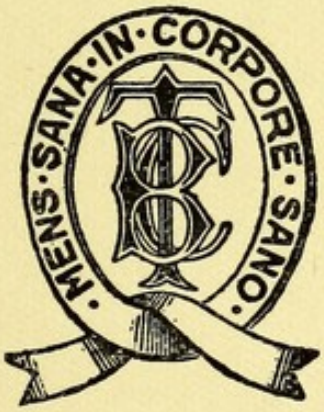

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TO

MY WIFE

PREFACE

THIS little volume contains the post-graduate lectures delivered at the Glasgow Ophthalmic Institution in September, 1908, arranged in book form. The work is published at the request of some of those who were present, in the hope that it may prove useful to senior students and junior practitioners. The lectures were purely clinical, and consequently no attempt has been made to treat the subject in a systematic or exhaustive manner. The aim has simply been to give my personal clinical experience, and to emphasise the importance of the influence of diathesis on the causation and treatment of diseases of the eye. To those who desire to pursue the subject further I cordially recommend the highly suggestive work of M. Giraud, entitled 'L'Œil Diathésique.'

I have to acknowledge my indebtedness to Dr. Gavin P. Tennent for many valuable suggestions;

to the pathologist of the Glasgow Ophthalmic Institution, Dr. Mary Baird Hannay, for the microphotographs reproduced on Plates III., IV., V., X., XI., XII., XIII., XIV., and XV.; and to Dr. John Pearson and Mr. Kirkpatrick Maxwell for the drawings for Plates VII. and XVII., and II. and VI. respectively. I have also to thank my friend Mr. William Melven, M.A., for much help in the revision of the proofs.

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DIATHESIS AND OCULAR DISEASES

CHAPTER I

INTRODUCTORY

A DIATHESIS has been defined as a permanent condition of the body (hereditary or acquired) which renders it liable to certain special diseases or affections—in short, a bodily condition predisposing to a particular disease. Thus, if an individual possess a certain diathesis, he will naturally suffer from special manifestations of disease, and any illness which may attack him will be modified by his peculiar constitutional state. To this fact the older physicians attached great importance: they put special value on what they called "knowing the constitution" of the patient; and, within due limits, they were doubtless right, for there can be no question whatever that much is to be learnt from a full knowledge not only of

the individual patient, but also of his family history. To the eye trained to look for external manifestations of constitutional states an underlying basis for illness—rheumatism or gout, for example—will be manifest from the beginning; and the recognition of its existence will suggest treatment the lack of which might result in the waste of much valuable time.

Though, then, a great deal that our forefathers believed to be essential must be set down as of little or no importance, and former ideas require much revision in the light of modern research, many of the old methods should not altogether be abandoned. The study of bacteriology has, indeed, revolutionised clinical medicine, and the results obtained by the many able workers in the laboratory are of the very highest value; but those results must only supplement, and never supersede, what is learnt at the bedside. There we are brought face to face with the individual patient, and must study him and his proclivities as well as the disease. In the present-day practice of medicine it is matter for regret that this is not universally recognised. Too much attention is being paid to the germ, and far too little to the soil on which it falls. It is inconceivable, when things are looked at from a broad philosophic standpoint, that the diagnosis of disease can ever

be so simplified that treatment will entirely depend on the recognition of a specific microbe, or, indeed, of any one pathognomonic sign or symptom.

The treatment of disease has, besides, not advanced in the way hoped for from the early study of bacteriology. Laboratory experiments do not always work out in practice according to expectation ; and, while physiological inquiry and pathological research have accomplished, and are accomplishing, much, in placing treatment on a proper scientific basis, and so making it more intelligent, more rational, and less of an experiment, yet the only touchstone of scientific generalisation must be the experience gained at the bedside, whether in private practice or in the hospital ward. However fashionable some novel system may be, and no matter what its sway and influence for a time, this is the only real final test. It is true that the greatest charm of the science of medicine is its constant advance—there can be no finality in knowledge—but it must also be remembered that the treatment of disease is an art as well as a science. The ultimate aim, therefore, of all practice being the cure or relief of the patient, anything that will produce either result is worthy of attention and trial, even though it may not be in accordance with all that is yet known of scientific method. The old and the new must

thus always go together—ever in contrast, but ever in contact. Nothing can be taken on trust. Not till a remedy has stood the test of experience can we be certain that we have in it obtained what is reliable ; and from what we abandon we should always pick out and take with us whatever is good and true.

Success in the art of healing is largely a matter of the physician's personal experience, and in the daily exercise of his profession the practitioner, no matter in what department of medicine he may choose to specialise, must always be prepared to deal with the personal factor with which he is constantly brought face to face. It is, therefore, just as incumbent upon the ophthalmic surgeon, as it is on the physician, to emulate the old masters in assiduous cultivation of the clinical instinct. This is on every side of the utmost value to him. It leads him, for example, in an attack of conjunctivitis to see not merely the local inflammation, but the gout that underlies the manifestation, and it thus leads him to prescribe at once for the general disease rather than for the local condition. Under no pretext whatever ought the eye specialist to dissociate himself from the general treatment of his patient, because success in combating the ocular inflammation depends entirely on the supervision of every

detail in the regimen prescribed. It is on this bedside knowledge that I here specially wish to insist, and what I am anxious to give clearly in the chapters that follow is the results of my own personal clinical experience.

The late Professor Laycock used to urge his students to "study well the physiognomy of disease," and his classification of the diatheses is as helpful as ever it was. True, we do not now speak much of temperaments—the sanguine, bilious, nervous, and so on—but we must still recognise as distinct types the neurotic, the bilious, the scrofulous, and the arthritic, all carefully outlined by him in his "Lectures on the Principles and Methods of Medical Observation and Research."

Before, however, proceeding to the consideration of these, it may be well to draw a clear distinction between a diathesis and an infection. The former is simply a soil, while the latter is a soil on which a germ has been implanted and has flourished; and in this connection it may be pointed out that the results obtained from the study of bacteriology are favourable, rather than antagonistic, to the old doctrine of diathesis. A very short clinical experience serves to prove that micro-organisms behave differently when they are cultivated on different soils. The most familiar

and striking examples are to be seen in the ravages wrought by the tubercle bacillus in those who are scrofulous, and by the gonococcus in those who are arthritic; while, on the other hand, it is rare to see phthisis pulmonalis in a rheumatic subject. Some affirm, and it is possible that future investigations may demonstrate, that in its beginnings every diathesis is an infection; but our present clinical knowledge does not permit the acceptance of that view. I agree with Sir Dyce Duckworth when he says: "Scrofula is now regarded as tuberculosis! To this new doctrine I venture to demur, and I regard it as a monstrous absurdity; to prove it requires us to believe that every person presenting the classical features and type hitherto regarded as scrofulous is from the earliest age, even as a fœtus, and throughout life, invaded and influenced by the bacilli and toxins of tubercle, and that this infection is responsible for the bodily conformation, characteristic ailments, vulnerability, and tendencies shown by the subjects of this condition."

I agree with him again when, in speaking of the arthritic diathesis, he says: "Those who believe that microbic infection entirely explains all the phenomena of rheumatic and gouty diseases, and that these may therefore be produced indiscriminately, have to show cause why these maladies

are not universally prevalent, and to explain how the majority of persons happily resist their influence and escape these ailments." Besides, the success which has attended serum and vaccine therapy is due to the proper recognition of the soil as well as of the germ ; the relations of these have thus been brought into proper harmony, and we now know that the microbes can be successfully overcome only by immunising the blood.

The practising physician is thus always brought back to the individual and his special proclivities to disease, and if he is to deal with the case successfully he cannot afford to neglect careful clinical observation, with all its experience laboriously accumulated and handed on from one generation to another. Nor can he utilise the abstract science of the laboratory except so far as it is confirmed at the bedside. He must treat his patient as well as the disease, recognising that he has a certain diathesis—a family history, hereditary proclivities, and certain personal peculiarities. The beginning and the end of his practice, therefore, is treatment, which is just what the medical student of to-day often tends to neglect ; and by treatment I do not mean simply the administration of drugs, but the making use of every agency or circumstance which can help to bring about the patient's recovery.

Let us now see how this doctrine of diathesis influences the causation and treatment of diseases of the eye. We shall recognise only three distinct types, since the bilious diathesis mentioned by Laycock is rather a modification of one of the others than a distinct form in itself. In practice we meet with many examples of mixed diathesis, the special proclivities of one parent becoming engrafted on those of the other. When the father, for example, is highly neurotic, and the mother is arthritic, we see in their offspring the result of those blended forces varying in degree according as the hereditary influence of one or other parent predominates.

We shall consider, then, three main types: (1) the Neurotic Diathesis; (2) the Scrofulous Diathesis; (3) the Arthritic Diathesis, with two subdivisions—(*a*) the Gouty, and (*b*) the Rheumatic.

CHAPTER II

THE NEUROTIC DIATHESIS

The neurotic patient is well known to us all. Of spare build, restless and unwearying, with a mind so active that it allows neither him nor his immediate circle any repose, he feels pain very acutely, and, consequently, what may in reality be a very trifling ailment, assumes to him, when interpreted and exaggerated by his nervous disposition, very serious proportions. His nerves, overdeveloped, tyrannise over his body, and his excellent memory makes him a terror to the young practitioner, whom he never allows to forget anything he may have told him. Full of fads, he has often real idiosyncrasies in regard to drugs, and is therefore a most difficult patient to treat; for every prescription, no matter how carefully weighed by the doctor, is liable to disagree, and may have to be put aside. It is easy to see how in such patients a slight error of refraction may give rise to eye-strain out of all

proportion to its degree. In them, indeed, low degrees of ametropia and of muscular imbalance are responsible not only for headache, giddiness, and sleeplessness, but for many other nervous symptoms. A careful examination of the eyes ought, consequently, to be a first step in rational therapeutics, since the advice of an ophthalmic surgeon may result in the rapid restoration of the patient to health.

Among the commonest accompaniments of eye-strain, more especially in the neurotic, are lithiasis and oxaluria ; and in the treatment of the symptoms associated with persistent asthenopia the possible coexistence of functional disorder of the liver ought never to be overlooked. In such cases, although the appearances presented by the fundus oculi are very difficult to describe, and even more difficult to depict, the ophthalmoscope reveals a very characteristic picture. The whole background of the eye is too red, and the retinal vessels, more especially the veins, are turgid, tortuous, and rough in outline. The light reflex from the arteries is more brilliant than normal ; the smaller twigs are inclined to be tortuous, and occasionally white lines accompany the vessels as they pass over the optic disc. There is a lack of normal transparency, and the whole fundus is distinctly pigmented, as if very fine black pepper

had been dusted over it and then rubbed in, so as to partially conceal it from view. The optic disc is generally pink from congestion of its capillaries and smallest bloodvessels. The macula is deeper in colour than the parts around, and is, in consequence, very easily seen.

Patients who suffer from such forms of eye-strain and its effects are usually sent to the ophthalmic surgeon by the family doctor, or consult him for headache on the recommendation of a friend. They seldom come spontaneously to complain of defective sight, but, almost invariably, careful examination discovers a low degree of ametropia, and perhaps in addition some latent inadequacy of the extra-ocular muscles. The head pain is often accompanied by sleeplessness, is as a rule unilateral, is usually very severe, and is always aggravated by any steady use of the eyes—*e.g.*, in reading, sewing, shopping, looking at pictures in a gallery, watching the stage at a theatre, etc. In a few instances the intense headache is preceded by the occurrence of coloured spectra, or by a transient attack of hemianopia, due to spasm of the retinal vessels. It would seem that, although the ocular flaw is latent, yet it is capable of inducing sufficient irritation to determine a "nerve storm" in a patient predisposed to such disturbance owing to natural

instability of the nervous system. Clearly, the first step in treatment ought to be to adjust glasses to restore both the refraction and the motility of the eyes to the normal; for until the primary exciting cause of the nervous disturbance is removed, there is little chance of the symptoms being relieved by medicines. While, however, the ocular causation should always be kept in mind, it ought also to be remembered that many factors may contribute, if not to cause, certainly at least to perpetuate, the irritability of the nervous system; and if treatment is to be rational and thorough, we must not underestimate the importance of any one of these, but must take each and all into careful consideration, and so look at the whole condition in due relation. The urine ought in every case to be examined both chemically and microscopically, for the results thus obtained will often afford valuable therapeutic suggestions. Evidence of defective metabolism is very frequently found, and it is, therefore, usually necessary to give careful directions regarding diet. These, however, should not be stereotyped, but must be modified to suit the requirements of each individual. What is one man's meat may be another man's poison—many people diet themselves to the verge of starvation. It is equally essential to promote free elimination of

waste products, and in practice I get excellent results from the phosphate or sulphate of soda combined with potash or lithia, administered every morning, or night and morning, for several weeks. These salts may be prescribed in the effervescing form, and taken in a tumblerful of either hot or cold water. The dose should be sufficient to act on the bowels, but must never purge. In neurotic patients the efficacy of the salines is greatly increased by combining them with a bromide, such as the hydrobromide of caffeine or Warner's preparation of bromo-soda. Lauder Brunton speaks highly of the good results obtained by the use of salicylate of soda with bromide of potassium —the former "to clear out waste products," and the latter "to quiet the nervous system."

There is another group of cases in which the patients, who are generally women, complain that every attempt to use the eyes is accompanied by intense discomfort. The symptoms, one of which is usually great intolerance of light, are so distressing that the patient is quite unable to read or write, and in many cases abandons the attempt to take any active part in life, and thinks and speaks of little else than her ocular troubles. One frequently finds that health has originally been impaired by illness, by prolonged sick-nursing, or by some serious mental or moral shock, and that

the asthenopia has come on during the period of convalescence. As a rule, the patient has consulted more than one ophthalmic surgeon, and has fallen a ready prey to the prescribing optician, but all in vain. She will often produce numerous pairs of spectacles, and in a calm, firm, unimpassioned voice declare that not one of them is of the slightest use. Examination may detect an error in the refraction and motility of the eyes, and the patient may show signs of the gouty or of the rheumatic diathesis; but neither the use of carefully adjusted glasses, nor the most appropriate and painstaking treatment, affords any relief. On the contrary, on each succeeding visit the patient will express herself as feeling no better, and, without any evidence of emotion, will again tell a tale of endless suffering. She is always on the outlook for an opportunity to prove the doctor wrong and herself right; and although she may be most punctilious in taking the medicines that are prescribed, she has no belief whatever in their power to do her good. In these cases the asthenopia is aggravated by psychical causes, but it must not on that account be concluded that the distress is imaginary. On the contrary, I believe it to be very real and very intense; for just as consciousness of pain may be completely inhibited by such causes, so in a similar way it may be greatly intensified. Here, obviously,

mental influences are among the most important means of cure, and the success obtained in any given case will be in direct proportion to the amount of faith the patient has in her doctor. The reality of the suffering makes it most difficult to withdraw the mind from it, but unless this can be accomplished treatment will be of little avail. Change of air and scene, the use of galvanism and high-frequency currents, baths, and massage, are all most helpful; but it is the personality of the physician that counts for most. In short, it is the patient herself who requires treatment more than her disease, and successful therapeutic results can be obtained only if the doctor can inspire her with hope, and by-and-by convince her that she is being gradually and completely restored to health. If he be able to do this, he will have accomplished all that was necessary.

CHAPTER III

THE SCROFULOUS DIATHESIS

The scrofulous diathesis is very common, and is, for the most part, met with in children under ten years of age. Although some of those affected may present the outward appearance of good health, most of them are, owing to defective assimilation and excretion, either abnormally pale or unnaturally livid. They have but too obviously inherited the miserable legacy of constitutional weakness, and the inherent vulnerability of their tissues has been intensified by improper dieting and by overcrowding in unsanitary houses. They are called scrofulous, but as yet there are no symptoms to show that the tubercle bacillus has effected a lodgment; and careful examination fails, as a rule, to discover it lurking in the conjunctival sac, although it is in children such as these that one would expect to find this micro-organism developing and increasing most rapidly. The Germans speak of them as "candidates for tuberculosis";

and the increase of lymphocytes, together with the deficient supply of multinuclear leucocytes, in the blood, and more especially an altered state of the blood-serum (opsonic index) whereby it is unfitted for preparing the bacteria for phagocytosis, mark them out as badly protected against any form of infection. Their eye troubles very often follow an attack of measles or other of the exanthemata, and though, under favourable circumstances, they may speedily subside, they have, unless every cause be taken in hand from the very outset, a most characteristic tendency to recur. If left alone, or simply treated by local remedies, the ophthalmia often proves to be the very first warning of the imminent danger of tubercular infection. This is especially likely to happen in those patients in whom photophobia is most distressingly persistent, although lesions of the conjunctiva or of the cornea are at first absent, or are of a very trivial character.

The phlycten is the most characteristic objective feature of strumous ophthalmia. It may be of large size and solitary, or there may be a group of small pustules, but in either case the situation is on the surface of the globe, for the most part on the limbus corneæ. It is the occurrence of these eruptions that has given the name of eczema of the conjunctiva to this disease. These pustular elevations vary greatly in size, are of a yellowish-

grey colour, and in most instances disappear after a few days, leaving no trace. At other times, however, their appearance marks the beginning of ulceration of the cornea. Up to this stage there has been no real pain, except when the eyes have been exposed to light. There is no complaint, if the patient be only left alone in a dark corner of a room, or with the face buried in a pillow; but whenever ulceration begins there is more or less active suffering, and pain is very apt to come on violently during the night, and cause the child to start up screaming from its sleep. Such ulcers are always slow in healing, and at times, even after the surrounding infiltration has all cleared up, there remains a transparent dimple, which may not disappear for weeks or even months. Sometimes a leash of newly-developed bloodvessels spreads from the corneo-scleral margin to the ulcer, which then, becoming vascular, appears as a red speck, which may persist for a long time. Occasionally the greater part of the cornea becomes vascular (pannus scrofulosus); at other times a small ulcer forms, most frequently at or near the margin, and, instead of spreading over the surface of the cornea, penetrates its substance so deeply that perforation takes place, and the rush of the escaping aqueous carries the iris quickly forward and causes it to prolapse. In unhealthy children phlyctenular

Plate I.

SCROFULOUS CHILD INFECTED BY THE TUBERCLE BACILLUS.

Reproduced from Plate XIX. in the Author's "Atlas of External Diseases of the Eye."

To face page 19.

ulcers are prone to suppurate, and then pus collects between the layers of the cornea, and accumulates in the anterior chamber. Should perforation occur, as is apt to happen in these severe cases, it is followed by a prolapse of iris so large that the eyeball is irretrievably damaged—a condition that may give rise to sympathetic inflammation.

It is by no means unusual for the conjunctivitis to alternate with suppuration of the middle ear, or with eczematous eruptions on the head or other parts of the body. Nutrition is seriously interfered with, and the coated tongue, studded with large red papillæ, shows the irritable condition of the mucous membrane of the whole intestinal tract. There is sometimes a constant craving for food, and almost invariably more is eaten than can be digested; fermentation results, the abdomen is distended, and the alvine evacuations have an offensive smell and an unnatural appearance. The urine is high-coloured, deposits urates, and may contain traces of sugar. The skin is pale and rough, the flesh hangs loosely on the bones, the hands and feet are often persistently cold, and the head perspires freely. After a time the system becomes infected by tubercle bacilli, and then the joints, both large and small, are very frequently

destroyed by tubercular inflammation of their synovial membranes and caries and necrosis of the bones. Severe ectropion—causing hideous disfigurement—will arise if the bone necrosis occur in the neighbourhood of the orbit ; and indelible scars invariably result if there be suppuration of the lymphatic glands in the neck or elsewhere.

The local treatment will necessarily vary according to the stage of the disease. The child's face and hands must be washed frequently, and, as far as possible, it ought to be prevented from crying and rubbing its eyes. The eyes themselves should be bathed night and morning—oftener if there be much discharge—with a warm solution of boracic acid, or a lotion containing perchloride of mercury and belladonna. While the symptoms of acute irritation last, atropine and cocaine, by soothing the nerves of the conjunctiva and diminishing the congestion of its bloodvessels, lessen the photophobia. Whenever the pupil dilates, the child usually opens its eyes ; but when the superficial irritation is great, the action of the atropine persists only for a few hours, and, in order to obtain full benefit, the drug ought to be reinstilled whenever the pupil begins to contract. As the blepharospasm lessens, the cocaine may be omitted from the ointment, and the atropine combined with boracic acid or with the red oxide of mercury.

Even in cases which have lasted for a long time, leeches or blisters should not be used.

After the acute inflammatory symptoms have somewhat subsided, more stimulating applications are necessary, and calomel and the yellow oxide of mercury are the two favourite remedies at this stage. The former is most serviceable in relieving passive congestions. It must be dried thoroughly, and flicked from a camel-hair brush into the conjunctival sac. Its beneficial action seems due to the fact that the calomel becomes, by the action of the tears, converted into perchloride of mercury. It is therefore necessary to be careful not to use it too freely, or in too coarse powder, for any excess collects in the lower retrotarsal fold, upon which it is apt to have a caustic action. The yellow oxide of mercury often acts like a charm in cases where there is an efflorescence of pustules upon the bulbar conjunctiva. It is best applied in the form of an ointment of the strength of one or two grains of the oxide to a drachm of white vaseline. The bulk of a barley-corn of this is instilled into the conjunctival sac, and the eye gently massaged for a few minutes through the closed eyelids.

In every case of phlyctenular conjunctivitis which has lasted for a long time and has been neglected or treated unskilfully, the cornea is

almost certain to suffer, and whenever ulceration occurs the danger to sight is so serious that the ulcer becomes the prominent feature, and all treatment must be directed towards its cure. Success or failure, however, will depend upon a correct understanding being come to regarding the causation of the ulceration. For example, if an ulcer form on the cornea of a healthy man, the probabilities are that it can easily be cured by local treatment; whereas if the ulcer occur in an unhealthy person, micro-organisms are not confined to the seat of injury, but are found, along with their toxins, both in the tissues and in the blood: consequently, if a speedy recovery is to be brought about, there must be general as well as local treatment. In the one case it might be said that the cornea is injured, but in the other that the patient is diseased, and that the ulcer of the cornea is only a symptom of his unhealthy state. It is the latter condition that prevails in phlyctenular conjunctivitis. The real treatment, therefore, is constitutional.

It is necessary always to bear in mind that the very essence of the ailment lies in the malassimilation of food, and that most, if not all, cases arise as a result of improper dieting. You may be told that the child pecks and trifles with its food and eats very sparingly, and that may be quite true so

far as the regular meals are concerned; but by careful inquiry you will usually discover that the small appetite at the proper time arises from the patient's having been, in response to cries for "a piece," supplied liberally between meals with bread and butter, sweets, fruits, or any other eatables that may have chanced to be at hand. Many think that a good appetite is a sign of good digestion, though all the time the latter is so poor that in the overladen bowels toxic substances are constantly being manufactured, and these, after they are absorbed, excite abnormal effects both in the eyes and in all the other tissues of the body. Instead, therefore, of eating too little, these children eat too much; and although they may appear ill-nourished, the malnutrition is due to malassimilation, rather than to insufficiency, of food. The first thing to be done, therefore, in treating a case of strumous ophthalmia is to give particular directions regarding the diet. The child must not be allowed to eat whenever it cries for food, but ought to be fed at regular intervals. Nor must it get what is among the poor popularly called "the run of the house"; it should have meals specially prepared, and in quantity and quality of such a kind as not to overtax the powers of digestion. Sugar in every shape and form, fruits, pastries, potatoes, etc., must be rigidly excluded from the

dietary, and it is usually advisable to confine the patient wholly to milk-and-water for the first forty-eight hours of the treatment, and then to add gradually meat-soups, eggs, fish, fowl, rice, etc., as the tongue becomes clean.

In addition to the careful supervision of diet, the free elimination of the toxins, which, as a result of malassimilation, have accumulated in the blood, must in every way be promoted. This is to be accomplished by stimulating the action of the kidneys, the bowels, and the skin, more especially the last. Hence the importance of the hot bath, which the child should have every night at bedtime, diaphoresis being further encouraged by the wearing of a warm flannel nightgown. It is usually advisable first of all to administer a dose of castor oil ; but it should be borne in mind that many of these children do not bear purgatives well, as the intestinal mucous membrane is so irritable that troublesome diarrhœa is easily induced.

Of drugs, tartar emetic is the most useful, and it should be given, as Mackenzie advised, in slightly nauseating doses. Its chief virtue depends on its diaphoretic action, and its efficacy is greatly increased when it is administered with a laxative—*e.g.*, powdered rhubarb. If the tongue be brown, a few grains of grey powder may with advantage

be added to the rhubarb and antimony combination. Under this treatment it is wonderful how soon the whole appearance of the patient changes. As the power of digestion becomes greater, the skin improves in colour, the hair loses its dry and brittle character, the hands and feet keep warmer, and the child, instead of lying with its face buried in a pillow, and fretting and crying when spoken to, is now quite good-tempered, and runs about and amuses itself with its playthings. Any indiscretion in diet will, however, promptly bring on a relapse, for in these cases the conjunctiva reflects the conditions of the gastro-intestinal mucous membrane even more quickly than the tongue. After some forbidden food has been eaten, intolerance of light, blepharospasm, and increased lachrymation speedily show themselves, while the tongue may not become furred till some days after. The fear of relapse makes it imperative, therefore, that treatment be continued for at least a fortnight after the recovery seems complete.

As soon as possible the child ought to be sent to the country, preferably to a high, dry, bracing locality, and it should live out of doors as much as the weather will permit. The sea-coast should be avoided, as the glare from the water is apt to prove irritating to the eyes, and to cause a relapse. In an ordinary case of strumous ophthalmia no

further treatment than that just indicated is required. If a case be not making satisfactory progress, careful inquiry should at once be made as to whether the prescribed diet and the nightly warm bath are being strictly attended to. Under such circumstances it is also sometimes advisable to change the sick nurse in charge; for no matter how sound the doctor's line of treatment may be, want of thoroughness and attention to detail on the part of the nurse may frustrate his best efforts.

Whenever the child's powers of digestion, respiration, and excretion, become healthy, fewer restrictions as to diet are necessary, and a scheme of treatment may then be entered upon to improve the general nutrition still further, and to promote the repair of any local lesions in the eyes themselves. Such restorative methods aim at supplying the blood with something specially needed at the moment; but if they were to be commenced prematurely, they would do much harm by adding to the child's difficulty in assimilating food. In every attempt to assist recuperation the all-important indication is to stimulate appetite and to strengthen digestion by means of simple tonics, and on no account to prescribe iron, phosphates, cod-liver oil, or the hypophosphites, if the tongue be either coated with fur or red and irritable.

CHAPTER IV

THE ARTHRITIC DIATHESIS

This diathesis, although not universally admitted, is in reality a well-marked and widely-spread type. It includes those persons popularly called rheumatic or gouty. Rheumatism in its acute manifestations, ocular or other, is now regarded by many as an infection by a diplococcus ; but gout is generally held to be the result of absorption from the intestine of toxins due to malassimilation. The gouty diathesis is the easier to describe. It exists among all ranks of society, is found at all ages, and is more frequent among children than is generally supposed. Much useful information as to it will be obtained by careful examination of the urine. It generally contains uric acid in excessive amount, the cayenne-pepper-like deposit being often sufficient to be noticed by the patients themselves, while in the case of children their mothers draw attention to it. The other secretions of the body are also hyperacid and very irritating. The acid

perspiration renders the epithelium vulnerable, and consequently persons of arthritic diathesis are apt to suffer from cutaneous eruptions. In inflammations of the eye, of doubtful origin, a valuable clue to the proper treatment is often found by detecting an eczema or other affection of the skin. The patients themselves are usually large-framed, well-covered, and broad, florid in complexion, genial in manner, and with exuberant spirits. They are as a rule hearty eaters, and in their younger days their digestion is usually quite able to cope with the many demands made upon it, and they frequently boast that they never need a doctor and never take a dose of medicine. With the advance of years, however, they tend to suffer from acid dyspepsia, or to be annoyed by cutaneous eruptions —the one condition often alternating with the other. Their habits of life must now be changed entirely with regard to food and stimulant, the one being considerably diminished in quantity and the other altogether prohibited. Regular exercise must be substituted for desultory attempts at exertion ; otherwise they may be suddenly cut off by an attack of pneumonia or other acute disease, or they may be invalided by a constant series of chronic degenerative ailments, which may terminate fatally from renal cirrhosis or from a cerebral hæmorrhage. This description corresponds in

brief to what Laycock has named the sthenic or sanguine form of the arthritic diathesis. The type is, however, frequently blended with the bilious, thus giving rise to an asthenic or melancholic modification. In this there is a great tendency to obesity, with poor muscular development ; and those who are affected by it are usually slow in their movements, and generally of a rather sluggish disposition. Their outlook on life is often pessimistic, and their powers of digestion quite inadequate for the quantity and quality of food they consume.

Ocular manifestations may be the only external sign of the arthritic diathesis. It is indeed rare to find eye complications in acute rheumatic fever, but chronic rheumatism and gout are responsible for many eye troubles, although the patient himself may not to his knowledge have suffered from either. Careful inquiry into the personal and family history, however, will very frequently reveal marked proclivity to arthritism ; and this will, in all probability, be confirmed by careful examination of the urine. The analysis and examination of the latter must, however, if it is to be of any real help in diagnosis, be thoroughly carried out and frequently repeated. The sample to be examined ought invariably to be taken from the whole quantity passed in twenty-four hours, and

in doubtful cases the services of an expert should always, if possible, be obtained. Where this cannot be done, valuable help may be got from Dr. Carstairs Douglas's "Handbook on Chemical and Microscopical Aids to Clinical Diagnosis," a most useful guide to urinary analysis.

Any or all of the tissues of the eyeball, together with the nerves and muscles of the orbit, may be affected; consequently arthritic affections might be taken to include every inflammatory disease which attacks the eyes and their appendages, and would, therefore, if they were to be fully considered, almost require a treatise on ophthalmology. In a sketch such as this full consideration is naturally impossible, and I shall give merely a brief description of the four most important: (1) Inflammation of the conjunctiva and sclerotic; (2) Inflammation of the uveal tract—iritis, choroiditis, and irido-choroiditis or uveitis; (3) Inflammation of the retina and the optic nerve, hæmorrhagic retinitis, toxic amblyopia, and retrobulbar neuritis; and (4) Glaucoma.

CHAPTER V

INFLAMMATION OF THE CONJUNCTIVA AND OF THE SCLEROTIC

A. Inflammation of the Conjunctiva.

The special characteristics of an arthritic conjunctivitis are a marked hyperæmia unaccompanied by catarrhal secretion. The patient complains of pricking, itching, and burning heat of the eyelids, which feel hot, dry, and stiff, especially in the morning, when there is always a difficulty in getting them open. This difficulty in opening the eyelids is not due to sealing by dried discharge, but rather to the weight of the upper lid, which requires to be raised with the finger. It has been compared by some to the stiffness of a rheumatic joint after rest. The ocular conjunctiva is hyperæmic, and traversed by large dilated vessels, which produce the sensation of a foreign body in the eye. The discomfort is always greatest in the morning, and passes off during the day. The edges of the lids are sometimes coated with very

slight deposit of mucus, and a soapy froth is generally seen at both the inner and the outer canthus. In chronic cases tiny vesicles full of serum develop within the margin of the lid. The attack is often very persistent, more especially during a period of cold and wet; but if the weather become warm and dry, it may pass off spontaneously. It is, however, very prone to recur after exposure to cold, wet, or dust; after exposure to an irritant (for example, tobacco-smoke); or after any indiscretion in diet—a single glass of port wine after dinner will often determine an attack which it may take weeks of careful regimen to cure. It may alternate with muscular rheumatism or any other arthritic manifestation, digestive or otherwise.

Corneal complications are always to be feared when examination reveals any diminution in sensitiveness to touch, and are apt to follow any febrile attack, more especially influenza. The development of the blister is always marked by increase in the conjunctival injection, by copious lachrymation, by persistent blepharospasm, and by severe neuralgic pain, which radiates from the eye along the branches of the fifth cranial nerve on the same side. The blisters burst almost at once and an ulcer appears, but as in neither the gouty nor the rheumatic is there much tendency to suppuration,

this is unaccompanied by purulent discharge. In nearly every case it is superficial, and spreads steadily over the cornea till a large area is implicated. In shape it varies greatly. Spreading in certain directions only, it may show grey striæ extending into the transparent cornea and branching to form a dendritic figure ; or it may advance uniformly over the corneal surface, to form a shallow ulcer, surrounded by a clean-cut infiltrated margin ; or, still again, it may be multiple, in which case several tiny ulcers form (very often on the inner aspect), and the cornea rapidly becomes cloudy over the whole of the ulcerated area. New blood-vessels form at the limbus, and, traversing the surface, work their way to each of the little ulcers. The primary object of these is to promote healing, but very frequently they themselves become so large as to cause much irritation and to increase the corneal dimness. No matter what their shape or size may be, these ulcers always run a very prolonged course (lasting even for several months), and they may leave at their site a permanent opacity which will seriously interfere with vision. The very worst cases are those associated with herpes of the skin supplied by the ophthalmic division of the fifth cranial nerve ; and the greater the insensitiveness of the cornea to touch before the eruption of the vesicles, the greater will be

the irritation and the more prolonged the ulceration.

Treatment must be methodical and rational. General remedies must be prescribed suitable to the diathesis, but local applications, so useful in simple conjunctivitis, must here be used with great caution. Cocaine and adrenalin, which act very favourably in ordinary circumstances, are liable to cause much irritation in the gouty, and I have come to regard a weak alkaline solution, with glycerine added in the proportion of one-tenth, as the most helpful topical application. Unless in the typically gouty, where cold is most grateful, all local remedies must be used warm, and moist dressings avoided for fear of setting up an eczema of the skin of the lids, which may prove very obstinate. Dusting powders—borochloretone, dermatol, and such-like—are often very soothing; but calomel is apt to prove irritating, and must on no account be used if the patient be taking iodides internally, since the biniodide of mercury formed in the conjunctival sac by contact with the tears acts like a caustic. When ulceration of the cornea is progressing, the advancing edge should be touched with a mixture of ten per cent. iodine vasogen, with pure carbolic acid and camphor (in the proportion of one part of the former to two of the latter), with absolute

alcohol, or with the actual cautery; but these topical applications must be used with the greatest caution. The pupil ought to be examined carefully at every visit, as inflammation of the iris is very prone to occur, and to be accompanied by increase in the intra-ocular tension. The best local remedy for lessening the scarring is probably a five to ten per cent. aqueous solution of dionine; but as the eye soon becomes accustomed to the drug, and as good follows its use only when a well-marked reaction takes place, its application ought not to be continued for more than two or three days at a time, and an interval of about a week should be allowed to elapse between each course of instillations.

The real essence of the treatment, however, lies in administering alkalis, and in prescribing an anti-gouty regimen specially suited to the needs of the individual patient. Carlsbad salts—a large teaspoonful of the natural salts in a tumblerful of hot water—should be taken slowly while dressing in the morning, and Vichy or Contrexéville water should be used freely at table. The former is better when digestive symptoms are present, the latter when there is excess of uric acid. If indican be detected in the urine in excess, one or two grains of calomel at bedtime every second night will be useful, and may have to be continued for two or

three weeks. The condition of the urine must always be the guide.

When the cornea is affected, or the inflammation of the conjunctiva is of long standing, it may be necessary to send the patient to the country—a high, dry, bracing locality with a sandy soil. Some of the watering-places of this country fulfil the necessary conditions, but foreign spas, such as Aix-les-Bains, Homburg, or Marienbad, are often more beneficial. The patient, more especially if he be past middle life, ought to eat sparingly, avoiding excess of the red meats, all saccharine foods, and acid fruits. He should live on fish, fowl, eggs, milk foods, rice, etc. Alcohol in all its forms is to be avoided ; tea and coffee must be taken weak and in strict moderation. Outdoor exercise is a necessity, but the eyes must be protected by goggles against bright light, wind, and dust. Any error of refraction ought to be carefully corrected, and the patient should be enjoined not to use his eyes by artificial light any more than he can possibly help.

B. Inflammation of the Sclerotic.

In no disease of the eyeball is the influence of diathesis more marked than in inflammation of the sclerotic, which is found attacking the part between the equator and the margin of the cornea.

Comparatively rare in occurrence, it may assume one or other of two forms: first, Episcleritis, where only the superficial layers are affected, and where, though it causes a good deal of annoyance, it is never serious; and second, Sclerotitis, where the middle and deeper layers are affected, and where, owing to complications involving the cornea, iris, ciliary body, and choroid, there is grave danger to sight. No matter which form be present, while a certain number of cases are the result of syphilis or tubercle, by far the larger proportion are undoubtedly due to gouty or rheumatic predisposition. The disease is generally found in young adults, and women suffer more frequently than men, the attacks often beginning with the onset of a menstrual period and passing off at its close. When that is so, a recurrent attack may be expected at each subsequent period.

Whether the inflammation be superficial or deep, the form of the lesion is largely explained by the anatomical structure of the sclerotic. Its blood-supply is small, but it is in close relation externally to the vessels of the conjunctiva, and internally to those of the choroid, ciliary body, and iris, and consequently inflammation of the sclerotic is often secondary to a similar condition in the ciliary body.

1. *Episcleritis.*—Episcleritis is generally chronic (the attack often lasting for some weeks), and the patient complains of an aching pain in the brow on the affected side. When the eye is examined, a raised patch of bluish-red colour is seen on the sclerotic, close to the corneal margin, obviously below the conjunctiva, and usually tender to touch. As time goes on, the elevation changes colour, becoming more and more livid, and at last slate-blue, and then it finally disappears. Recurrence is, however, very common, either at the same place, or at another, also near the corneal margin ; and these relapses may go on until the whole circumference has undergone the inflammatory process.

A very rare condition, but one which, when it does occur, is always distinctly associated with gout or rheumatism, is that described by Hutchinson as " hot eye " and by Fuchs as episcleritis periodica fugax. It resembles the more chronic forms in its tendency to recur, but the disturbance is much more serious while it lasts, and the persons affected are generally of middle age. The duration of the attack, which may involve both eyes or only one, varies from a few hours to a few days, and when it is over, recovery is complete. The eye presents on examination a striking clinical picture: considerable swelling is present,

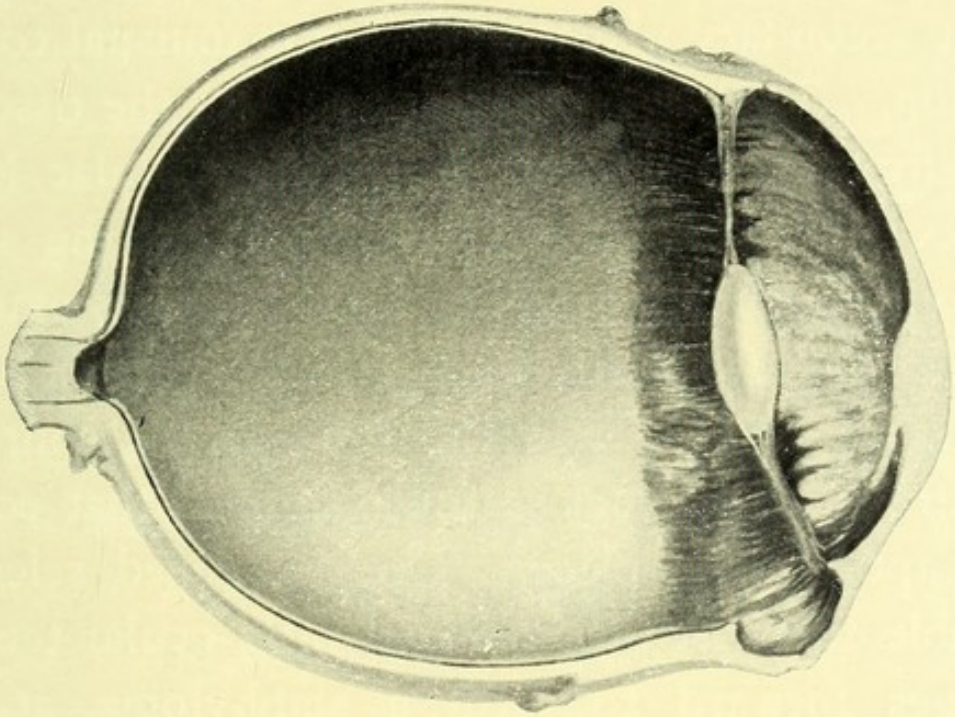
and both conjunctiva and episclera are inflamed. The patient complains of pain, the eye waters, and there is great intolerance of light.

It has been demonstrated that the raised patches in episcleritis are due to the separation of the fibres of the episclera by exudation, and these elevations are thus connected with the subcutaneous nodules found in rheumatic subjects. Suppuration never occurs, and cure takes place by gradual absorption of the exudate. The characteristic bluish colour is due to the choroid shining through the thinned sclerotic.

2. *Sclerotitis.*—Sclerotitis is, as has been already said, a much more serious condition than episcleritis ; for, although at first the sclerotic alone is affected, the disease is very insidious, and later the cornea and uveal tract are involved, vision being always impaired and often lost. The patient suffers acute pain, there is profuse lachrymation, and there is great intolerance of light. Examination shows that the sclerotic is much swollen, and that on it, at intervals, there are thickened patches having the appearance of porcelain. The swelling is not in circumscribed elevations, as in episcleritis, but is more uniform, and may occupy the whole circumcorneal zone, while a few dilated bloodvessels may be seen on the surface. By-and-by the cornea is involved

(inflamed patches seeming to spread to it from the sclerotic), there is iritis of a chronic type, and there is serious diminution of vision. With the occurrence of iritis the pupil is contracted and occasionally displaced, and, as a result of posterior synechiæ, the iris may impinge on the posterior surface of the cornea and cause obliteration of the corneo-iridic angle and of the canal of Schlemm, so that secondary glaucoma is a not unusual complication. The pathological change in the tissues is chiefly marked by a deposit of unicellular leucocytes in the middle and deep layers of the sclera, accompanied in some cases by a fibrinous exudate, which is afterwards absorbed, leaving a dark-coloured scar. The sclera thus in the course of cicatrisation becomes so much thinned that ectasiæ are apt to take place. The weakened sclerotic, unable to resist the increased intra-ocular tension, bulges forward to form a staphyloma, at first usually partial and situated immediately behind the corneal margin, around which are blue elevations —multiple staphylomata. Should the ectasiæ be situated over the ciliary processes (where they show as dark streaks), they are called ciliary staphylomata ; but their usual site is a little farther forward along the zone between the cornea and the root of the iris, and then they are called intercalary staphylomata. As the disease progresses, the

Plate II.



GENERAL DISTENSION OF EYEBALL WITH WELL-MARKED CILIARY STAPHYLOMA.

Drawn from a specimen in the Pathological Museum of the Glasgow Ophthalmic Institution.

To face page 40.

increased secretion of fluid into the vitreous causes still greater tension, with the result that the already weakened walls of the globe stretch, and there is a certain amount of exophthalmos. By this time, too, the cornea is opaque and enlarged, and its curvature so altered as to make it seem almost continuous with the attenuated sclerotic.

In both forms of sclerotic inflammation prolonged and painstaking care is necessary to cure the attack and to prevent relapse, and the ophthalmic surgeon has often need of all the medical resources at his command to combat this chronic and tedious affection with success. Treatment should be both local and general. The all-important matter is, as has been already said in speaking of other eye affections, to deal with the underlying cause, as well as to make use of palliative measures for the actual pain. The ordinary treatment will be the same for both forms of the disease, as they differ only in degree. As far as local measures are concerned, a blister should be applied to the temple, or two leeches to the outer canthus. The value of atropine used early should be remembered, as it is an important point in the treatment to see that the pupil dilates at once and remains dilated. Should the instillations of atropine, however, be followed by pain and increase of intra-ocular tension, they must at once be dis-

continued, and eserine or pilocarpine substituted. Just as in speaking of local treatment of conjunctivitis of rheumatic or gouty origin we had to insist on the patient's intolerance of irritating lotions, so, in dealing with diseases of the sclerotic, all eye-washes, except the most bland, should be avoided; bathing with warm saline solution, or with boracic lotion, will be the best means of affording relief. Fomentations may sometimes be very helpful, but they must be used with caution, as the skin of both gouty and rheumatic patients is very prone to eczema. For the relief of photophobia, dark glasses should be worn in bright light, and any error of refraction must be corrected.

Of recent years ionic medication has been highly recommended by Leduc, and very satisfactory results have been obtained. Clearly, however, such measures can be successful only if the disease has passed its active stage, and this method is, therefore, of service merely in dealing with the results of the morbid process. A hot solution of chloride of sodium, one to two per cent., is prepared, and a compress, made of several layers of absorbent lint, dipped into it and laid upon the affected eye. The lids are closed, and the anode being applied to any part of the body, the electric current is allowed to pass with a gradually in-

creased strength up to five or six milliampères. If the increase be very gradual, the patient ought to feel no pain. The application should last for a quarter of an hour each time, and be repeated two or three times a week.

If the symptoms be in the least degree acute, the patient should be kept in the house and in bed ; and, indeed, at the commencement of recurrent subacute attacks in the more chronic forms, a few days in bed may be sufficient to effect a cure. Cold and damp are very powerful factors in causing a relapse, and exposure to either must, therefore, be carefully avoided. General medical treatment should begin with a brisk purge —preferably calomel, followed by a saline draught —and after that the bowels should be kept freely open with some form of salts, such as Carlsbad salts, which have a special action on the liver. Should the family history or the personal history of the patient show that there is any tendency to gout or rheumatism, it will be very beneficial to prescribe colchicum or salicylate of soda combined with an alkali. Examination of the urine must never be neglected, and it is often of great help to take the specific gravity of the whole quantity passed in twenty-four hours, and to test carefully for indican in excess. In all these cases the free use of diluents is necessary, and consequently it is

very important to know the actual quantity of urine passed in twenty-four hours, and to compare that with the specific gravity of the specimen. It is equally important to exercise careful supervision over all the digestive processes in order to prevent a relapse.

Most important of all, however, is the securing of strict adherence to a carefully planned régime, which is the essential part of the treatment of this, as of every other, form of gouty or rheumatic disease. A dry soil and bracing air often work wonders, and a person who, while living on a clay soil in a river valley, is continually subject to annoyance from attacks of inflammation of the sclerotic, may find himself perfectly free from trouble from this source if he can live on a sandy or gravelly soil, a few hundred feet above sea-level. A period at a spa, either at home or abroad, has often excellent results; for it has the double advantage of giving the patient appropriate medical treatment and at the same time of taking him away from his business and other cares. A great many natural mineral waters are now to be obtained in bottle, and may in this state do good to those whom it is impossible to send away from home; but there is no question that residence at the watering-place itself is much more beneficial—partly, no doubt, on account of the environment,

and partly perhaps also because the waters lose some of their finer essence by being put in bottle. At the spa there are the greatly increased amount of sunshine and fresh air that patients enjoy, the brightness of the place and its surroundings, the company, the change from the daily round of home routine, the lack of the wear and tear of work and worry—all of them most helpful. As to the waters themselves, just as the air around us contains some rare constituents, that have only recently been determined, so these products of Nature's laboratory may contain fine gases that escape after their transfer to the bottle; or they may contain minute quantities of other ingredients which with even brief lapse of time may change their combination, and so cease to exercise the same influence on the living tissue. We know now, too, that many waters have certain radio-active properties, and it is, therefore, possible also that there may be in the process of bottling and keeping a loss of these powers. Looking at all the conditions, we may be quite certain that the value of natural mineral waters is ever greatest at the source, and that the advantages of the actual well-appointed spa far outweigh any comfort that may come from having the water in home surroundings. Apart from anything else, the complete regularity of the place and its ways fits

thoroughly in with the scheme of inducing the patient to abide strictly by the régime which has been prescribed for him, and which is, as I have already insisted, the very essence of the cure.

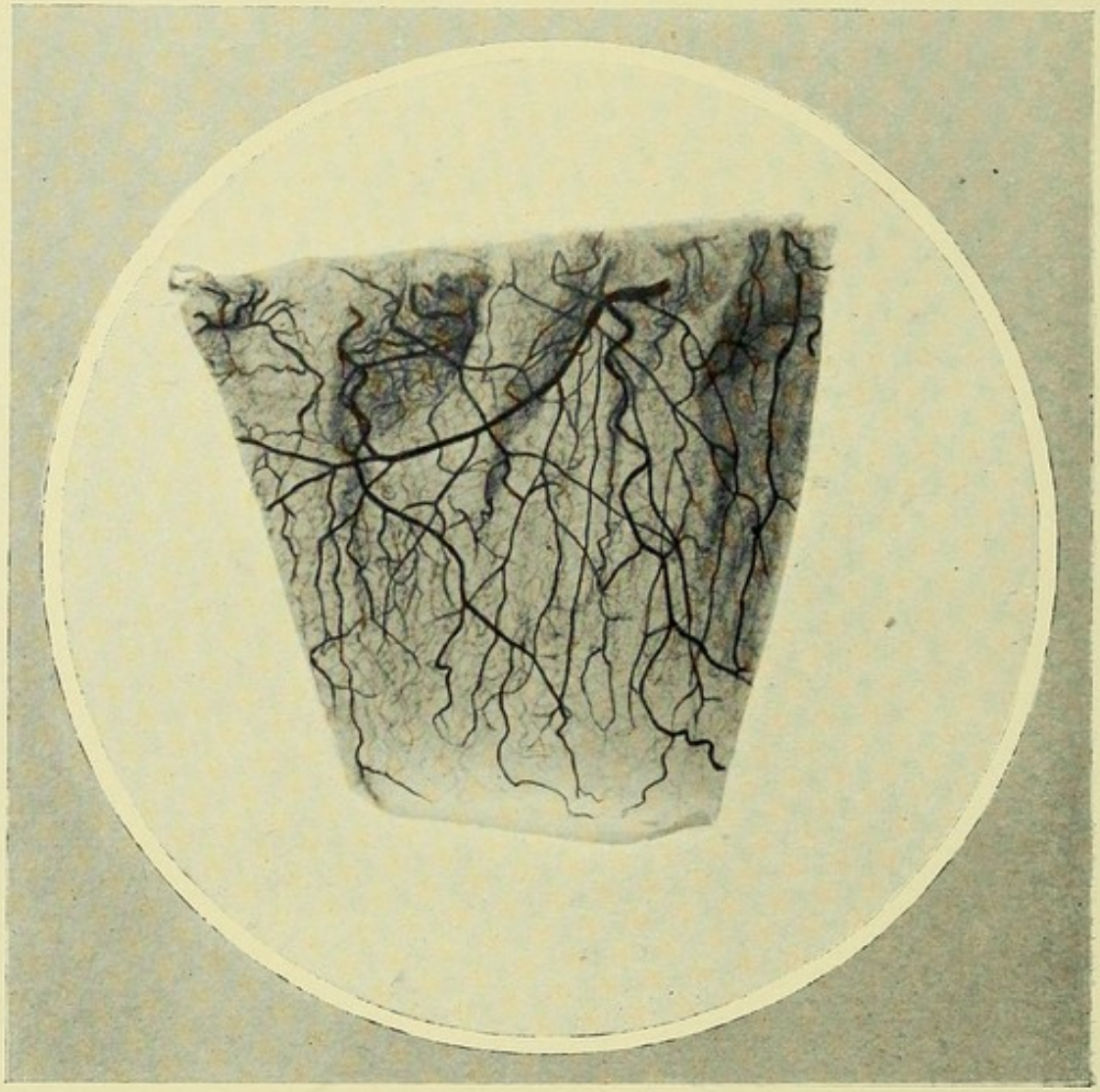
Such methods as I have indicated often bring about a great improvement in general health, but, unfortunately, this may come too late. The prolonged and recurrent attacks of inflammation may already have induced such grave ocular changes, due to complications with the iris and ciliary body, that the nutrition of the eye is constantly imperilled. Increased intra-ocular tension is a very serious danger, and prompt measures often require to be taken for its relief. When leeches, fomentations, myotics, morphia, etc., all fail, surgical interference ought at once to be resorted to. Probably the easiest and safest method of operating, in the first instance, is to puncture the sclerotic with a broad needle. The puncture should be made as near as possible to the equator of the globe, and the needle should be turned on its axis, so as to permit some vitreous to escape. This causes immediate hypotension, and pain is at once relieved, the respite from suffering being occasionally of considerable duration. When the cornea is extensively involved, and the inflammation is being kept up by large bloodvessels, which enter its substance and

traverse its surface from the periphery, the excision of a circumcorneal ring of conjunctiva (peritomy) cuts off the abnormal vascular supply, and so facilitates the disappearance of the corneal opacities. A somewhat similar operation, also at times attended by very gratifying results, is the cauterising of the tissues surrounding the cornea, a ring being burnt down to the level of the sclerotic.

Occasionally an iridectomy does good ; for not only does it lower intra-ocular tension, but, if the piece of iris be excised opposite a transparent portion of the cornea, the artificial pupil may greatly improve sight. Iridectomy should, however, never be performed till all symptoms of inflammation have subsided. Premature operation may make matters much worse, and be followed by acute inflammation, leading to general distension of the eyeball. On the whole, therefore, scleral puncture and peritomy, either by the knife or by the cautery, are the safest surgical methods, and they have the additional advantage that, provided aseptic precautions be taken, they may be repeated as often as necessary without fear of doing harm. Unfortunately, however, in many instances, while the distress incident to acute attacks may be, to a great extent, relieved, it is not possible to arrest the progress of the disease.

Under favourable conditions there may be some slight improvement, but in almost every case it is merely temporary, and in predisposed subjects the slightest cause induces a relapse. After each recurrence vision deteriorates more and more, and when sight is entirely lost and the suffering still continues, nothing can be done except to enucleate the disorganised eyeball.

Plate III.



INJECTED IRIS. × 16.

From a specimen prepared by the late Dr. John Griffith.

To face page 49.

CHAPTER VI

INFLAMMATION OF THE UVEAL TRACT

When there is inflammation of the uveal tract, the anterior and the posterior portions may each be separately implicated, or the whole may be involved, consequently these affections naturally divide themselves into three main groups : (*a*) Inflammation of the iris—iritis ; (*b*) Inflammation of the choroid—choroiditis ; and (*c*) Inflammation of the whole tract—irido-choroiditis or uveitis.

A. Iritis.

In every inflammation of the iris not due to direct injury, the physician should seek for a predisposing as well as an exciting cause ; and as this is probably quite unknown to the patient, and far from apparent on the surface, the search requires to be a very careful one. The most common predisposing causes are infections from syphilis, gonorrhœa, and tubercle ; but, in addition, there remain very many cases, estimated by some at about thirty per cent., which are undoubtedly

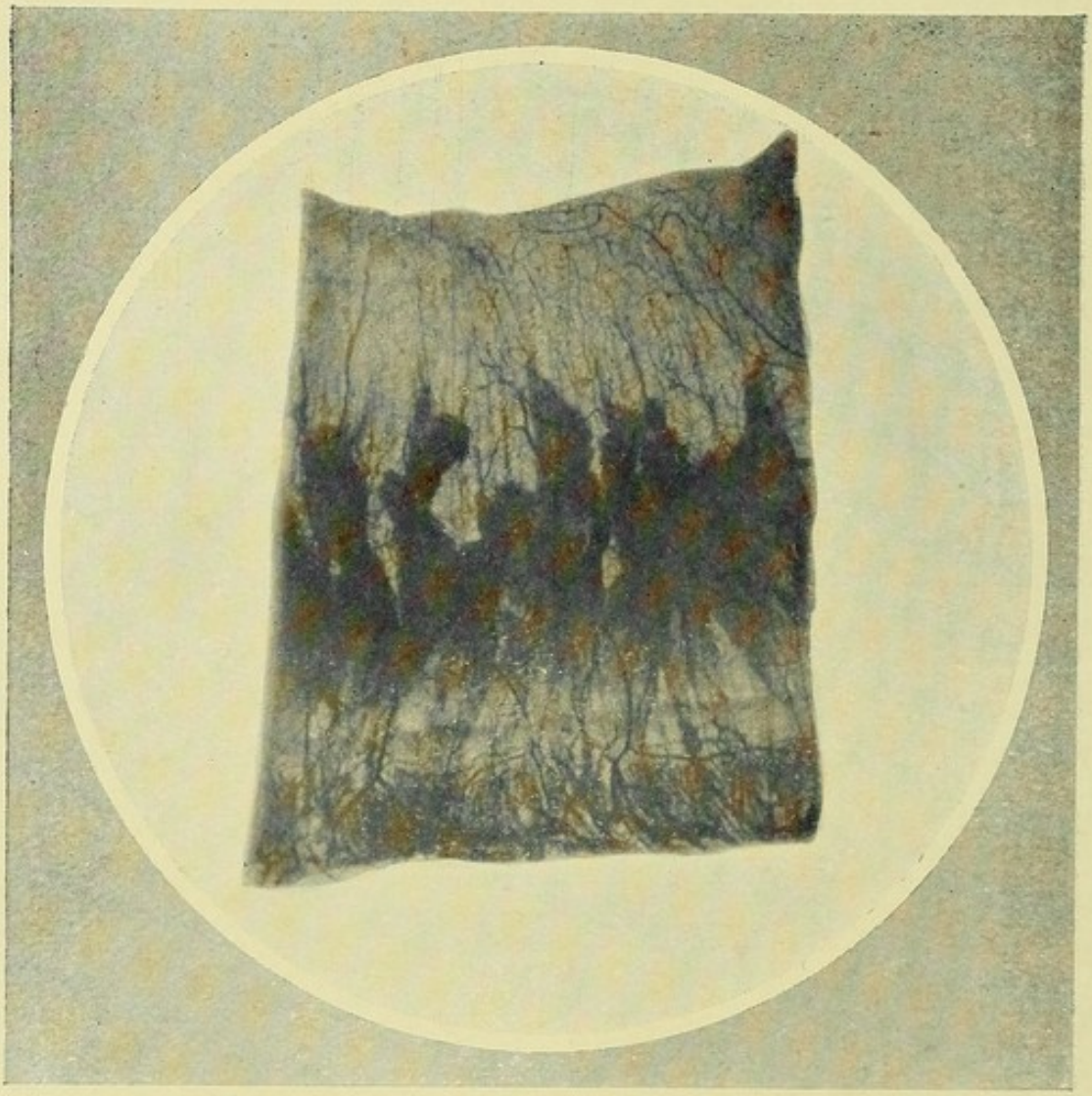
the result of the arthritic diathesis. The most marked clinical feature in this group is the great tendency to relapse, and the cases described by old authors as recurrent iritis probably all belonged to it. The reason of the recurrence is most likely to be found in the fact that the true predisposing cause has been misunderstood, or that the patient has wearied of the regimen prescribed, and has, in consequence, disregarded the instructions as to diet and exercise laid down by his doctor. Even under appropriate treatment these cases are apt to prove very tedious, and one cannot be surprised at this, when one remembers their diathesic origin; for it is one of the aphorisms of medicine that the longer a cause has been in operation the more intractable is the resulting disease to treatment, and the more liable to recurrence. Although the physiognomy of arthritic iritis is pretty well recognised, it must be admitted that there is often great difficulty in an individual case in distinguishing the rheumatic from the gouty form. Careful examination of the urine and minute inquiry into the family history will afford valuable aid, but the favourable results of salicylate of soda in rheumatic iritis, and of colchicum in the gouty form, are in most cases so rapid and striking that their action at once removes all doubt as to diagnosis.

The chief symptoms in every case of iritis are

pain, intolerance of light, lachrymation, impairment of sight, pericorneal injection, discoloration of the iris, turbidity of the aqueous, irregularity of the pupil, and general malaise. These symptoms vary much in severity, being very pronounced when the disease is acute, and but slightly marked when its onset is insidious. An ordinary attack lasts from four to six weeks, but whenever complications arise the duration is very much longer. In the typically arthritic group of cases, which is that at present under consideration, it may be noted that, while inflammation of the iris is rarely seen during an attack of acute rheumatism, it occasionally does occur, in patients suffering from rheumatic endocarditis, in a very intense and destructive form. The usual type occurs in adults in whom there is a history of general rheumatism, or, more frequently, in those who, although sensitive to cold and damp, have no pains in joints or muscles, but suffer from digestive or circulatory disturbances and have in their urine urates, uric acid, or oxalate of lime crystals. The disease prevails for the most part during the early spring and late autumn, and, although both eyes suffer, yet, as a rule, one only is implicated at a time. The pain is intense, the injection brick red, the lachrymation copious, and the photophobia most distressing; while arthritic foam collects along the edges of the

eyelids and at either canthus. The discoloration of the iris is not so pronounced, and the amount of exudation is not so great, as in some other forms of inflammation of the iris (syphilitic and tubercular, for example); but the pupil becomes gradually closed, and may be contracted to a mere pin-point by posterior synechiæ. The worst feature of this form of iritis is its tendency to recur, whence it has received the name of recurrent iritis. One patient, a man of thirty-six years of age, told me he had suffered from twenty attacks within six years. In the gouty forms more especially, the intra-ocular tension becomes increased, and hæmorrhage into the anterior chamber is not unfrequent. These symptoms are all the more likely to occur if the patient be elderly. The pain is intense, and usually aggravated, rather than relieved, by the use of atropine. The name glaucomatous iritis occasionally applied to this form of the disease is objectionable—iritis and glaucoma are so distinct that no term should be employed which has the slightest tendency to suggest connection between them. Any error in the diagnosis of the two is fatal, because the treatment which is beneficial in the one is absolutely destructive in the other. Fortunately the size and shape of the pupil and the depth of the anterior chamber are trustworthy guides. If the

Plate IV.



INJECTED IRIS AND CILIARY PROCESSES. × 10.

From a specimen given to the Author by Dr. Thomas Reid.

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pupil be contracted and irregular in outline, and the aqueous chamber normal or increased in depth, the disease is iritis; whereas, if the pupil be dilated and the anterior chamber shallow, the hypertension is almost certainly due to glaucoma. Although, as has just been said, the inflammations due to gout are more painful and more liable to be complicated at the outset by hæmorrhage and by increased intra-ocular tension, yet those due to rheumatism are undoubtedly more serious in their results, owing to their marked tendency to cause adhesions of the iris to the capsule of the lens.

The deeper parts of the uveal tract also become implicated, and when the ciliary body is involved the prognosis is always much more grave. The cyclitis is readily recognised by the rapid failure in sight and by the great increase in the suffering. The eye becomes acutely tender on pressure, the aqueous humour becomes cloudy, and minute dots of exudation form on Descemet's membrane. Moreover, the rheumatic cases, from the beginning, are complicated by inflammation of the episcleral tissues, and in inveterate forms the sclerotic itself becomes inflamed, consequently in many instances sight is in the end irreparably lost from the occurrence of ciliary or intercalary staphylomata.

A very insidious form of irido-cyclitis is occasionally met with in adolescents, more especially

of the female sex. The first symptoms are misty vision and muscæ volitantes. There is no complaint of pain, but inquiry elicits the fact that the eye is somewhat tender and waters on exposure to bright light. Careful examination reveals the presence of minute spots of exudation on the posterior surface of the cornea, and although the details of the fundus are visible on ophthalmoscopic examination, yet they are seen through a cloud, and numerous flocculent bodies, mostly of very small size, are detected in the anterior part of the vitreous. At the outset the pupil dilates fully under the influence of atropine, but, as the disease progresses, posterior synechiæ form, and a pink zone of congestion appears surrounding the cornea. This form of inflammation is always very tedious, and is occasionally complicated by attacks of increased intra-ocular tension. Sight slowly but steadily deteriorates, as the disease is usually persistently progressive. Some of the cases are undoubtedly due to hereditary syphilis or to tubercle, but many are the result of the arthritic diathesis. The rheumatic and gouty toxins, accumulating in the blood, induce marked anæmia, which is a characteristic accompaniment of this form of inflammation. There may be a personal history of articular pains, of quinsy, or even of pleurisy or pulmonary inflammation, and, more-

over, there is as a rule a distinct gouty or rheumatic family history.

The treatment of arthritic inflammations of the iris must be local, general, and dietetic ; and the main indications are to dilate the pupil, to relieve pain, and to combat the underlying rheumatism or gout, as the case may be. Strict injunction must be given against the use of all irritating and astringent lotions, as these always do harm when the iris is inflamed.

During the acute stage the patient ought to be kept in bed in a darkened room. Of all local applications, atropine is of the first importance. It is prescribed in a one to two per cent. aqueous solution, one drop of which is to be instilled every three hours until the pupil dilates freely or the acute symptoms are relieved. Care must be taken to use only the neutral salts, as the slightest impurity is apt to cause atropine irritation, which gives the patient much unnecessary annoyance and seriously handicaps the treatment. Oily solutions are sometimes very serviceable, but then the pure alkaloid and not the sulphate must be employed. It sometimes happens that instead of affording relief, the instillation of atropine aggravates the suffering and increases intra-ocular tension. This very serious complication is most frequently seen in the gouty. After each instillation pain in-

creases till it is almost unendurable, and if the use of the drug be continued, the upper lid becomes œdematous and the eyeball exceedingly tender to touch ; the media become more and more turbid ; and sight rapidly deteriorates, until the patient can hardly distinguish the light. Such an unfortunate state of matters may be met by substituting for the atropine a one per cent. solution of pilocarpine ; but the drawback to the use of the latter drug is that it contracts the pupil, which may become fixed by posterior synechiæ and occluded by inflammatory exudation. It is wiser, therefore, when high tension persists, to lower it by paracentesis of the anterior chamber, and to employ atropine tentatively to keep the pupil as widely dilated as possible. This operation is usually followed by great relief of suffering, but the patient should be warned that he will probably experience spasms of very severe pain immediately after the aqueous escapes, owing to the forward displacement of the inflamed ciliary body and to hæmorrhage from the bloodvessels of the iris. Pain always acts as a new exciting cause of the inflammation, therefore anything that relieves pain aids the curative action of the atropine. Cocaine, in one per cent. solution, by anæsthetising the surface, diminishes reflex action from the fifth cranial nerve, and so promotes the mydriatic

effect, but the idiosyncrasy of the gouty to this drug, already referred to, must be borne in mind, and alypin or novocaine substituted. Of all the local analgesics, dionine is undoubtedly the best. In five per cent. aqueous solution it is one of the most valuable agents which we possess for the relief of deep-seated pain. When dropped into the eye, it causes at first a smarting and burning sensation, accompanied by chemosis of the conjunctiva and swelling of the lids. These symptoms are sometimes very pronounced and may alarm the patient greatly, if he has not been forewarned of the probability of their occurrence and told that they speedily pass off. This lymphagogue property of dionine is intimately associated with its power as an analgesic, because only after a good reaction is there much relief of the pain. Extract of belladonna rubbed up with glycerine to the consistency of treacle, and painted over the brow and lids, often affords great relief. Hot applications are, as a rule, always soothing. They diminish the engorgement of the blood-vessels, and so by reducing tension relieve pain. They may be applied as fomentations or as dry heat.

Fomentations, unless the case be very acute, ought not to be applied continuously, but three or four times daily for periods of from half an hour to an hour. Between the applications the

eye should be protected by a pad of cotton-wool kept in position by a bandage. As a rule the temperature of the fomentations ought to be as high as can be borne by the patient, and they may be made all the more soothing by the addition of opium, belladonna, or chamomile. Dry heat is sometimes preferred by the patient, and is applied to the eye by masses of heated wadding, by the Japanese muff-warmer, or by an electric heater wrapped in cotton-wool. In this connection, however, it must be remembered that the gouty differ from the rheumatic. The former do not stand heat well and often get more relief from cold, in which case an ice-bag, iced compresses, or a Leiter's tube with cold water may be applied three or four times daily for periods varying from a quarter of an hour to half an hour.

Neither do the eyes of the gouty bear bandages without irritation, and in many instances the patients are most comfortable with merely dark protective glasses. When the signs of inflammation are very acute, the pain excruciating, and the photophobia intense, nothing affords such quick relief as local blood-letting. This is usually carried out by either three or four natural leeches, or by Heurteloup's artificial leech. Leeches are best applied round the external canthus, or over the mastoid region. The part being thoroughly

cleansed, the leech is taken in a narrow glass tube and placed over the spot, which may require to be moistened with a drop of milk to induce the animal to suck. It is thereafter allowed to remain until it lets go of its own accord. The amount of blood which should be withdrawn will vary according to the individual case, but, generally speaking, the bleeding should be continued till the pain is relieved. For some hours after the leeching the patient should be kept quietly at rest in a darkened room, and, if necessary, the bleeding encouraged by fomentations. If the hæmorrhage afterwards be excessive, it may be checked by pressure over a pad of absorbent cotton-wool dusted with powdered alum, or moistened with a 1 in 1,000 solution of chloride of adrenalin. No one can deny the great value of blood-letting in the initial treatment of acute iritis, for after the application of leeches to the temple the pain lessens, and the pupil yields to the influence of atropine, though previously the drug had been ineffectual or had even caused increased irritation. The leeching, in acute cases, requires to be repeated whenever the pain recurs ; but if the inflammation, though diminished in severity, still tend to linger and become chronic, repeated blistering of the temple and the mastoid with cantharides is often productive of much

good, and in a genuinely rheumatic case a fly blister will often relieve pain more quickly and permanently than leeches. Local applications alone, however, are rarely sufficient of themselves to bring relief, and a dose of one-sixth of a grain of morphia combined with one-two-hundredth of a grain of atropine, injected preferably beneath the skin of the temple on the same side as the eye affected, is followed by much relief. Of all pain-killing remedies, however, aspirin, in from ten to fifteen grain doses, is probably the best and frequently acts like a charm. It should be given after meals, and, should it tend to cause depression, it is wise to combine it with caffeine. When the patient is sleepless its efficacy is greatly enhanced by the addition of trional or of veronal.

The older practitioners had great faith in mercury, and there can be no doubt that a pupil which has stubbornly resisted the mydriatic action of atropine will often begin to dilate synchronously with the slight soreness of the gums which indicates the first sign of approaching salivation. Just this amount of mercurialisation, and no more, should be obtained as rapidly as possible; and by carefully regulating the dose and using a chlorate of potash mouth-wash freely, the patient can be kept gently under the influence of the drug without the slightest danger. In the

arthritic cases, the combination I most generally employ is a powder containing calomel, Dover's powder, salicylate of soda, and nitrate of potash.

If, in spite of all that has been done, the inflammation continue, a turning-point may be got after free diaphoresis from the administration of one-twelfth to one-eighth of a grain of pilocarpine hypodermically. Free sweating is promoted by the use of hot packs and warm drinks. In many of those lingering cases, the inflammation is undoubtedly kept up, and relapses favoured, by absorption of toxins from the intestine, and constipation, therefore, must be very carefully avoided. The calomel is helpful in promoting intestinal antisepsis, but the old-fashioned plan of giving a dose of turpentine and castor-oil is often followed by successful results. Turpentine in drachm doses three times a day was highly recommended by Carmichael in the treatment of some forms of iritis, and probably any success that followed its administration was due to its antiseptic action on the bowel.

After the acute stage has passed, the real general diathesic treatment must begin, and the best guide is careful examination of the urine. The first condition of success is to find out if possible whether gout or rheumatism is at the bottom of the trouble, to prescribe appropriate

remedies in such dose and state of combination as will suit the individual patient, and then to persevere steadily until the disease be overcome. The all-important point is to make a searching diagnosis early, so that from the first the treatment may be both local and constitutional; and in emphasising the latter I am not, for one moment, to be taken as underestimating the value of the former. It should always have its proper place, for neglect might bring about complications, and of course if the tissues be destroyed no amount of medicine of any kind can replace them.

In many instances, however, when, as a result of complications, the whole uveal tract has become involved, and the prospects of success are not hopeful, a well-thought-out line of treatment and earnest perseverance will accomplish much, while an ill-considered plan and intermittent effort will altogether fail. It is, too, of the greatest value for the patient that the doctor be resourceful. There is no royal road in medicine, and, whatever drugs be employed, it cannot be too strongly urged that, no matter how high the reputation of a remedy, it at once does harm to the individual for whom it has been prescribed, if it interfere with his powers of digestion and assimilation of food. He is, as a rule, the most

successful practitioner, who can at once vary the preparation and the combination of the drugs to suit the idiosyncrasies of the patient, and at the same time never depart from the line of treatment he has laid down for himself.

Generally speaking, it is wise to begin by prescribing the salts of soda and potash, the therapeutic effects of which are enhanced by combining them with ammonia, the mixture being well diluted with water and taken between meals. For the gouty, lithia may be added with advantage, and, indeed, in their case the large amount of fluid taken with the medicine is often of great value, for, as a rule, such patients drink far too little water. If complaint be made of feelings of depression, and of disinclination for, and discomfort after, food, a simple tonic containing tincture of nux vomica and a liquid preparation of pepsin, taken twenty minutes before meals, will very often remove the unpleasant symptoms and enable the patient to persevere cheerfully in the use of the alkali. The effervescent preparation of piperazine may be given with advantage as an alternative to the alkaline mixture. In the later stages the cure may be perfected, and recovery more securely established, by a prolonged course of the iodides, and here again a combination of the salts is usually productive of more good

than is obtained from any one of them given separately.

If the patient can afford it, he should be sent to a spa, care being taken to select the locality and the waters best suited to his individual requirements. No medication, however, can take the place of a proper regimen. These patients often take too much food and too little exercise, so their habits and mode of life require to be very carefully considered. They must be urged to live so as to make the best of the digestive power they still possess, and ever to bear in mind that the power of elimination tends naturally to diminish as age advances. Their food must be plain and well-cooked, and they must be careful not to eat too much; while stimulants in any form should be taken very sparingly, and, unless in special circumstances, alcoholic beverages avoided altogether. Daily exercise in the open air, short of fatigue, is absolutely necessary, and the dwelling-house, more especially the sleeping apartment, ought to be well ventilated. Marked improvement in health is sure to follow such careful regimen, and the eye will share in the general well-being. The patient, however, must follow the prescribed method of life closely over a long time, for if he weary of the restrictions imposed upon him, and return to his former ways

of living, the eyes will, in all probability, again become inflamed, and each fresh attack is more and more difficult to cure.

In cases that have been neglected, and where sight has become worse and worse owing to recurrent attacks of inflammation, iridectomy will be necessary ; and the operation is more likely to do good when the intra-ocular tension is increased, and the anterior chamber shallow, as a result of iridoncosis. It ought to be carefully borne in mind, however, that the necessity for operation arises from the failure of the local, general, and diathesic treatment to prevent the formation of extensive posterior synechiæ. Striking improvement in sight often follows the iridectomy, and the patient naturally attributes this to the operation. In reality, however, the cutting out of a piece of the iris only removes a mechanical obstruction to the free circulation of the intra-ocular fluids (it has its analogy in the gastro-jejunostomy of the general surgeon), and in no way does away with the need for continuous maintenance of the regimen directed against the gout or rheumatism, the underlying cause of the whole condition.

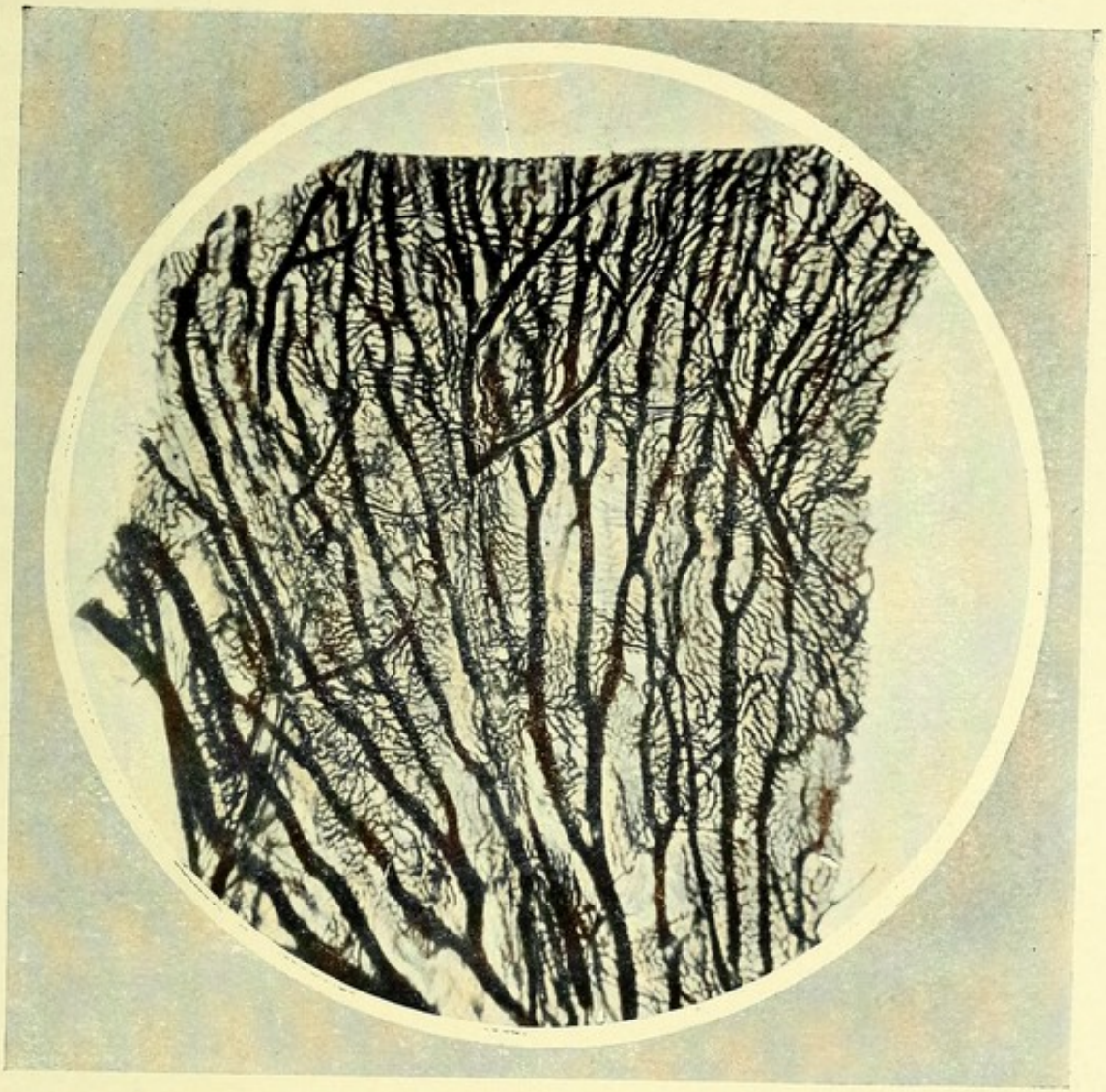
While, therefore, operation must not be too long delayed, and ought to be resorted to at once, if sight is rapidly failing, or intra-ocular tension

is persistently above normal, it ought always if possible to be preceded by careful general treatment; and the most lasting results are obtained when an equally careful regimen is steadily followed after the operation has been performed.

B. Choroiditis.

Inflammation of the choroid, of arthritic origin, is principally met with either in the young about the time of puberty or in adults late in life. Short-sighted women who have passed through the menopause are the chief sufferers. The disease as a rule affects both eyes, but is usually much more advanced in one than in the other. It may attack either the anterior or the posterior portion of the choroid, and in the former case is always complicated by inflammation of the sclerotic and by iridocyclitis—the sclerotico-choroiditis anterior of the older ophthalmic surgeons. The acute form is accompanied by pain, and by all the external signs of inflammation. It tends to recur again and again, and in cases associated with the menopause transient attacks are observed immediately preceding each menstrual period, while in the intervals the eye is free from inflammation. When fairly established, however, the disease is most inveterate, and the eye is

Plate V.



INJECTED CHOROID (RABBIT). × 20.

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rarely free from pain and redness. Ultimately the cornea becomes more or less opaque and altered in curvature, and the sclerotic, thinned and weakened in consequence of prolonged inflammation, is unable to resist the intra-ocular tension, so that the pigment of the choroid becomes visible, and finally ciliary and intercalary staphylomata form, in the worst cases in a complete ring. In such instances sight is early and seriously impaired, and after years of suffering may be altogether lost. The treatment is similar to that already described when dealing with acute iritis. Like all other arthritic troubles, choroiditis is aggravated by cold and wet, so, if it be possible, these patients ought to winter abroad. Bath suits many of them very well, but they have always to contend against the uncertainty of the English climate. On the whole, if their circumstances permit, they are wiser to go to Egypt. The eyes, under any circumstances, must be carefully protected by goggles against bright light and dust. A suitable regimen must always be prescribed, and conscientiously carried out all through life.

If the pupil threaten to become excluded by posterior synechiæ, and symptoms of subacute glaucoma supervene, iridectomy will be required, but all that was said regarding surgical interference, in treating of recurrent iritis, is doubly appli-

cable in sclerotico-choroiditis. Operation may be necessary to remove a mechanical obstruction to the circulation of the intra-ocular fluids which at the moment threatens to destroy sight, but it must never be looked upon as a cure for the disease. It simply gets rid of an obstacle and so gives general and dietetic treatment a fair chance.

The non-acute cases are for the most part confined to the posterior pole of the eye and are unaccompanied by pain or any external sign of inflammation. Young patients, however, complain of increasing short-sight and of tiredness of the eyes after close work, while adults complain of increasing difficulty in reading and frequently of metamorphopsia. Children thus affected are said to suffer from progressive myopia, but careful inquiry will often disclose an arthritic parentage and a history of " growing pains " in the patients themselves. When ophthalmoscopic examination is made, changes in the choroid, chiefly to the outer side of the optic nerve, are detected in addition to the myopia, and in advanced cases a well-marked posterior staphyloma may be seen.

In these circumstances all school work must be stopped, and in my own experience there is nothing of more value in checking the progress of the choroiditis than a well-regulated course of Swedish gymnastics. It is not enough, when one

is dealing with children, simply to adjust glasses suitable for the correction of the myopia : a quick estimate must at the same time be made of the patient's general condition, and while the error of refraction must always be carefully corrected, every effort ought also to be made to develop and strengthen the whole muscular system by proper food, by drill, by exercise on the bicycle or preferably on horseback, and by an active outdoor life. Adult patients frequently tell us that they became short-sighted during early school life, but from the time they began to wear suitable glasses their eyes had given them no trouble, until, somewhat suddenly, they experienced difficulty in reading, and found that the outline of any object they looked at was distorted. They first notice the outline of a spoon wavy, or a coin flat along part of its circumference, and then, suddenly, they find themselves unable to read or to see any object clearly when they look straight at it—*e.g.*, when they look at a face one eye may be visible and the other not. Ophthalmoscopic examination reveals evidence of past and fresh choroiditis to the outer side of the optic disc and implicating the macula, and a recent hæmorrhage or hæmorrhages may be seen in and around the macular region, the occurrence of these affording a ready explanation for the sudden deterioration

of sight. It is not unusual to find in one eye that the yellow spot has been completely destroyed, and that with this eye the patient is quite unable to read, although he only became aware of this disability when the second eye became involved. The power to read may be lost quite suddenly, and when the eye is examined scars of past choroiditis are seen and a recent hæmorrhage is visible in the macula. Unless the effused blood has destroyed the yellow spot, sight will gradually return as the hæmorrhage becomes absorbed; but the patient will now, in all probability, begin to complain of metamorphopsia, if he has not done so before. These are the cases in which so much good is often obtained from the subconjunctival injection of sterile saline solution. I usually employ an eight per cent. solution of chemically pure chloride of sodium, and inject from ten to twenty minims, trying to get the fluid as far back behind the eye as possible, and taking care not to get beneath the capsule of Tenon. I prefer to use the curved needle devised by Dor. It ought to be as sharp as possible, and the puncture made in the conjunctiva as far away from the cornea as convenient. Pain, which is usually very severe at the time of the injection, may be mitigated by the addition of a few drops of a one per cent. solution of acoin, or of a two per cent. solution of

alypin, to each dose of the saline solution immediately before the injection. Pflugk has recently recommended a one per cent. solution of acoin in sterilised arachis oil, and it should always be remembered that subconjunctival injections give less pain when they are introduced at blood heat.

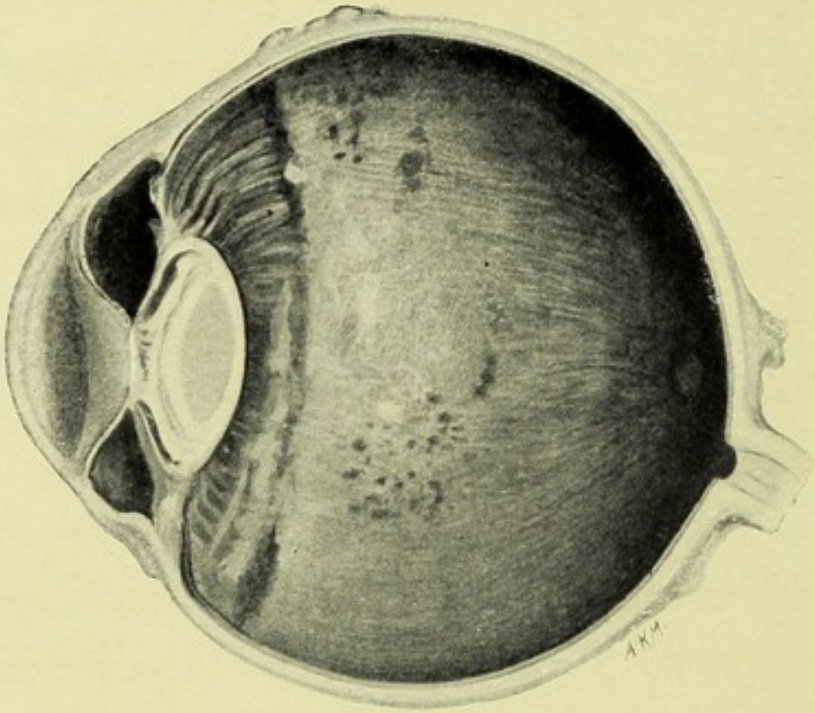
I believe that the benefit resulting from the injection of the solution of chloride of sodium is wholly due to the counter-irritant action of the injection, and in my experience no lasting benefit will follow unless the patient is at the same time put on a course of suitable general treatment and an appropriate regimen prescribed. As a rule I put the patient to bed for three or four weeks, in order that I may the more thoroughly carry out any active treatment, leeching, sweating, etc., but in every case the first thing to attend to is the action of the bowels. In the early stages of all diseases of the uveal tract a mercurial purge and alkaline saline draughts stimulate the liver, bowels, and kidneys, and their administration is often attended by the most satisfactory results. Many patients suffer habitually from constipation, and it happens not infrequently that the bowels cannot be satisfactorily moved until the rectum has been thoroughly washed out with a soap-and-water enema containing a large dose of

castor-oil and turpentine. After this treatment in bed the patient is advised to go to the country for some weeks, to avoid all reading and sewing, and to wear peacock-blue glasses to protect the eyes from bright light, this colour of glass, by cutting out the red rays, being usually found most grateful to those suffering from inflammations of the uveal tract. He is counselled to adhere strictly to the regimen prescribed for the gout or the rheumatism as the case may be, and advised to take an alkaline chalybeate tonic after meals. It may also be necessary to order a simple laxative to be taken regularly at bedtime, as a recurrence of constipation will almost to a certainty be followed by a relapse in the ocular inflammation, and probably by a repetition of the hæmorrhage from the vessels at the posterior pole of the eye.

C. Irido-Choroiditis.

The different parts of the uveal tract—iris, ciliary body, and choroid—are in most intimate anatomical connection with one another, consequently the whole tract is frequently inflamed as a result of disease beginning in the iris and spreading backwards to the choroid, or on the other hand beginning in the choroid and spreading forward to the iris. In the former group the

Plate VI.



IRIDO-CHOROIDITIS WITH WELL-MARKED IRIS BOMBÉ.

Drawn from a specimen in the Pathological Museum of the Glasgow Ophthalmic Institution.

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affection is a complication and sequela of iritis, and is usually from the beginning characterised by pain and by the external sign of inflammation. Although at times the patient may be free from suffering, yet vision instead of improving becomes more and more blurred, and, in consequence, this disease has been described as the despair of both the patient and his doctor. In every case there is more or less exudation, and it is this exudation which plays the most important part in the pathological history of the disease. Instead of being limited to points around the pupillary margin—posterior synechiæ—the adhesion of iris to lens capsule may be so complete as to preclude the possibility of any circulation of fluids between the posterior and anterior divisions of the aqueous chamber—exclusion of the pupil—and when such a condition exists, a mass of fibrin generally fills up the pupillary area more or less completely—occlusion of the pupil. The amount of exudation on the surface of the lens may be so great as to resemble cataract. When the pupil is excluded or occluded, cyclitis followed by secondary glaucoma occurs, the iris becomes bulged forwards from the pressure of the aqueous behind, and the depth of the anterior chamber is diminished except at its central portion—iris bombé or iridoncosis. Glaucomatous symptoms are liable to supervene after the

slightest exposure to cold, dust, or glare; after any indiscretion in eating or drinking; or after a sleepless night, or any worry or anxiety. In such cases the iris is always discoloured and atrophied, and at one or more points its fibres are so thinned that the uveal pigment shines through as black spots or stripes; the iris stroma proper becomes quite rotten and so completely adherent to the lens capsule that, if iridectomy be attempted, only the superficial layers can be removed, and that piecemeal; and the dense pigment layer remains glued to the lens capsule from the pupil to the ciliary border. The border of the pupil is often deeply pigmented, and there may be ectropion of the pigment layer of the iris. The blood-vessels also degenerate, and intra-ocular hæmorrhage is of frequent occurrence. By-and-by the nutrition of the globe is so seriously impaired that the intra-ocular tension diminishes, cataract forms and the vitreous shrinks, the retina becomes detached, and the eyeball, now quite blind, gradually shrivels. In the very early stages of a case in this group where cataract is threatening it is always right to instil into the conjunctival sac, or to inject beneath the conjunctiva, a one per cent. solution of iodide of sodium, because there is both clinical and experimental evidence in support of the contention that cataract may, in some cases,

at the very first start, be arrested, or even dispersed, by the use of iodides.

In the second group, where the disease begins in the choroid, the patients usually complain of muscæ volitantes and of indistinctness of sight; but although an aching in the affected eye and on the same side of the forehead may be mentioned, yet pain is not as a rule a striking feature of this form of inflammation: sight, however, steadily fails. When the eye is carefully examined, several greasy-looking spots are usually observed on Descemet's membrane, the iris is thickened and presents a lack-lustre appearance, and the instillation of a drop of atropine reveals that the iris is more or less glued to the capsule of the lens by posterior synechiæ. The pupil itself may have a somewhat cloudy appearance, but ophthalmoscopic examination shows it to be quite clear. Floating bodies are, however, usually detected in the vitreous, and signs of inflammation of the choroid may be present. Both eyes, as a rule, are affected, although the one may be attacked considerably in advance of the other. Vision gradually deteriorates and finally may become extinguished, while from increase of the opacities in the vitreous it becomes more and more difficult to distinguish any detail in the fundus oculi. These cases have been for the most

part regarded as being due to syphilis inherited or acquired, but the recent experiments of Stock, and the use of injections of Koch's old tuberculin, have demonstrated at the bedside that many of them are tubercular. Over and above all these, however, a number of cases remain which cannot be attributed either to syphilitic or tubercular infection, and which clinical experience shows to be manifestations of the arthritic, and more particularly of the gouty, diathesis. It is our fuller methods of physical examination, and more especially careful investigation of the urine, that enable us to make this differential diagnosis; and the truth of it is proved by the gratifying result occasionally obtained by general treatment, and by a regimen directed against the arthritic diathesis and carefully suited to the needs of the individual patient. In the acute cases, all that has been said of the treatment of iritis is doubly true. Both the general and dietetic treatment must be thoroughgoing, and patiently persevered in over a long period of time. The use of salicylate of soda ought not to be forgotten, and occasionally pain and other signs of inflammation are relieved with surprising rapidity by the hypodermic injection of 2,000 units of antidiphtheritic serum. As to the why or wherefore of the beneficial action of this last, I do not attempt to offer any explana-

tion. We have been taught to believe that both microbic infection and antitoxins are specific, and, therefore, so far as we know, the use of this non-specific serum can have no scientific basis. Therapeutics being, however, more of an art than of a science, a sane empiricism is always of value to the patient; and of the clinical fact of the power of antidiphtheritic serum, under certain non-specific conditions, to relieve pain, I am so convinced, that I would rather trust to it than to hypodermic injection of morphia. Its use is as a rule unaccompanied by any constitutional disturbance. Untoward results, such as cutaneous eruptions, backache, and albuminuria, have, indeed, been described by Darier and others, but of these I have had, so far, no personal experience. In one of my cases there was sudden rise of temperature accompanied by rigor, but the fever lasted only a few hours and was followed by no unpleasant consequences. Although very large doses may be administered with safety, 2,000 units of the serum are, in my experience, on the average quite enough, and this quantity may be repeated, daily, three or four times. In medicine it is very easy to argue *post hoc, ergo propter hoc*, but the uniformly favourable results which I have obtained at the bedside in dealing with cases of extreme gravity enable me confidently to advise the use of anti-

diphtheritic serum in very acute and apparently hopeless cases of irido-choroiditis in which enucleation seems to be inevitable.

In both chronic and acute cases much good is obtained from repeated diaphoresis and the use of alterative medicines. Turkish baths, at regular intervals, and carefully graduated so that they do not produce any after depression, are most valuable. Mercury in the form of a Plummer's pill, every night at bedtime, or the bichloride combined in a mixture with quinine and iron, three times a day after meals and alternating with a course of arsenic, are useful methods of carrying out general treatment. A combination of chloride and iodide of ammonium, or of the iodides of sodium and ammonium, are also of great service. In all this medication, however, I would again repeat the caution I have already given that the plan should be adjusted and carried out so that nothing in any way interferes with the patient's digestion and assimilation of food. Subcutaneous injection can now be employed to administer any of the remedies likely to be prescribed in dealing with diseases of the uveal tract, and is a valuable means of treatment for patients who are, owing to digestive peculiarities, unable to assimilate medicines when taken by the mouth. In my own experience the hypodermic use of twenty-

five per cent. iodipin has been very satisfactory. The injections are made between the shoulder-blades, every second or third day, in the usual way, with strict antiseptic precautions. The dose is from one to two drachms, and it should be warmed to about the temperature of the body. Heat by increasing the fluidity of the iodipin enables it to pass more readily from the syringe, and also renders the treatment less painful. The puncture made in the skin should be covered with adhesive plaster.

The essence of treatment is, however, after all, careful dieting on the lines already indicated in dealing with iritis. The advice to patients should be to eat sparingly, to avoid alcohol, to take plenty of exercise, to have the dwelling thoroughly ventilated and well exposed to the sun, and to live if possible on a gravelly soil in a high, dry, bracing locality. Early surgical interference is to be deprecated, for although in many instances iridectomy is most necessary, and is followed by brilliant results, these results will be all the more permanent if treatment has had time to modify the diathesis before operation. The symptoms when the patient is first seen may, however, be so urgent that delay is not possible, and then all that can be done is to operate at once, but to be specially careful to use energetic

treatment against the diathesis after iridectomy has been performed.

In such circumstances, it is always prudent to operate with the patient thoroughly under the influence of an anæsthetic, as so much depends upon the exactitude of the operation. If much pain follows, the prompt application of an ice-bag to the eye, and the administration of one-sixth of a grain of morphia subcutaneously will often insure a restful night—a great help in obtaining a good result, and securing permanent improvement. What has just been said must not, however, be interpreted to mean that the occurrence of pain is always to be prevented. On the contrary, pain is, as a rule, of the greatest service, for when properly understood it is a danger-signal warning both patient and surgeon that something is wrong. The suffering, however, which follows immediately after an operation is quite different; it interferes with the patient's capacity for sleep, which, as Sir James Paget insisted, is of the greatest value in giving Nature the chance to encourage healing of a wound, of which she is never slow to avail herself. These precautions are all the more necessary when operating on the cases previously alluded to, where, owing to the complete adhesion of iris to lens capsule, an iridectomy is impossible, and where relief can be

given only by removing the lens and afterwards forming an artificial pupil by iridotomy.

The question as to the most favourable time for operation on gouty or rheumatic patients will also present itself in those unfortunate cases in which the patient's one eye is completely blind and shrunken as a result of advanced irido-choroiditis, and where a fully developed cataract is present in the other eye when first seen by the surgeon. If the eye with cataract be free from inflammation and the projection of light good, the temptation to extract the opaque lens is great ; but, on the whole, a more favourable result will be obtained if time be given to treatment of the patient and his special disease proclivities before the operation be undertaken—good food, fresh air, rest, every means of strengthening digestion, are all essential, much the more so if, as so often happens, the sufferer be a poor man who has, through defective sight, been unfit for work for several months, and thus, through poverty, has been unable to procure sufficient nourishment.

CHAPTER VII

INFLAMMATION OF THE RETINA AND OPTIC NERVE

Gout and probably rheumatism also play a very important part in the etiology of the vascular changes which precede inflammation of the retina. As has already been said when dealing with eye-strain associated with oxaluria, the ophthalmoscope reveals a characteristic picture, whose chief feature is an alteration in the appearance of the retinal bloodvessels. These changes were ascribed to defective metabolism, the result of functional derangement of the liver and of renal inadequacy. The frequent association of oxaluria with albuminuria and glycosuria carries us a step farther. As a result of defective elimination toxins manufactured in the intestine are absorbed into the blood. If the toxicity be acute, the blood itself becomes so altered in character that it does not circulate freely through the smaller bloodvessels, and thrombosis readily occurs, accompanied by hæmorrhage more or less extensive. If, on the

other hand, the toxicity be chronic and maintained over a long time, changes occur in the vessel walls themselves, so that they become brittle (arterio-sclerosis) and readily burst whenever any strain is put on the circulation. In the former case, the consequent lesions are always acutely inflammatory, while in the latter the type is degenerative. The clinical association of defective sight with diseases of the kidneys did not escape the observation of the older physicians, more especially Bright, and the graphic ophthalmoscopic picture of albuminuric retinitis first published by Liebreich is still looked on as a piece of classic clinical description. There is the reddish optic disc, swollen, blurred in outline, and surrounded by a diffuse opacity of the retina, spotted here and there with red patches due to hæmorrhage. Radiating from the macula in the form of a star are numerous small, white, shining dots, and scattered over the fundus are larger white patches, the result either of the partial absorption of a blood-clot or of fatty degeneration. The arteries are generally attenuated and accompanied by white lines, and the veins are distended and tortuous.

This is the type; but there are many variations. There may be associated with Bright's disease very strongly-marked visual defects, unattended

by any gross lesions in the fundus oculi, and cases of dimness of sight connected with diseases of the kidney characterised by albuminuria may, therefore, be divided into two classes :

1. *Uræmic amaurosis*, where the ophthalmoscope reveals no gross lesions in the retina.

2. *Retinitis albuminurica*, where marked retinal changes are present.

Uræmic amaurosis occurs most frequently in those cases of Bright's disease in which cerebral symptoms predominate. It may exist alone, but is more frequently accompanied by headache and vomiting, and an attack is often preceded by a convulsive seizure. Without discussing the various explanations which have been put forward to account for uræmia, it may be said that it is due to blood-poisoning brought about by the endogenous formation of waste products that ought to have been eliminated from the system by the urine. The resulting blindness is usually bilateral and complete, and though, as a rule, it passes entirely off after some hours, yet, in exceptional cases, it may last for days.

All this is in very marked contrast to what is often seen in the second group—retinitis albuminurica—where retinal changes may be discovered by the ophthalmoscope and yet the patient may be quite unaware that there is

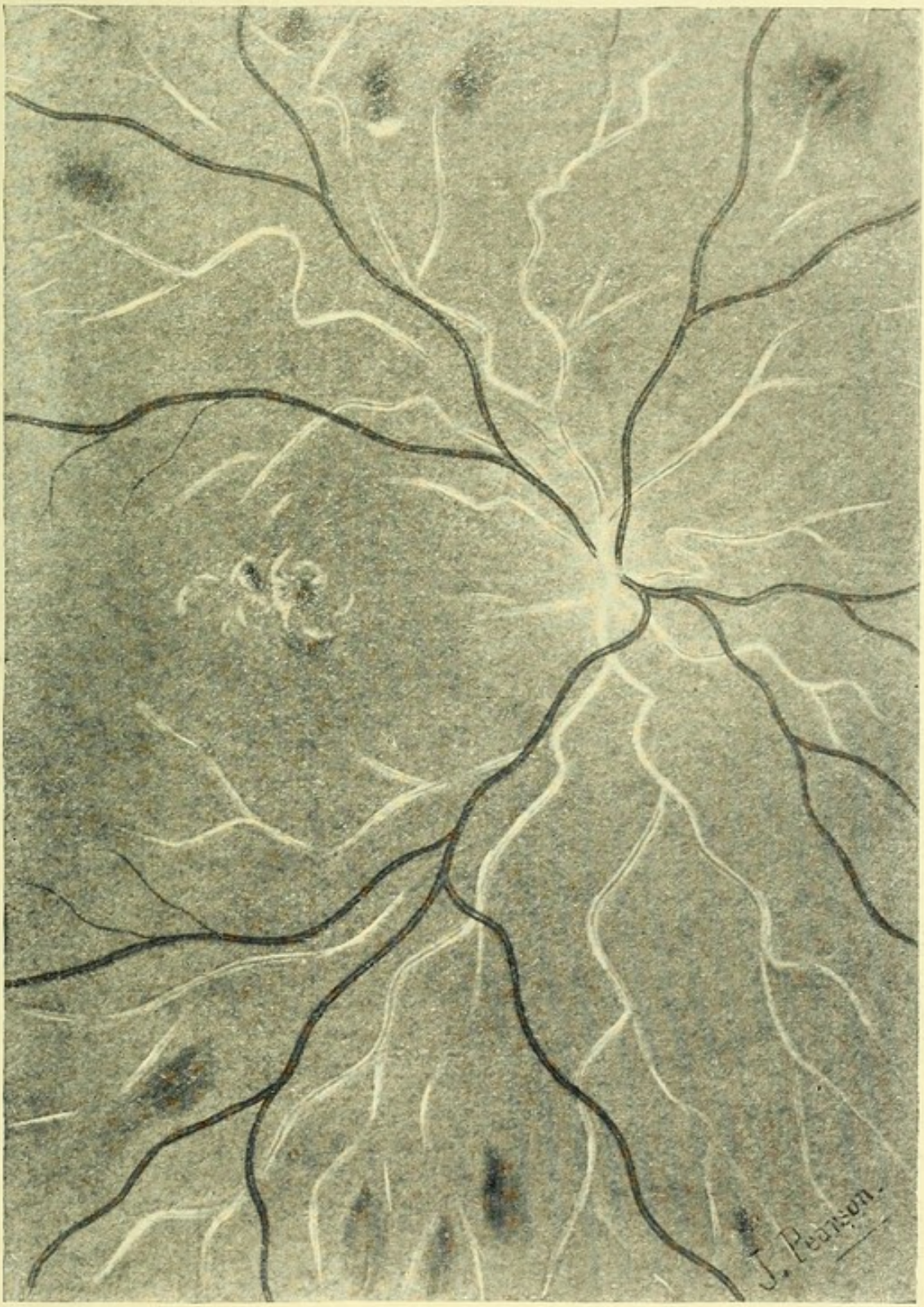
anything wrong with the eyes. The fact that such a serious state of matters can exist without the knowledge of the patient emphasises the need for and the great value of careful ophthalmoscopic examination in every case where the general symptoms indicate any disturbance in the function of liver or kidneys.

Cases of albuminuric retinitis naturally divide themselves into two groups, according as the lesions in the fundus oculi are inflammatory or degenerative. The inflammatory form is characterised by the occurrence of œdema, hæmorrhage, and inflammation, and is usually found associated with dropsy and with the presence of albumen in considerable quantity in the urine. It must not, however, be supposed that the retinal lesions are dependent either upon dropsy or upon the amount of albumen. The more acute the nephritis the greater is the former, and the larger the quantity of the latter; but it is rare indeed to find albuminuric retinitis present at all during a first attack of acute parenchymatous nephritis. The eye-changes occur most commonly when the acute attack supervenes on previously existing chronic nephritis. In that case the kidneys have, for a long time, been doing their work inadequately, and the blood has, in consequence, become charged with waste products, which by

their toxic influence have excited inflammatory changes in the optic nerve and retina. Hence the neuro-retinitis comes on suddenly and runs a violent course. Still, notwithstanding this, it may, under favourable conditions, pass off, leaving no trace, as is well illustrated in the phenomena observed in retinitis albuminurica during pregnancy. Here the onset is acute, the progress rapid, and sight lost more or less completely, yet these apparently hopeless symptoms admit of a favourable prognosis.

The degenerative form has its origin in pathological changes in the retinal arteries, and we are indebted to Mr. Marcus Gunn for an admirable description of the ophthalmoscopic appearances. The arteries are irregularly contracted, abnormally tortuous, and even the very smallest exhibit a brightness of the central light streak which is very characteristic. The artery loses its natural translucency, and becomes hard and rigid, and consequently, when it crosses a vein, it not only conceals the latter from view, but also mechanically exerts so much pressure upon its walls that the blood-flow is hindered. The result may be a hæmorrhage, and on account of œdema of the retina, more especially in the neighbourhood of the optic nerve and macula, the fundus does not present a bright red reflex, but appears grey and

Plate VII.



WELL-MARKED SCLEROSIS OF THE RETINAL ARTERIES.

From the right eye of a woman 68 years of age.

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hazy. In addition to these vascular changes—the hæmorrhages and the œdema of optic disc and retina—there are always present minute white dots, whose stellar arrangement around the macula, and bright shining appearance, are perhaps the most characteristic feature of the ophthalmoscopic picture. The anatomical changes which explain these lesions of the fundus oculi were investigated by Brailey, and are similar to those described by Gull and Sutton as arterio-capillary-fibrosis. They are found for the most part in association with the contracted granular kidney, but it is important to note that they are not of necessity dependent upon the renal disease, for in many instances they are but a part of a widespread general disease of the bloodvessels. They creep slowly but steadily along the walls of the arteries (their insidious progress being for a time marked by no symptoms), and remain quite unsuspected until, little by little, they reach an advanced stage. In this lies the importance of routine ophthalmoscopic examination in all cases of suspected granular kidney in which the urine, though it be copious and of low specific gravity, may contain albumen only intermittently and in minute quantity. Marcus Gunn has said that " ophthalmoscopic examination is one of the most ready clinical means for the early detection of

important arterial changes," and in a recent paper de Schweinitz has insisted upon the value of ophthalmoscopic examination of the fundus oculi to detect persistent high arterial tension. The latter lays great stress on the existence of a cork-screw-like appearance of the smaller arterial vessels, of the flattening of a vein where it is crossed by an artery, and of a general congestion of the optic disc; but while he looks upon these three signs as almost pathognomonic of the early stages of arterio-sclerosis, he very wisely urges that the ophthalmoscopic evidence ought, if possible, to be confirmed by examination of the heart and the pulse, and by the accurate measurement of arterial tension by a sphygmomanometer. The clinical importance of such a thorough examination as de Schweinitz insists upon will be at once apparent when one remembers the intimate connection between the retinal lesions and the state of the bloodvessels in the brain, for in not a few instances the patient dies from cerebral hæmorrhage. It sometimes happens that inflammatory changes become superadded to the ordinary signs of degenerative albuminuric retinitis, and this always indicates that an attack of acute or subacute nephritis has supervened upon one which has been for a time chronic.

Although it is convenient to speak of kidney

disease as divisible into two groups characterised by the presence or absence of dropsy, and to connect with each of these groups a definite form of albuminuric retinitis, it must be remembered that the divisions so merge into one another that it is not possible to distinguish different varieties of renal disease by the ophthalmoscopic appearances associated with them. Retinal changes may occur in any form of Bright's disease, though they are most frequently associated with chronic renal cirrhosis. Both eyes are, as a rule, affected, and while the neuro-retinitis is usually more advanced in one than in the other, one of the most remarkable features is the symmetry of the lesions. In exceptional cases, however, more particularly in the retinitis associated with the albuminuria of pregnancy, one eye may remain perfectly normal.

To diagnose a case of albuminuric retinitis by the ophthalmoscope is much easier than to appraise its true significance. It is generally admitted that the occurrence of this symptom adds additional gravity to the prognosis, and if the results of hospital statistics were accepted the outlook would be gloomy in the extreme. There is, however, a great difference between the ordinary hospital patient and the ordinary private patient, and the reasoning which is applicable in dealing with the one requires, in most instances, to

be considerably modified in the case of the other.

The main point to remember is that albuminuric retinitis is a late manifestation in the course of renal disease; that, as a rule, it is associated with the phenomena that are attendant upon high arterial tension, and that its onset may be determined by general toxæmia, by vascular degeneration, or by these conditions combined. Prognosis will obviously be more favourable in the inflammatory group than in the degenerative, because in the former the toxic elements may be removed from the blood. That is why recovery is so frequent in albuminuric retinitis of pregnancy, and why, when eye symptoms occur early and are threatening to destroy sight, premature labour should be induced with the least possible delay. Many cases of recovery from albuminuric retinitis are on record, but their interest depends not so much upon the disappearance of the eye-changes as upon the removal of the cause of the albuminuria. Prognosis must, therefore, be considered not only in relation to sight, but also in relation to life.

1. *Prognosis in Relation to Sight.*—Speaking generally, sight is not usually lost through albuminuric retinitis alone, and the degree of amblyopia present depends upon the amount of de-

struction due to degeneration and to the position of the retinal hæmorrhages. When the ophthalmoscope clearly reveals changes in the blood-vessels arising from arterio-capillary fibrosis it will be safe to predict that vision will become steadily impaired, because the vascular degeneration is likely not only to be progressive, but also to lead to local malnutrition and further hæmorrhage. As has already been observed, however, hæmorrhagic retinitis may be present and yet no complaint be made of defective sight. The fundus may be spotted with flame-shaped blood-clots, but so long as these are peripheral, not only may the patient be quite unconscious of their presence, but subjective examination may fail to detect anything wrong. It is very different, however, when the blood-clot occupies the macula, or when its round shape shows that it is situated deep in the substance of the retina, for then the sentient layer is implicated and the consequent disturbance of the rods and cones, if it does not produce a blank in the field of vision, will certainly induce metamorphopsia. A blank in the central area of the field of vision, due to a hæmorrhage in the macula, interferes completely with the patient's power of reading; and, although the blood-clot may become absorbed in course of time, it has probably caused so much disturbance in the

regular arrangement of the sentient elements that objects are seen with their outlines seriously distorted. As a patient once put it to me, "Everything seems done in rustic work."

Metamorphopsia is always a very painful symptom, and although it may pass off, the prognosis is all the more unfavourable because the macula has been seriously involved. When in the course of a chronic attack of albuminuric retinitis, acute symptoms, marked by œdema, exudation, and hæmorrhage, become superadded, an attack of acute parenchymatous nephritis has, as a rule, occurred; and the onset of such retinal changes, although causing greater anxiety at the time, may yet improve the prognosis of the disease as a whole by placing the case in the category of those where the kidney lesion is for the most part a local affection rather than a portion of a degenerative change in the bloodvessels as a whole.

2. *Prognosis in Regard to Life.*—Even if I felt competent for the task, this is neither the time nor the place for a complete discussion of albuminuria, so I shall content myself with simply mentioning the general signs and symptoms which ought always to be attended to when giving an opinion in a case of albuminuric retinitis. First of all, it should be remembered that albuminuric retinitis is rarely found with acute inflammation of the

kidney, except when the acute symptoms are superadded to previously existing chronic disease, and the main points to be attended to are the occurrence of uræmic seizures; the degree of œdema of the internal organs as evidenced by dyspnœa, vomiting, or purging; and the onset of acute inflammation of the serous membranes, or of persistent hæmorrhage. In cases associated with pregnancy the prognosis is usually favourable, but in them also danger becomes imminent if eclamptic seizures are frequent and severe. Formerly, when retinitis albuminurica was discovered in the course of chronic renal cirrhosis it was regarded as of such serious import that practically a death sentence was passed upon the patient. It was found, however, that although many did die within a few months of the retinal changes having been detected, others, who were more comfortably circumstanced, and consequently better able to take care of themselves, lived for several years. It is not wise, therefore, to disturb the general perspective of the disease by assigning to the eye symptoms a position of importance out of all proportion to the others. They ought to be regarded as part and parcel of the renal disorder, and when a prognosis as to life has to be given, they must be looked upon in their due relation to the whole. An unfavourable

opinion must always be expressed when retinitis albuminurica is associated with steadily failing strength, due to a large daily loss of albumen; with a weak heart and a low-tension pulse; with diminished excretion of urine; with the occurrence of uræmic symptoms; and last, but probably most important of all, with progressive anæmia.

The treatment resolves itself very largely into a question of how a kidney which is failing to adequately discharge its proper function can be aided and protected. For the ocular changes themselves very little can be done, except to advise the patient to avoid straining the eyes over fine work, and to protect them from exposure to bright light. There can be no doubt that exposure to glare is a potent exciting cause of recurrent hæmorrhage from the retinal blood-vessels; hence the urgent necessity of protecting the eyes from bright light. The ordinary London smoke goggles accomplish this, but they do so by diminishing the light and by materially altering the appearance of things. Of this patients complain, but if amber or chlorophyl coloured glass be prescribed the difficulty is overcome, because by this means the highly irritating actinic rays are cut off, and the patient gets a sensation of restfulness and of brightness without glare. The

general treatment consists chiefly in flushing out the kidneys by copious draughts of water, and in the use of such simple remedies as the citrates or acetates of potash, soda, and ammonia. In cases such as those described by de Schweinitz and others, in which the retinal vessels present the appearance of degeneration indicative of generalised arterio-sclerosis, the iodide and nitrate of sodium administered in a hot saline draught are often very helpful.

Good can be effected only by improving the condition of the blood, and this may be accomplished by calling on the skin and the intestine to aid the kidney in eliminating waste products. Of these, the skin is the more important, as skin and kidney present many points of similarity. Both have a common origin, for it was from the ectoderm that the true kidney was originally developed, and the uriniferous tubules and capsules bear a striking resemblance to the coils of the sweat glands. Owing to their community of descent, kidney and skin have a wonderful sympathy with each other, and one of the most familiar facts in clinical medicine is the manner by which renal inadequacy is compensated by increased cutaneous secretion. To promote free action of the skin is one of the first principles of treatment, and, as a rule, this is best accomplished by means of the

vapour bath and by hypodermic injections of pilocarpine. The dose must be a very small one to begin with, and its effects watched carefully, for fear of the occurrence of cardiac depression, or even of a syncopal attack. While, however, every effort is made to promote free elimination on the one hand, care must also be taken on the other to supply the patient with food of such a kind as will throw little work on the kidney. Skimmed milk is the ideal substance for this purpose, but all means should be taken to avoid too limited views about diet. The patient must be considered as well as the disease from which he is suffering. To maintain strength is essential, and whatever tends to increase anæmia does harm.

The following is a good case in point. The patient was a man, thirty-eight years of age, who, after exposure to cold and wet, was suddenly seized with acute inflammation of the kidneys, accompanied by copious hæmorrhage from the gums and nasal mucous membrane. There was a large percentage of albumen in the urine, and extreme general anasarca. He was removed to a hospital, where he was carefully restricted to a diet of skimmed milk, the medicines administered being imperial drink and occasional doses of compound jalap powder. Under this treatment he became steadily worse, till, as it was thought he

was going to die, his wife took him home. About the same time, just before he left the infirmary, he began to complain of failing sight, and vision deteriorated very rapidly, till when, shortly after he was brought to his own house, I saw him in consultation with Dr. Gibb, of Paisley, he was practically blind in both eyes. In the right eye the ophthalmoscope revealed intense neuro-retinitis, with hæmorrhage into the vitreous, and in the left all the signs characteristic of acute exudative retinitis albuminurica. The man was undoubtedly in a most serious condition, and stated that he felt very ill indeed. He was weak and breathless, and very anæmic; there was marked general anasarca; the pulse was quick and the heart-sounds feeble; and the urine contained 2·5 per cent. of albumen, and was diminishing in quantity. It was decided that the skim-milk treatment had been tried long enough, and the patient was put upon a more generous dietary, which was to be gradually increased as he became able to digest more food. The medicines prescribed were ammonia, potash, and iron. At the end of two months he was in every way improved, and was able to distinguish large letters. He was urged to continue his treatment steadily, and as his appetite and digestion were now excellent, he was encouraged to take suitable food freely and

to drink large quantities of milk. Three months later he felt perfectly well, and the albumen had disappeared from his urine. He was reading large print, and was able to write a little; and some months after that again, he resumed his duties as sergeant-instructor of Volunteers.

It follows, then, that there can be no specific remedy for albuminuric retinitis. At one time fuchsin was largely prescribed, with the result that, though there was in some cases a diminution in the amount of albumen passed, there was no real and lasting improvement in the patient's health. Nor could it be otherwise, for the albuminuria, like the retinitis, is merely one of the symptoms, and not the disease itself. A rational therapeutics can be arrived at only by careful study of the natural history of the disease; and the proper treatment for all patients suffering from albuminuric retinitis is to protect the eyes, as far as possible, from glare and strain; to provide proper food, warm clothing, comfortable surroundings, and plenty of pure water and fresh air; and to make judicious use of simple eliminants and of tonics containing iron.

It is often very difficult indeed to make a differential diagnosis with the ophthalmoscope alone between hæmorrhagic retinitis associated with albuminuria and that associated with glycos-

uria. It is generally stated in the text-books that one distinction is that the glistening white spots in the macular region in retinitis associated with glycosuria are not arranged so regularly in the form of a star as they are in retinitis associated with albuminuria ; and also that the hæmorrhages in the former are numerous, scattered all over the fundus, and more usually punctiform than flame-shaped ; but it would be rash, even with those differences in mind, to give a decided opinion without examination of the urine. This should always be made, and will afford the right clue not only to the etiology, but also to the treatment of the condition. The regimen of the patient with glycosuria will of course differ from that suitable for one with albuminuria, but here also the essence of the treatment consists in proper dieting, and in the use of means to promote the free elimination of toxins by kidneys, skin, and bowels. At the same time careful watch must be maintained over the patient himself, lest a too strict dietary, or too vigorous means of elimination, induce blood poverty or muscular weakness, with their attendant syncope or cerebral failure.

CHAPTER VIII

TOXIC AMBLYOPIA AND RETROBULBAR NEURITIS

EVERYONE is familiar with the indistinctness of sight which so frequently accompanies any functional derangement of the stomach and liver, and undoubtedly the most feasible explanation of this failure in visual power is to be found in toxicity of the blood, the result of defective elimination of waste products.

It has long been known that the excessive use of tobacco and alcohol may give rise to defective sight, and, when toxic amblyopia is mentioned, we naturally think of these agents as the cause. In many obscure forms of disordered or suspended visual function, however, whose symptomatology is in almost every respect identical with what is recognised as typical tobacco amblyopia, the patient may never have used either tobacco or alcohol. The etiology of the disease, therefore, in these circumstances, must be ascribed to some

cause other than smoking or drinking to excess, and such a cause I believe is to be found in the defective elimination of waste products due to perverted metabolism. Provided that the digestive function be perfect and all the eliminating organs doing their work properly, many persons seem to be able to use both tobacco and alcohol very freely without suffering any physical discomfort ; but, on the other hand, where digestion is poor and elimination imperfect, more especially where sugar is present in the urine, a very small quantity of either may do a great deal of harm. They seem to accentuate the already perverted metabolism, and to cause great increase in the toxicity of the blood.

The clinical picture of all forms of chronic toxic amblyopia is very much alike, and the diagnosis is made not from any pathognomonic ophthalmoscopic appearances, but rather from careful examination of symptoms. Indeed, the contrast between the gravity of the symptoms and the absence of any marked lesion that ophthalmoscopic examination can detect is one of the most striking characteristics of this disease. The patients are usually of the asthenic type of arthritism, that is, they have a mixture of the arthritic and the bilious diathesis, and many are, in addition, markedly neurotic. They may be

strong and healthy in appearance, and often say they have never been ill; but one finds on inquiry that they frequently suffer from digestive disturbances. They often, moreover, tell you that in consequence of domestic cares, or of business difficulties, they have been subjected for many months to much mental anxiety, and they themselves in many instances attribute the onset of the defective vision to indigestion and worry. The onset of the symptoms, though sometimes sudden, is usually so slow and gradual that patients have difficulty in determining the exact date of commencement, and they complain that in bright light they are easily dazzled, and that a whitish or yellowish mist rises like a cloud in front of their eyes and prevents them from seeing clearly. Towards sunset, however, this sense of dazzling disappears, and in consequence they tell you that they can always see best in the evening. By-and-by small print can be read only with difficulty, and stronger spectacles are procured, but with no good result; while at last, the inability to read even ordinary sized type becomes quite decided.

They then complain also that they do not readily distinguish their friends as they walk along the street, and may volunteer the information that when they look at a person's face they have difficulty in seeing the eyes, and that all healthy

colour seems absent from the cheeks. In pronounced cases they may tell you that the flame in a street lamp seems suddenly to go out, but again becomes visible as it is approached, while another then disappears. The dimness of vision is as a rule as pronounced in the one eye as in the other, and this symmetry, being a strikingly characteristic symptom, is of great value in distinguishing this form of amblyopia from diseases of the choroid, the retina, or the optic nerve, in which both eyes are also frequently affected, but where the diseased condition of the one is as a rule much in advance of that of the other. Indeed, when a person from forty to sixty years of age is found on examination to see in the distance only the largest letters of Snellen's test type, and, near at hand, only No. 16 or No. 19 Jaeger, and the one eye to be as defective as the other, toxic amblyopia ought always to be suspected. The diminution in the visual acuity varies according to the stage of the disease, but in every case careful examination demonstrates the failure of sight to be due to defect in the centre of the field. The patient, however, is not conscious of this, as he would be if the disease were due to a lesion in the outer layers of the retina. The scotoma is therefore "negative" or "relative." It is transversely oval, and usually extends from the point of fixation to

the blind spot. It is remarkably constant in size and shape, but may occasionally be of larger dimensions and surround the fixation point. These variations in size and shape seem to depend more upon the amount and effect of the toxic agent than upon the particular kind of poison. The more profound the amblyopia the larger the scotoma.

A central scotoma is not, however, pathognomonic of toxic amblyopia, for a similar blank in the centre of the field of vision occurs in disseminated sclerosis, in hereditary optic atrophy, and in some cases of inflammation of the orbit when there is pressure on the optic nerve in the neighbourhood of the optic foramen. In every case a differential diagnosis is come to through the collateral symptoms, and in toxic amblyopia a pathognomonic sign is that even when a white object can still be recognised a scotoma for colour exists in the centre of the field. Green appears grey or white, pink blue, and red brown. It is most marked for red and green. One patient, a gardener, told me that the first indication he had of failing eyesight was inability to distinguish the red colour of a strawberry. Before the fruit was ripe he could recognise the berries, but whenever these became red he failed to see them unless he were looking closely at the plants. Another patient complained that he had to give

Plate VIII.

SPECTROSCOPIC COLOUR-TEST USED BY THE AUTHOR.

The special advantage of this test is that in the examination the pure colours of the spectrum are employed instead of hues artificially produced. When the rotatory diaphragm is brought into use (Fig. 4) a small circular spot of colour is in the line of central vision, and can be varied as the examiner pleases by turning the left-hand screw underneath the lower end of the box. If a double-image prism be placed over the eyepiece the test becomes still more delicate, for the patient, while he cannot see the colour of the central stationary spot, can by peripheral vision detect the colour of the eccentric one as it revolves when the prism is rotated.

A A′ Diaphragms in focus of eyepiece giving two thin lines of colour (Fig. 2).

B B′ Slits movable by pinions, allowing the colour in either or both Diaphragms **A A′** to be changed as required.

C C′ Scales reading in wave lengths indicating colour in Diaphragms **A A′**.

D D′ Screw adjustments with graduated heads controlling width of Slits **B B′** and consequently the intensity of illumination in Diaphragms **A A′**.

E. Diffraction grating.

F. Electric lamp.

G. Lever allowing top Diaphragm **A** to be removed so that a full-length spectrum can be obtained above the Diaphragm **A′** (Fig. 3).

H. Diaphragm allowing various-sized discs of colour to be obtained (Fig. 4).

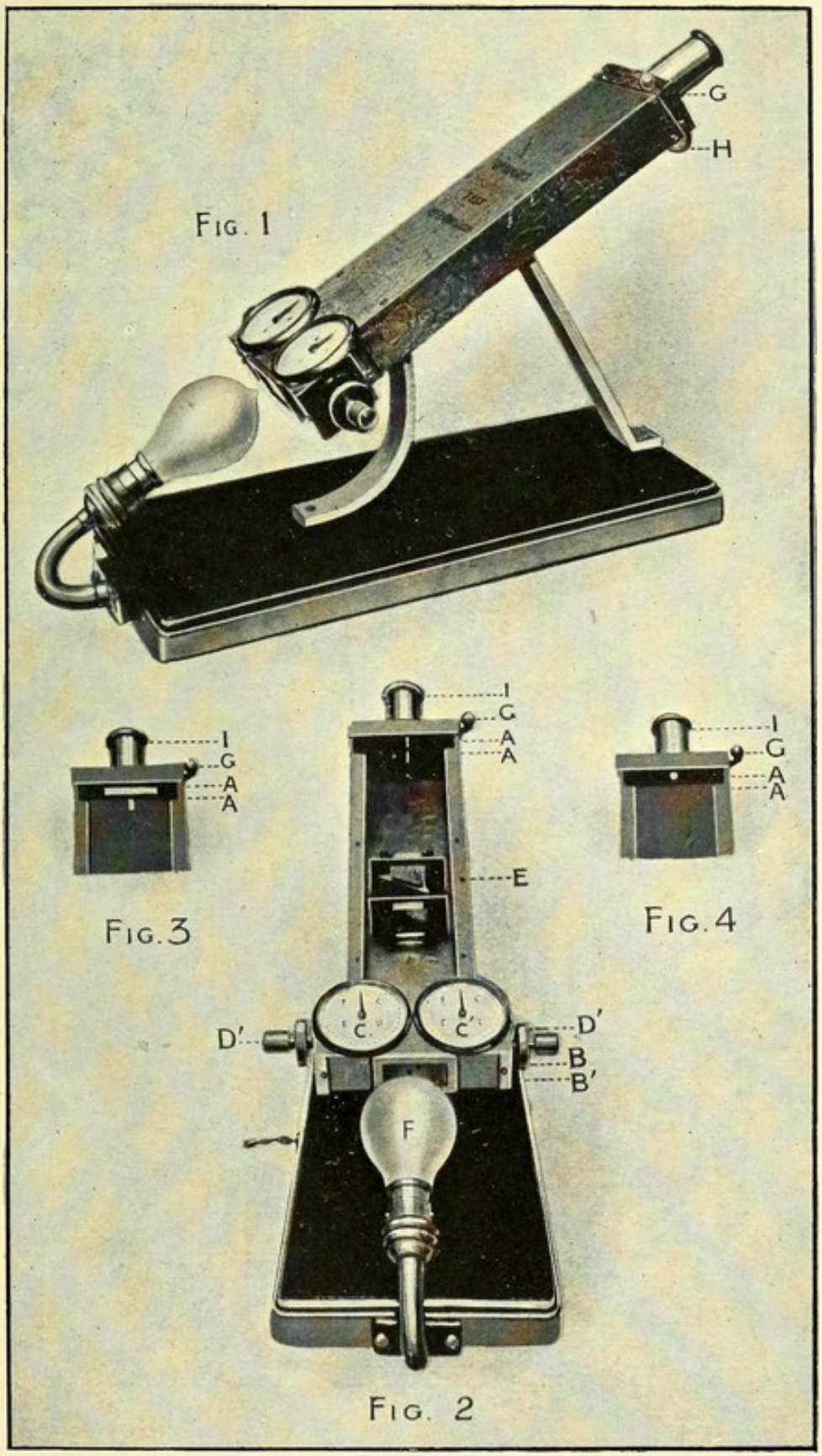

FIG. 1

FIG. 3

FIG. 4

FIG. 2

SPECTROSCOPIC COLOUR-TEST USED BY THE AUTHOR.

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up playing billiards because in certain positions he could not see the red ball. As the disease progresses, these colours assume a metallic lustre, green looks "like silver," while red glitters "like gold." The patient, however, may have considerable hesitation in distinguishing gold and silver coins, and is not able to tell half a sovereign from a sixpence until he holds them very closely up to his eye or until he takes them in his hand and feels the difference in weight. As, however, the eccentric parts of the visual field are normal, the patient may be altogether unaware of his colour blindness, and herein lies a grave danger to the community. He can see a large surface of red or green with perfect distinctness, but not the small circle of colour used as a test object, and consequently, unless he be properly examined, he may occupy a post on a railway engine, or be placed on the lookout at sea, although he is quite unfit to distinguish the red or the green signal, or to tell the port from the starboard light. In some cases blue is a strikingly predominant colour. One patient told me that one of the first things he noticed amiss was that the flames in the street lamps were blue, while another realised his visual disability when sitting in the dress circle of a theatre and feeling puzzled to know why every chorus girl was dressed in some shade of blue. I

cannot explain this, but I have over and over again found this symptom associated with the presence of oxalate of lime crystals in the urine. At length comes the difficulty of distinguishing a white object in the centre of the field, and in the most extreme cases even a candle flame cannot be seen. The scotoma is now absolute.

In striking contrast to the changes in the visual field and the marked disturbance of the colour sense are the results of ophthalmoscopic examination. As I have already said, the appearances are by no means characteristic, but in the early stages the retinal veins are usually turgid and somewhat tortuous, and the optic disc may be hyperæmic and less transparent than normal. As the disease progresses, however, the natural colour of the nasal third of the papilla contrasts strongly with the greyish whiteness of the temporal two-thirds.

Some group all cases of toxic amblyopia under the heading of retrobulbar neuritis, but, as Berry has insisted, there are good reasons for doubting in many instances the existence of actual inflammation. In a typically toxic case, the symptoms often pass off with great rapidity during a holiday on the moors or at sea, provided the regimen is simple and the night's rest is undisturbed; while on the other hand a colour scotoma

can be increased by fatigue. In both functional and organic cases, the position of the scotoma corresponds to the area of the retina which is supplied by the papillo-macular fibres, and there is both experimental and pathological evidence in support of the view that the retina is the structure primarily affected. In my opinion both functional and organic forms have a common etiology in defective elimination, the difference between them being one more of degree than of kind. What at first seems to be simply a functional disorder may, if misunderstood, go on to become a definite inflammation. When that occurs, symptoms develop which are not present in the purely functional cases. A well-marked case of retrobulbar neuritis usually occurs suddenly after exposure to cold, and is characterised by pain on movement of the eyes and tenderness when the eyeballs are pressed backwards into their sockets ; the central scotoma is not constant in size and shape ; and the ophthalmoscopic picture is usually characterised by distinct redness and even by more decided inflammatory change in the optic disc. The pupil reacts both to light and in the act of convergence ; but in acute cases, as was pointed out by Marcus Gunn, a very characteristic sign (seen quite readily on careful examination) is that,

although it contracts at once when exposed to a bright light, yet, if the exposure be prolonged the myosis is not maintained, but slowly gives place to full dilatation. The amblyopia is often more pronounced in one eye than in the other, or it may be wholly confined to one eye; and there are often intolerance of light and complaint of aching pain in the circumorbital region. In a typical case of the toxic form, the fairly constant shape of the scotoma, its symmetry, and the similarity of the degree of amblyopia in both eyes point rather to the existence of some lesion of a vascular kind than to structural inflammation. From their anatomical position, the papillo-macular fibres at the optic foramen, where they enter the nerve stem, are those which are most abundantly supplied with blood, on account of the very fine capillary meshwork which surrounds them, and are consequently those that will be most liable to nutritional disorder when any toxic agent exercises an irritating action in their neighbourhood. It is probable, therefore, that in the simpler forms there is only a functional derangement of the macular fibres, while in severe cases anatomical changes in the nerve become superadded. An interstitial neuritis, limited to the fibres of the papillo-macular bundle in their course through the nerve stem from the optic

foramen downwards towards the optic disc, was demonstrated by Samelsohn in 1882, and his observations have been confirmed by Nettleship, Uhthoff, and others.

I am well aware that the clinical picture I have just tried to give is typical of an ordinary case of tobacco or alcohol amblyopia, and, in support of my thesis that these agents are not a direct exciting cause of the visual trouble, but only contribute to it by inducing biochemical changes in the organism, which lead to retention of toxins in the blood, I now cite a case in which the symptoms closely resembled those of tobacco amblyopia, although the patient had never smoked and had never taken alcohol.

A stout florid woman, forty-five years of age, who presented all the characteristics of the sanguine arthritic diathesis, was seen in October, 1902, in consultation with Dr. Gibb, of Paisley. She had in childhood lost the sight of the right eye, which was very highly myopic, and the ophthalmoscope revealed extensive scars of past choroiditis extending from the optic disc outwards beyond the macula, which was completely destroyed. She complained of a blur—of a "something she would like to wipe away"—that came between her and any object she looked at with her left, her only, eye. The ophthalmo-

scope revealed nothing amiss, but she was hypermetropic. When suitable glasses for reading were prescribed, she said that she did not notice the blur, and she read the smallest print. She returned in about a year, however, saying that she had never been able to read with comfort. To begin with, she saw perfectly well, but her eyes soon became tired, and then the words got indistinct owing to the appearance of a mist which, rising up in front of what she was reading, blurred the vision. A weak convex glass was prescribed for distance and a stronger lens given for reading, and again she expressed herself as satisfied, and said she saw quite clearly both for distance and near at hand. In two months she came back complaining that she was worse; and now, for the first time, the visual acuity was found to be diminished, for even when assisted by her spectacles she saw only $\frac{6}{24}$ Snellen in the distance, and No. 4 Jaeger near at hand. Careful examination showed the defect to be in the central area of the field of vision, and from the state of the other eye, it was feared that there might be choroiditis developing in the region of the macula. The ophthalmoscope, however, revealed no signs of disease in the fundus oculi, but the ordinary subjective tests proved that the patient was suffering from well-marked toxic

amblyopia, and repeated examination of the urine revealed lithiasis alternating with oxaluria. The true nature of her condition being recognised, a careful regimen was prescribed, antigouty medicines were ordered, and dark spectacles were given to protect the eyes from glare. Sight soon began to improve, and by the end of March the vision was $\frac{6}{9}$ Snellen and No. 1 Jaeger. She continued to make perfectly satisfactory progress until one bitterly cold day in the following spring, when, while she was walking out, she felt her left eye becoming more and more painful, and when I saw her on the following afternoon I found her suffering from acute gouty iritis. The attack was very severe and painful, and lasted about six weeks. Immediately after the iritis subsided she went off to Matlock and to Buxton. In both places she had treatment, and when, after ten weeks, she came home, there was no trace of iritis, her sight was as keen as ever it had been, and there was no hesitation in recognising red and green in the centre of the field of vision. She was counselled to persevere faithfully with the antigouty regimen, and to take alkalis at times, with an occasional blue pill at bedtime, followed by a saline draught the next morning. The subsequent progress was all that could be desired. There has never been the slightest relapse in the

eye, and when I last examined the patient, in the spring of 1908, the fundus was natural, the field of vision normal, the colour sense perfect, and the visual acuity as keen as ever, although she is naturally now quite dependent on her glasses for clear distance vision, as well as for reading and sewing.

The case presents many points of interest, but the chief are, first, the slow and steady deterioration in sight for nearly two years, followed by rapid improvement whenever the diathesic cause of the trouble was recognised and properly treated; and, second, the confirmation of the diagnosis by the occurrence of an attack of acute gouty iritis during the course of the toxic amblyopia. In this case I do not think there can be any doubt that the same toxins which caused the amblyopia were also responsible for the structural inflammation of the iris. It is easy, therefore, to imagine that similar toxins can just as readily originate inflammation in the optic nerve. A good example of this was the case of a teacher aged twenty-five whom I first saw in June, 1899, in consultation with Dr. James Adam, of Hamilton. He was a tall, thin, bilious-looking man, of somewhat melancholy disposition and pessimistic outlook. He was exceedingly studious, took no exercise, and after school work was over returned home to pore over books. He ate well, but took too

little sleep. About a month before he came to me he noticed that his sight was failing, and the defect in vision increased quickly, so quickly that when I made my examination he could, with the left eye, hardly count fingers held straight in front of him at twelve feet distance, while with the right he could read only the largest letters of Snellen's test types. The defect was wholly confined to the centre of the visual field, and in this region also there was disturbance in the colour sense, especially for red and green. He complained of the predominance of a blue tint in all light objects. There was practically no error in refraction. The ophthalmoscope revealed marked distension and tortuosity of the retinal veins, and hyperæmia and slight blurring of the optic discs. Examination of the urine revealed pronounced oxaluria. Associating the oxaluria with the visual disturbance, and regarding both as the results of defective elimination, a favourable prognosis was given, but progress was very tedious, chiefly owing to the patient's unwillingness to take proper exercise in the open air. About a year after the onset of the symptoms, Dr. Adam wrote that the patient had difficulty in recognising his friends in the street, and that when he came to consult him he stumbled over the chairs in the room. He was moping over his condition, and as his rela-

tives were becoming apprehensive that he was to lose his sight, another medical opinion was obtained. By this time there was pallor of both optic discs, but this was perhaps considerably exaggerated by contrast with the congested state of the whole fundus. The eminent ophthalmic surgeon who was now consulted pronounced the opinion that the patient was suffering from partial atrophy of both optic nerves, and that, although he might possibly preserve the sight he still had, he would certainly never be able to read again. Notwithstanding this, however, finding that the oxaluria was as persistent as ever, I again gave a favourable prognosis, and urged the patient to be more whole-hearted in carrying out the regimen prescribed. My efforts were aided by the unfavourable opinion that the other doctor had given, for this stimulated the patient to do more to help himself, and he now took outdoor exercise vigorously. In July, 1900, he took a sea trip to Shetland, and during the three weeks he remained there his vision improved so much that he was encouraged to carry out a further recommendation to take a voyage to Canada. When he came back from that country at the end of October he had recovered his sight so perfectly that he was able to resume his duties at school. I saw him again two years after this

(in September, 1902) and examined him very carefully, when I found that his vision was $\frac{6}{6}$ with each eye separately and $\frac{6}{4}$ with both together, but he had still slight hesitation in recognising green in the centre of his visual field. Dr. Adam has informed me that the patient has never since had the slightest relapse; and that he has continued regularly at work as a teacher since he resumed his duties in October, 1900. He faithfully carries out the diathesic treatment prescribed for him.

What makes the case of more than usual interest is that in September, 1905, this patient's sister, also a teacher, consulted Dr. Adam and me for a condition of sight in every respect similar to that from which her brother had recovered, except in so far that the ophthalmoscopic evidence of optic neuritis was much more pronounced. With her, too, there was the same disinclination to take proper exercise in the open air, and there was persistent oxaluria alternating with lithiasis; but, profiting by her brother's experience, she early took the advice given her and sought change of scene and lived a life as much as possible in the open air. Her progress was slow but steady, and after a sea voyage she came home quite recovered. She also has never had any relapse.

The prognosis is undoubtedly favourable in all

cases both of toxic amblyopia and of retrobulbar neuritis, which are definitely due to the imperfect elimination of waste products from the blood consequent upon perverted metabolism. The true guide, moreover, is to be found in the examination of the urine, rather than in any signs or symptoms presented by the eyes themselves. Even in the most favourable circumstances the progress is slow, and, except in very mild cases, six or nine months, or even longer, are required before the patient is able to use his eyes for near work. It is the slow progress which disappoints and perturbs both the patients and their relatives, and if the physician be not confident and steadfast, grave trouble may arise. In the case of the teacher mentioned above, the general pallor of the discs, the large size of the central scotomata, and the consequent impairment of vision and its prolonged duration, regarded as eye symptoms *per se*, and considered away from their proper relation o the patient's whole general condition, rendered the diagnosis of " partial atrophy of both optic nerves " the most natural one to arrive at.

As Paget said, however, long ago, " no disease can be properly understood unless it be considered in its whole pathology." Whenever, therefore, a diagnosis of optic atrophy is made without due consideration being given to the cause of the

atrophy, errors in treatment are very apt to arise. Strychnine, phosphorus, and other nervine tonics are of great value in the treatment of certain states, but they are likely to do much more harm than good, unless, prior to their use, the patient's special disease proclivities have been properly recognised and thoroughly treated. If the gout or rheumatism which determined the amblyopia in the first instance be allowed to progress, structural damage will undoubtedly occur in consequence of prolonged irritation. This process of inflammation leads to proliferation of the connective tissue surrounding the optic nerve fibres, which, suffering compression, will undoubtedly, in the end, become atrophied, whenever the new-formed tissue begins to undergo cicatricial contraction. The ophthalmoscopic appearance of the optic disc is not of itself, however, a sure guide in prognosis, for the mere colour of the disc conveys very little information regarding its structural condition. When, therefore, there is an absolute scotoma associated with well-marked pallor of the optic disc the visual field ought to be carefully taken with a perimeter. If any peripheral contraction be discovered a guarded opinion ought always to be given, and the patient ought to be further examined very thoroughly for any signs which might indicate incipient dis-

ease of the spinal cord. Even if such exhaustive investigation prove negative, caution must be exercised until sufficient time has elapsed to permit the efficacy of the treatment employed to be tested, because peripheral contraction of the visual field always indicates structural disease of the nerve, and atrophic changes in the optic disc, once set a-going, are difficult to arrest and very prone to become progressive. As has been said, however, repeated examination of the urine affords the surest guide both in the prognosis and treatment of these doubtful cases. In this connection I would also add that, on several occasions, I have observed, in patients suffering from glycosuria, the rapid onset of central scotoma coincident with the disappearance of the sugar from the urine under the influence of treatment by eucalyptus or by nitrate of uranium. In every case the loss of the power to read was permanent, although no pathological changes in the fundus could be detected on ophthalmoscopic examination. In every case also the patients died within a comparatively short time after the onset of the visual troubles.

In the treatment itself the first step should always be to find out the patient's habits and mode of life. The possibility of any infection such as syphilis must be excluded from the outset,

and the chance of poisoning by quinine, methyl, alcohol, etc., ought not to be forgotten. The use of tobacco and alcohol must be entirely prohibited, because it must ever be borne in mind that the result is determined not so much by the amount smoked, or the quantity of spirits consumed, as by the capability of the patient to resist their injurious influence: where sugar is present in the urine, for example, a very slight exciting cause is sufficient to bring on an attack of amblyopia. A proper regimen must at once, then, be prescribed, and the patient advised how to live the healthiest life possible in whatever circumstances he may be placed. After all, disease, when rightly understood, is only a perversion of natural processes, and prophylaxis is the highest form of therapeutics. The food supplied must be of proper quality and in sufficient quantity to satisfy the needs of the individual patient. If, however, the nutritive value of the blood is to be maintained at normal, it is imperative that all waste products be removed at the earliest possible moment, and to this end Nature has made provision in the bowel, the liver, the kidneys, the skin, and the lungs. The constant and free activity of these channels of excretion is essential to health, and if, by reason of illness, the function of one be temporarily inter-

rupted the others are always ready to undertake vicarious duty. A very short clinical experience will, however, prove that the full functional activity of any one, for example the skin, is, in certain circumstances, of more value than the combined activities of all the others. I have already referred to the value of a mercurial purge followed by alkaline saline draughts in the early stages of disease of the uveal tract, and have now to point out the great benefit to be derived from free diaphoresis and bracing air in toxic amblyopia and retrobulbar neuritis. In the treatment of these diseases the influence of soil and of climate is of paramount importance. A high altitude, a gravelly soil, and dry bracing air are sure to be helpful, whereas a low-lying locality, with a clay soil and a moist relaxing atmosphere, are equally certain to hinder progress and encourage relapse.

The following case will illustrate what I mean. A lady, twenty-five years of age, consulted me in April, 1895, on account of gradual failure in sight which had been going on for about two years. She was found to be suffering from a mild attack of neuritis, evidently of retrobulbar origin. Her distant vision was barely $\frac{6}{9}$, and she complained that, when she looked at a printed page, a letter, or even a small word, was apt to disappear, and that, in consequence, she had difficulty

both in ordinary reading and with music. She stated also that the failure in sight had been much worse since an attack of scarlet fever eighteen months before I first saw her. She looked pale, suffered from amenorrhœa, and complained of rheumatic pains in her joints and muscles. The defect in vision was due to a small central scotoma, and in the same region of the field she was unable to recognise blue and yellow, although she had no hesitation about red or green—a peculiarity of which I can offer no explanation. The examination of the urine revealed a copious deposit of urates, which she said was persistent. Under treatment she steadily improved, so much so that by the end of three months the visual acuity was normal, and by the end of a year colour perception was almost perfect, the power of distinguishing blue having been the last to return. She continued to improve in every way up to the time of a visit to the Continent with some friends. The place to which they went was sheltered and close, and, with the hot weather they experienced, the atmosphere was so stuffy and relaxing that she was in a bath of perspiration all the time and always quite unfit for any exertion. Almost at once she observed that her sight was again beginning to fail, and the deterioration progressed steadily, till, when she

returned home at the end of a month, the visual acuity of both eyes was reduced to $\frac{6}{24}$, and the presence of crystals of oxalate of lime in the urine afforded further evidence of perverted metabolism. Treatment was at once begun, but, although she showed slight improvement, sight was never brought back to the normal. Very soon after, she was unavoidably compelled to change her residence to a damp low-lying town on a dense clay soil, and ever since that time, in spite of every effort to prevent it, she has become slowly but steadily worse. There are now undoubtedly present all the signs and symptoms of gradual atrophic changes in both optic nerves. The oxaluria persists, but there is nothing suggestive of incipient sclerosis of the spinal cord.

Many of these patients do well at a spa, but they should, when they go, be provided with an introduction to one of the resident physicians, in order that their case may be viewed in its right perspective, and treatment prescribed accordingly. The dose of the waters and the general regimen must be adjusted to meet the requirements of each individual. One of the advantages of a watering-place, which ought never to be undervalued, is that it generally provides the patient with a restful holiday and freedom from worry,

and in consequence does as much as medicine to promote his comfort and improve his general well-being.

Copious draughts of hot water taken at regular intervals throughout the day flush out the kidneys and sometimes determine what may be called a urinary crisis, so that the blood is relieved of much of its toxicity ; and it is noteworthy, as Dr. Wright Thomson, following Bouchard, has demonstrated, that the urine of patients suffering from tobacco amblyopia is, when injected into the blood of a rabbit, much more poisonous after this increased diuresis, than it is before it. Alkalis and alkaline salines are always beneficial, and their efficacy is greatly increased by free dilution. Diaphoretics also play a distinct part in the treatment, and a Turkish bath regularly once or twice a week rarely fails to do good. The bowels must be carefully attended to, as constipation is always a fresh exciting cause of the trouble. If necessary, a mild laxative should be given every night at bedtime ; and an occasional blue pill, followed next morning by a hot draught of alkaline purgative water, is most helpful in promoting assimilation and in clearing waste products out of the system. Systematic exercise in the open air is essential, and its results are invaluable, the great aim being to make sure that

there is just sufficient expenditure of physical energy to properly balance the amount of food eaten. Exhaustion will thus be avoided on the one hand, and defective excretion on the other. The eyes ought not to be used for near work, and the dazzling in bright light is much relieved by the wearing of dark glasses.

In acute cases, leeches or blisters on the temple or the mastoid are indicated; but local therapeutics, unless in exceptional circumstances, play but a small part in the treatment either of toxic amblyopia or of retrobulbar neuritis. Reliance must be placed entirely on general treatment, wisely planned and patiently carried out.

When the state of the urine shows, on examination, that assimilation is beginning to improve, the iodides may be given, either alone or combined in a mixture with nux vomica; and strychnine, phosphorus, and arsenic may then also be administered with advantage, and their use continued intermittently for many weeks. If the patient be anæmic some preparation of iron may be given cautiously after meals. Electricity in the form of galvanism or high-frequency currents, hydrotherapy, and Swedish gymnastics may all be employed to aid in completing a cure.

The great value of a sea voyage is strikingly illustrated in two of the cases I have cited. Sea

air has undoubtedly a powerful influence in quickening metabolism; but, before the patient is allowed to embark on any prolonged cruise, careful inquiry should always be made as to whether he is likely to be affected by sea-sickness: protracted *mal-de-mer* is sure to be harmful.

CHAPTER IX

GLAUCOMA

GLAUCOMA is characterised by increased tension of the eyeball, a physical sign which has been frequently referred to in the description of inflammation of the uveal tract. There, it was shown that the hypertension was due either to an abnormally viscous condition of the ocular fluids or to some form of posterior synechia, there being in either case a hindrance to the free excretion of fluids through the filtration spaces at the corneo-iridic angle. While the affection is, therefore, in these circumstances, secondary to the disease already present in the eye, it becomes, as soon as it has declared itself, the predominant and most serious feature of the case, and treatment must be at once modified so as to check the fresh complication and to restore, if possible, the normal tension of the globe.

Hypertension occurs, however, also in eyes in which, as far as can be discovered, there was no pre-existing disease. It is then spoken of as

primary, and it is in connection with the primary form that we now proceed to consider the influence of diathesis. Even here still the disease is not to be looked on as a morbid entity, but as a symptom-complex; and its true nature will be all the better understood if one thinks of its acute manifestations as analogous to an attack of angina pectoris. Its occurrence depends not only upon the size and minute structure of the eyeball, but also upon the age, race, and general health of the patient. The small eye of the hypermetrope, for example, is much more liable to be attacked than the larger one of the myope; and so, also, specially, are eyes which are malformed, as for instance those in which the iris is congenitally absent. Both eyes are usually affected, but, as a rule, not simultaneously, for months, perhaps years, may elapse before the second is attacked; and it may be stated generally that the more acute the disease in the one first involved, the shorter will be the interval before the other suffers. On the other hand, if the disease in the first eye be non-congestive, the longer is the second eye likely to escape.

With regard to age, glaucoma is a disease of senility, rarely met with in persons under forty years of age, but often seen in those over sixty. It attacks women more frequently than men, and

this extra liability of females, more particularly to the congestive forms of the disease, is in many cases intimately connected with the cessation of the menses. Certain races, too, such as the Egyptians and the Jews, seem to have a special predisposition, and Englishmen suffer in greater numbers than Scotsmen. This racial proclivity being in great part dependent on heredity and consanguinity, those in whom it is present, or those even who have a strong family tendency, are apt to be affected at an abnormally early age. One of the most striking examples of hereditary predisposition that has occurred in my own practice was a woman of only twenty-seven years of age, both of whose eyes had been attacked by acute hypertension. I had previously operated on her mother (in whom the first symptoms had appeared when she was thirty-four years of age); and her grandmother, uncle, and four cousins, all on the maternal side, had suffered from the same disease, every one of them except the uncle having been blind for years.

Patients frequently attribute the onset of glaucomatous symptoms to some injury, but there is rarely any sure ground for this assumption. In such cases the eye must be regarded as predisposed to attack, for in most of them the injury has been very trivial—so slight, indeed, as

to have been forgotten till recalled to mind by the failing sight. Though anything that depresses and disturbs the action of the heart predisposes to glaucoma, and an attack may in many instances be clearly traced to some mental distress or moral shock; to the injurious influences of cold or of hunger; or to fatigue, the result of worry or of sleeplessness; and while there may be associated anæmia, lithiasis, bronchitis, constipation, or the suppression of some habitual discharge; yet the most important underlying conditions from an etiological point of view are certain constitutional states, more particularly the rheumatic and the gouty diathesis. It has already been shown that in the vascular changes so frequent in patients of arthritic disposition the ocular bloodvessels do not escape. In eyes predisposed to glaucoma there is probably always an abnormal rigidity of the walls of these vessels, and consequently alterations in the intra-ocular circulation will take place all the more readily. A familiar example is seen in the glaucomatous attack which occasionally occurs after atropine or other mydriatic has been instilled into the eye of an elderly person. No matter what may have been the determining cause, however, as soon as there is disturbance in the equilibrium between the processes of secretion and excretion within the

eyeball, there is at once a rise in the intra-ocular pressure, and this increase of tension is the essence of the disease : as Priestley Smith puts it, " there is an excess of pressure within the eye, plus the causes and consequences of that excess." The first and most important symptom, therefore, is increase of tension, and from it arise all the other phenomena which go to make up a picture of primary glaucoma. Many instruments have been devised for estimating the amount of the intra-ocular pressure ; but in practice the most satisfactory guide is the educated finger of the surgeon, and there is always a standard of comparison in the sound eye of the patient, where only one is affected, or in the practitioner's own eye.

Once glaucoma has become thoroughly established, there is not much difficulty in its diagnosis. The stages most apt to be overlooked are the early ones ; and, as successful treatment depends for the most part upon early recognition, it is essential that a clear and accurate conception be formed of the symptoms of which a patient whose eyes are about to become glaucomatous will complain.

The symptoms in the premonitory stage, whether of long or short duration, are transient, and are thus, unfortunately, liable to be disregarded. As one who was suffering from a severe

attack of congestive glaucoma, and in whom the premonitory symptoms, lasting over a period of two years, had been very characteristic, said to me, "I thought nothing of them, as they just passed away." That being so, it is all the more necessary that the medical attendant should be quick to appreciate, and appraise at their proper value, remarks regarding eyesight, seemingly trivial, but often in reality of the gravest significance, made by a patient in a casual manner. In particular, suspicion should always arise (1) if a patient states that he every now and then suffers from temporary obscuration of vision—that he seems for the time being to see everything through a fog—even although when tested by the ordinary methods the visual acuity is found to be quite up to normal; (2) if a patient who requires to use spectacles says he has had to change them frequently, and is found to be using glasses much more powerful than ought to be necessary at his age; (3) if he sees coloured rings round a gas or candle flame—an appearance which must be familiar to all who have driven in a cab on a frosty night and looked at the street lamps through the steamy windows. Usually while these symptoms last the patient complains of dull pain in the eyes and forehead, and he may be conscious that both his central and peripheral

vision are defective; but it is only when his medical attendant chances to see him during an attack that any objective signs of glaucoma can be detected. It is then found that the eyeballs are harder than normal, and that the cornea is more or less cloudy. There may be slight dilatation of the pupil, but as a rule there is no diminution in its response to the stimulus of light, and the iris presents a normal appearance. There may, or may not, be some slight pericorneal injection and overfulness of the episcleral veins. The proper tests will show that the extent of the visual field is contracted, and the limitation will be most marked on the nasal side.

In incipient glaucoma Bjerrum's sign will, if sought for with care, be almost invariably found. It may be detected before the development of any symptoms indicating impairment of the functional activity of the eye, and may then be regarded as belonging to the prodromal stage of the disease. It consists of a characteristically shaped relative scotoma, which can always be traced to the blind spot. For its demonstration it is necessary to have a screen of black velvet suspended vertically opposite a window, and a white test object of ivory or cardboard mounted on a long slender black rod. The test objects employed are very much smaller than those used with

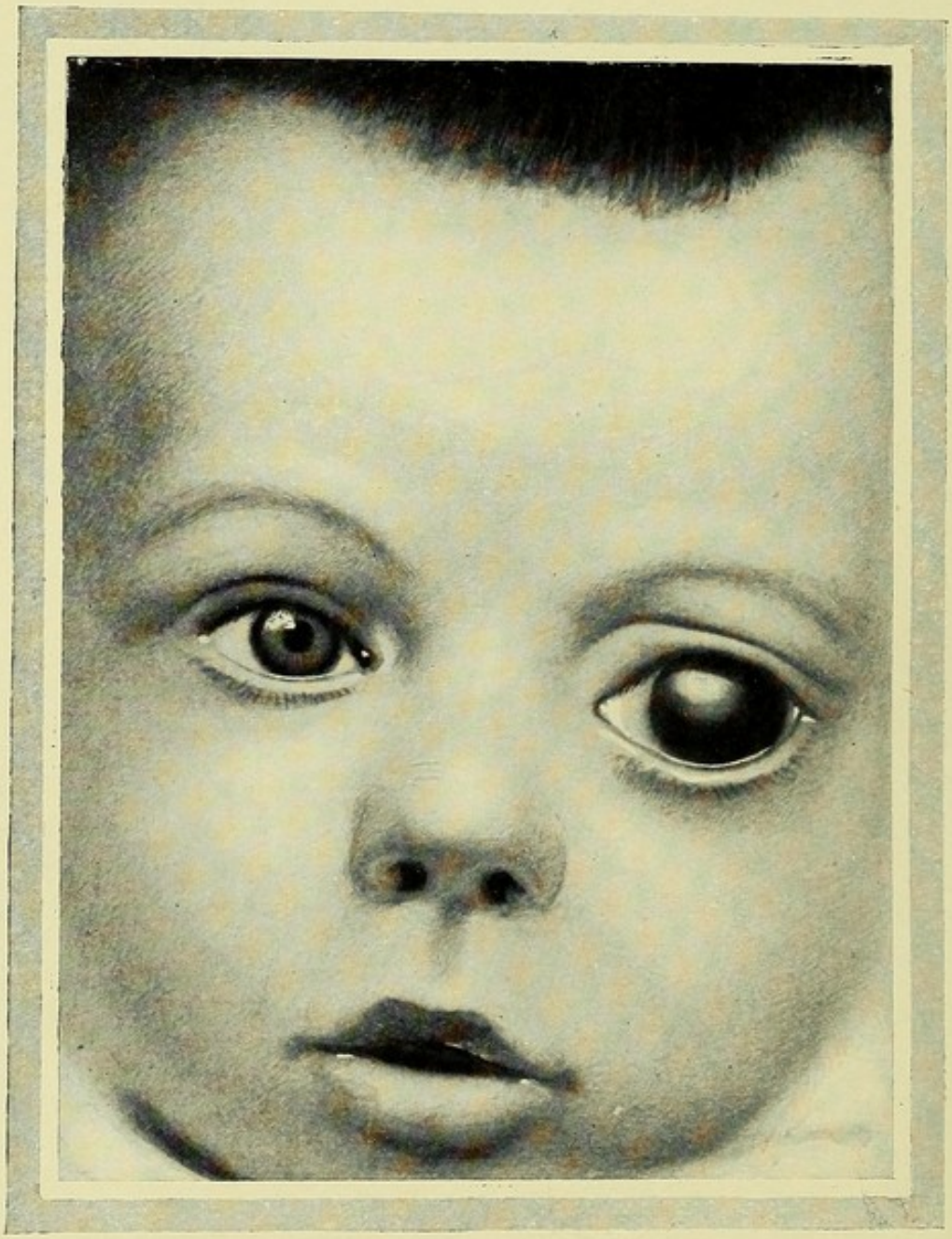
the perimeter, and in practice a disc three millimetres in diameter will be found the most convenient, the patient being placed six feet in front of the screen. The test is most delicate, for not only does it show the presence of glaucoma in eyes in which the central visual acuity and the peripheral field of vision are normal, but, as Sinclair has pointed out, since the area of relative defect can always be traced to the blind spot, it at once distinguishes glaucoma from atrophy of the optic nerve. In the latter, though Bjerrum's method also reveals the existence of a relative scotoma, this is invariably separated from the blind spot. Ophthalmoscopic examination will disclose congestion, and perhaps increased tortuosity, of the retinal veins ; and pulsation in the retinal arteries, if not present, can always be produced by slight pressure upon the eyeball. Attacks such as these, in the intervals of which the eye is to all appearance healthy, may vary in duration from a few minutes to several hours ; but the periods between them get gradually shorter, until at length the condition of the eye is one of permanently increased tension with the changes consequent upon it, and glaucoma is then thoroughly developed.

It is characteristic of many cases that this increase of tension is intermittent ; but whenever

it has existed for any length of time a number of changes follow in its train.

1. *Alterations in the Cornea and Sclerotic.*—Sudden increase in the intra-ocular pressure is shown by a diffuse cloudiness of the cornea, most marked towards the centre, and specially distinguished by the fact that it passes off almost immediately after the excessive tension has been relieved. To this appearance must be attributed the occurrence of the iridescent vision. It is due to œdema, and as the anatomical seat of the fluid which causes this is in the nerve channels in Bowman's membrane, the corneal nerves get pressed upon and paralysed; a condition which explains the more or less anæsthetic condition of the cornea found in nearly every case. Owing to its rigidity, the sclerotic in the adult is not much influenced by pressure, except at its weakest part —the lamina cribrosa—or in old cases of absolute glaucoma where it occasionally happens that staphylomatous projections form at any part where the sclera has been weakened by injury, and in the equatorial region of the ball. When, as the result of intra-uterine disease, or after ophthalmia neonatorum or other inflammatory affection occurring during the first years of life, there is an increase in the intra-ocular tension, the tissues of the eyeball yield very readily, and the globe

Plate IX.



BUPHTHALMOS, OR INFANTILE GLAUCOMA.

Reproduced from Plate XXXVIII. in the Author's "Atlas of External Diseases of the Eye."

To face page 135.

may become enormously distended. From the large bulging cornea—in some cases clear, in others opaque—this form has received the special name of buphthalmos, or ox-eye : in reality it is simply the glaucomatous process occurring in very early life.

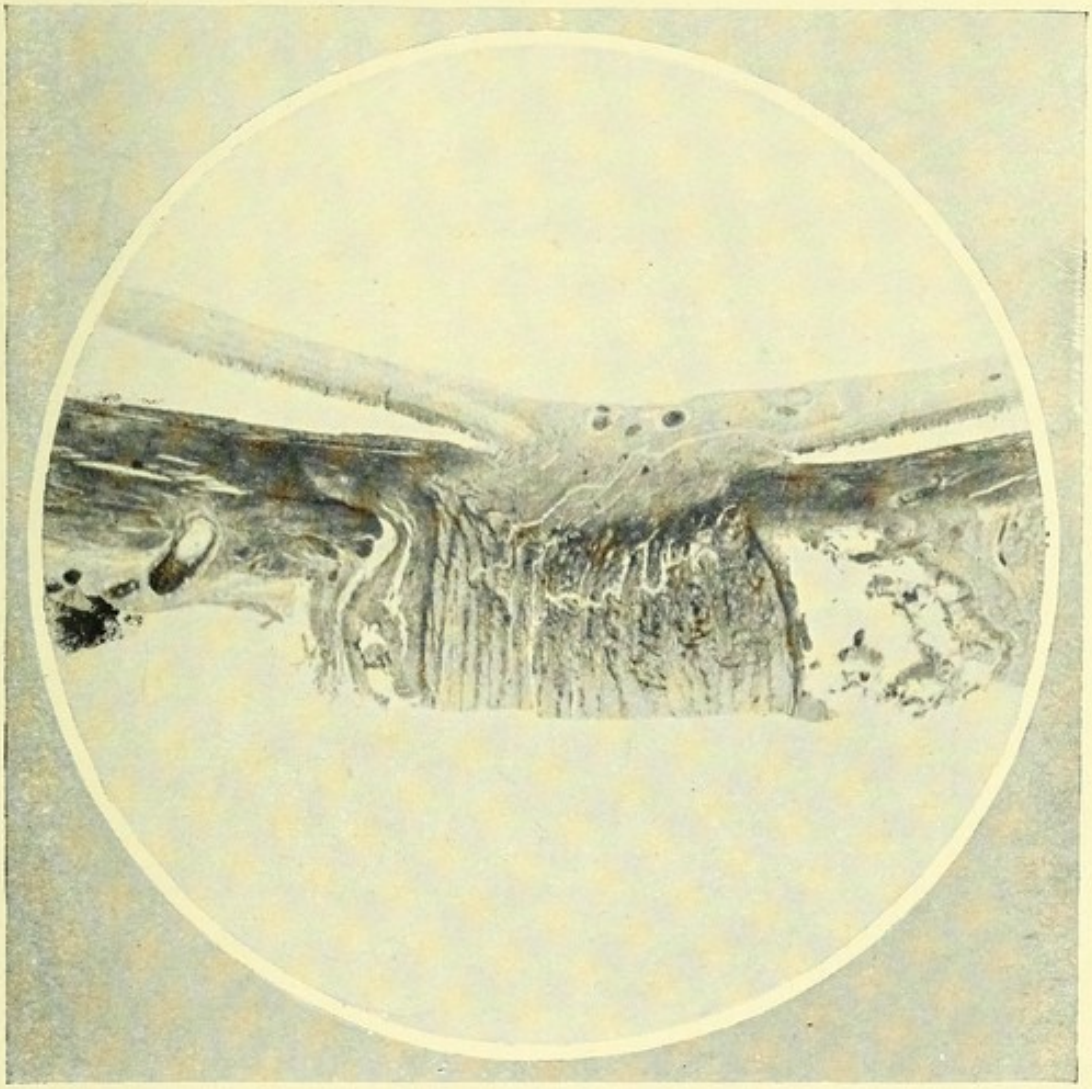
2. *Alteration in the Uveal Tract.*—Sudden congestion of the choroidal and ciliary bloodvessels leads to excess of pressure in the vitreous, with the result that the lens and iris are pushed forward at the expense of the depth of the anterior chamber. The bloodvessels on the outside of the eyeball become dilated and tortuous, and the conjunctiva may become œdematous ; while in very acute cases serous effusion may form between the choroid and retina, and lead to rapid extinction of vision. In advanced cases the choroid may become thinned (the atrophy being usually most marked at the posterior pole of the eye), and this thinning shows itself on ophthalmoscopic examination as a whitish-yellow ring surrounding the optic disc. The increased pressure of the distended ciliary processes upon the base of the iris leads to constriction of its bloodvessels, and the pupil becomes dilated ; and if the pressure be more pronounced at one part of the iris circle than at another, the dilatation is unequal, and the pupil tends to assume an oval form. In the

earlier stages at least there is no real paralysis of the sphincter of the iris, for the pupil will contract with eserin and dilate with atropine; but after the increased pressure has been long maintained the iris fibres lose their elasticity and begin to atrophy. The ciliary muscle is early affected in a similar manner, and its enfeeblement gives rise to the progressive failure in the power of accommodation, which is one of the most suggestive of the premonitory warnings of the onset of glaucoma. Of course, direct pressure upon the ciliary nerves will also tend to intensify the muscular paresis, while irritation of the branches of the fifth nerve affords an explanation of the neuralgic pain which is an invariable accompaniment of the congestive forms of the disease.

3. *Changes in the Transparent Media.*—The aqueous tends to become muddy, and the lens and the vitreous to lose their perfect transparency, and these changes, together with the opacity of the cornea, serve to explain the peculiar greyish-green reflex observed in the dilated pupil of a glaucomatous eye which, being to the ancients the most striking feature of the disease, gave rise to the name.

4. *Changes in the Retina and Optic Nerve.*—The retinal circulation is naturally disturbed, because, as a result of the increased pressure, the

Plate X.



NORMAL OPTIC NERVE ENTRANCE.

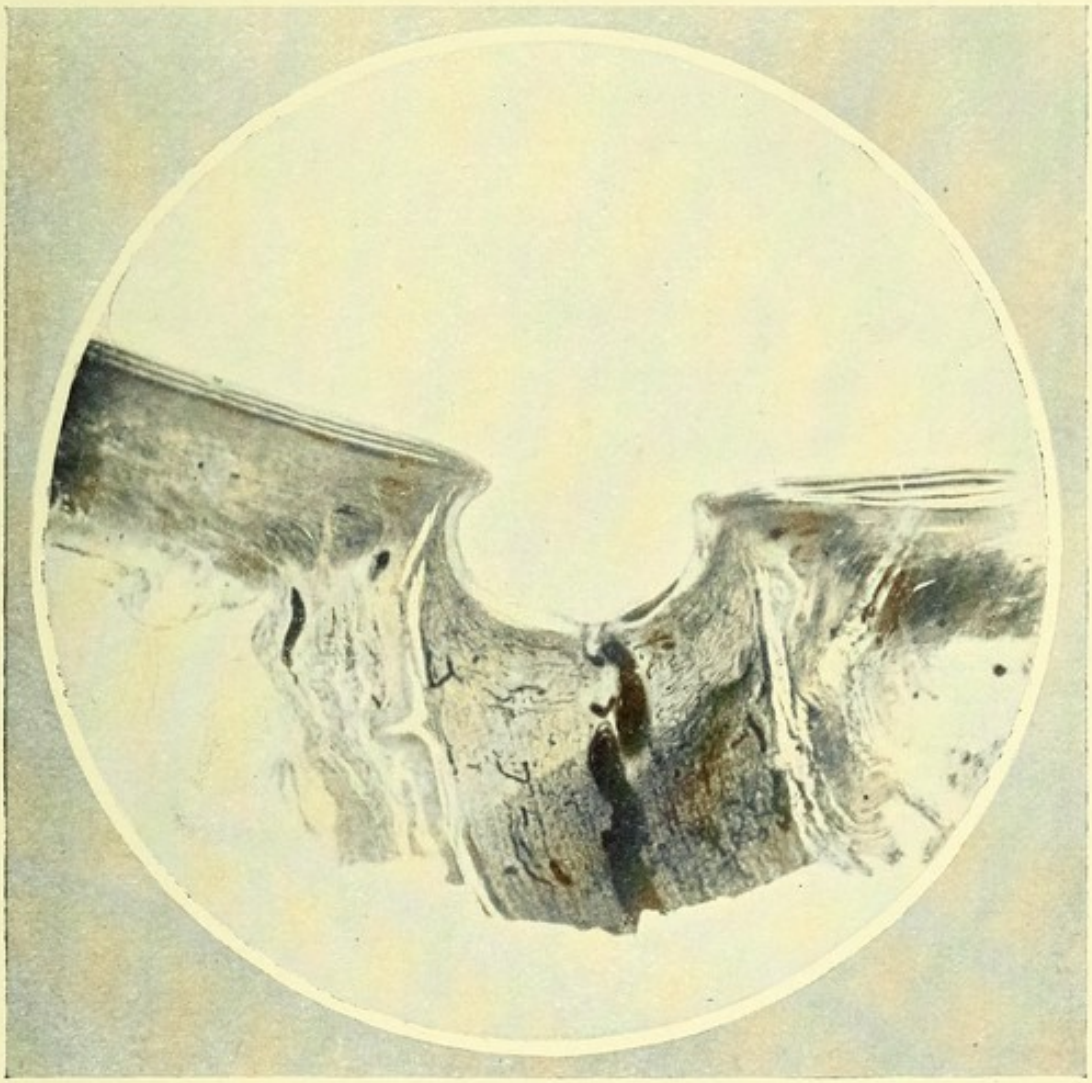
To face page 136.

arteries are incompletely filled and the retinal veins congested; indeed, when advanced degenerative changes have taken place in the walls of the bloodvessels, hæmorrhages are not uncommon. On ophthalmoscopic examination, both the arteries and the veins, as they pass over the optic disc, are seen to pulsate, and, as pulsation in the arteries never occurs in a healthy eye, its recognition is of great diagnostic value. The increased pressure leads also to changes of a very characteristic kind in the optic nerve and retina. Brailey has demonstrated that the first change in the optic disc, resulting from the increased pressure, is a backward displacement of the lamina cribrosa, and as this carries along with it the optic nerve fibres, excavation of the surface of the disc begins, and is readily revealed by the ophthalmoscope. As the disease progresses, and the increased tension is maintained, the lamina cribrosa recedes farther and farther, and the deeper and deeper excavation of the disc can, if the case be kept under observation, be easily measured.

A glaucomatous cup requires time for its formation, and is only developed after a considerable period of increased tension, consequently it is not seen after a single acute congestive attack, unless there has been a prolonged

premonitory stage. When fully formed, it presents certain appearances which may be regarded as pathognomonic. It involves the whole disc, and is surrounded by steep, overhanging margins, while its floor has a greyish, stippled look, due to the lamina cribrosa. As the retinal vessels are pushed backward along with the nerve fibres, they are abruptly bent at the margin of the disc, and get under cover of the overhanging edges until they reach the floor of the cup, pressed against which they lie until they again disappear into the vascular canal of the optic nerve. The arteries are usually somewhat reduced in calibre, but the veins are always congested. The bending of the nerve fibres over the margin of the cup, and the pressure to which they are subjected, sooner or later tell on their nutrition, and atrophy sets in. When this commences, the colour of the disc is altered, and, coincidently, sight begins to fail—the failure depending not so much on the actual depth of the cup as upon the stage of atrophy of the nerve fibres, the amount of this being indicated by the degree of the pallor. Observation of the pallor, and of the calibre of the retinal vessels, is, therefore, of the highest prognostic importance. A pale, or, what is worse, a bluish or greenish-white nerve, with small arteries and distended veins, has a much more serious

Plate XI.



GLAUCOMATOUS CUPPING OF OPTIC DISC.

To face page 138.

significance than a deeper cup of a more natural colour.

Along with defects in the visual acuity there is always associated a restriction of the visual field. At first this is confined for the most part to the nasal portion, but after the disease has made considerable progress it involves the temporal region also, and steadily increases till vision is totally lost. It is interesting here to note that colour vision, which disappears so early in primary atrophy of the optic nerve, is retained in glaucoma until a comparatively late period, and consequently, in a doubtful case, the results of the examination of the colour-sense may be of very considerable value.

Once established and allowed to run its course unchecked by treatment, the natural tendency of the disease is to take on one of the forms about to be described, and sooner or later to produce complete loss of vision. Even after absolute blindness has set in, degenerative changes proceed. Subjective sensations of light may continue to torment the patient and encourage a delusive hope that sight may yet be restored; or attacks of pain may again and again recur, until consent is given to the removal of the eyeball. These degenerative changes affect the cornea in a very striking manner. Its surface may become opaque,

with the epithelium here and there raised in blisters; or it may become completely necrosed and separate as a slough. The iris is atrophied and forms a narrow rim round its ciliary attachment, the lens is cataractous, and there are staphylomatous projections from the sclera, most frequently in the equatorial region of the globe. Finally the tension inclines to diminish, and complete atrophy of the eyeball takes place; and then, but not till then, will the patient be free from pain and discomfort.

In connection with the pathology of glaucoma there are many points still undecided; but in a clinical work such as this it is not possible to deal with these, except in so far as may be necessary to make the principles of treatment clear. Those who wish to pursue the subject further I would refer to the admirable discussion on the experimental and clinical facts to be found in the third volume of Parson's "Pathology of the Eye." The tension of the eyeball is kept normal by the maintenance of a constant relation between the inflow and the outflow of the ocular fluids. In health, increase of the inflow is at once compensated by increase of the outflow; but whenever this ceases to be so, the internal pressure becomes too great for the distensibility of the walls of the eye, and glaucoma occurs. Increase of tension,

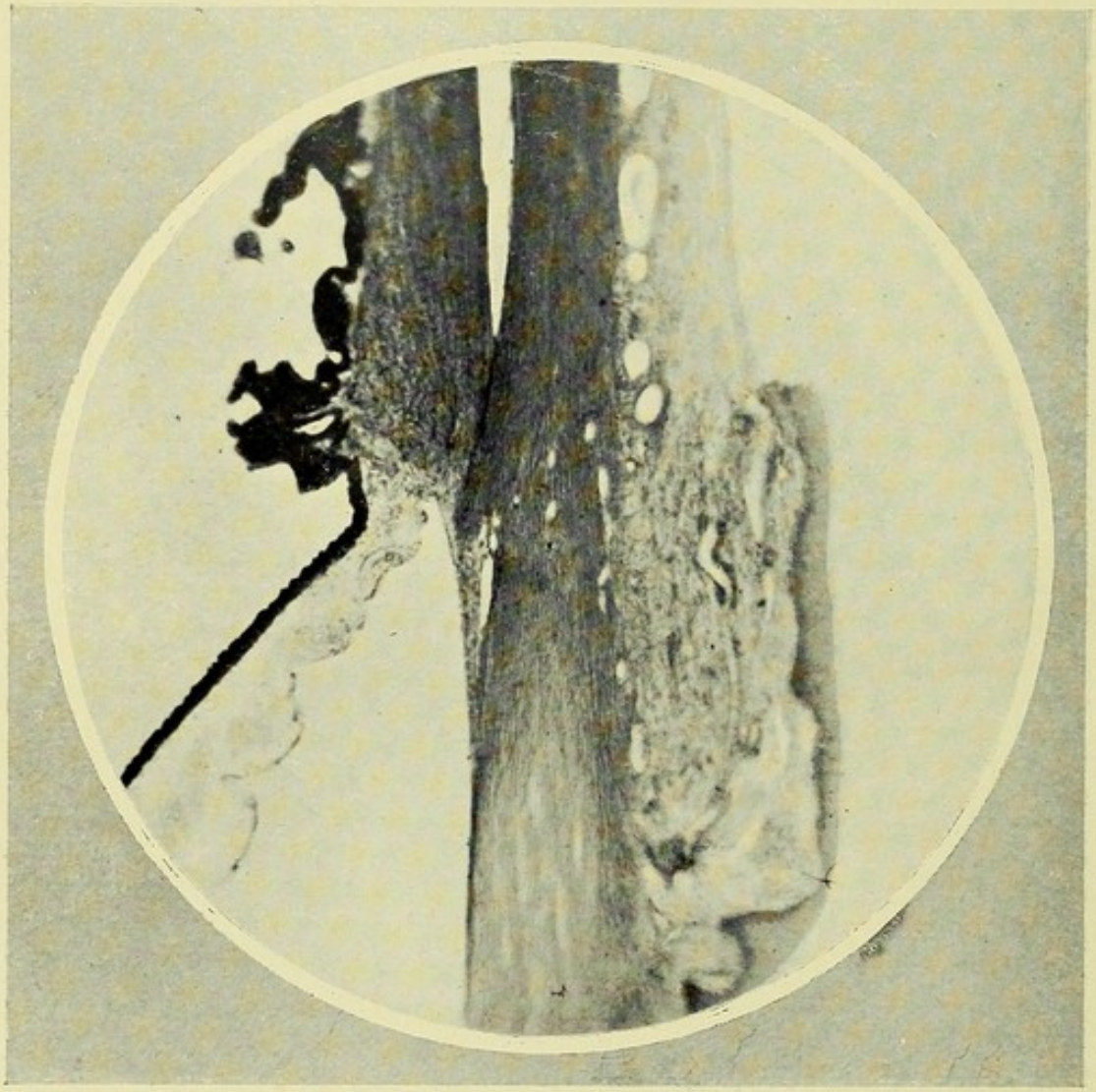
therefore, is brought about by disturbance of the equilibrium between the secretion and excretion of the ocular fluids—if one may still use the term secretion in this connection, seeing that recent observations favour rather the view that the aqueous is a transudation from the ciliary vessels and depends on the amount of blood-pressure in the arteries. Examination of eyes that have been enucleated for secondary glaucoma shows that, in nearly every case, the corneo-iridic angle and the filtration spaces are closed, through the adhesion of the base of the iris to the posterior surface of the sclerotic and the cornea, and hence the fluids produced by the ciliary body, instead of circulating through the pupil into the anterior chamber, and then passing out of the eye through the spaces of Fontana and the canal of Schlemm, are retained within the eyeball, the tension of which is thus increased. It is true that in irido-cyclitis glaucomatous symptoms may supervene, although the corneo-iridic angle remains wide and open ; but in this disease the character of the secretions themselves is changed, and Brailey has demonstrated that, as a result, the spaces become blocked, and hence the filtration function is lowered. It has also been proved experimentally that the injection of oil into the anterior chamber will produce an attack of glaucoma, because the

oily fluid closes up the filtration spaces, and from this fact Priestley Smith and others have argued that, in certain inflammatory affections, we have to deal not only with an increase in the amount of fluid, but also with an abnormal fluid, which, owing to its highly albuminous nature, obstructs the excretory channels. The study of cases of secondary glaucoma leads, therefore, to the conclusion that the increased tension is caused by the retention of fluids within the eyeball due to hindrance of their outflow.

It has, indeed, been objected to the retention theory that glaucoma has occurred in eyes from which the lens had been removed, and in others in which the iris was absent. Treacher Collins has, however, set such difficulties aside by demonstrating that, in cases of glaucoma following cataract extraction, there was faulty technique, and the corneo-iridic angle was blocked by the entanglement of the capsule, the iris, or the hyaloid, in the wound; while in cases where the iris seemed to be absent he has proved that there was merely an arrest of development, whereby that structure, instead of appearing externally, remained as a rudimentary stump, which, having become adherent to the periphery of the cornea, had closed the filtration spaces.

Most of the old theories as to the causes of

Plate XII.



NORMAL CORNEO-IRIDIC ANGLE. × 30.

To face page 143.

primary glaucoma were, however, based upon hypersecretion as opposed to retention. Mackenzie and von Graefe, starting with this idea, attributed the increased secretion to serous choroiditis, while Donders thought it was due to irritation of the choroidal nerves—a neurosis of secretion. This last theory has been revived in a modified way by Abadie, who, as the result of experiment, concludes that simple glaucoma is due to irritation of the cervical sympathetic nerves. The chief objection to the hypersecretion idea is that when the existing channels are in good working order, any increase in the inflow of fluids is very soon counterbalanced by an increased outflow, and so the natural tension is maintained. Knies and Weber advanced a retention theory for primary glaucoma, similar to that just described in connection with secondary glaucoma, and the general consensus of opinion now favours their idea.

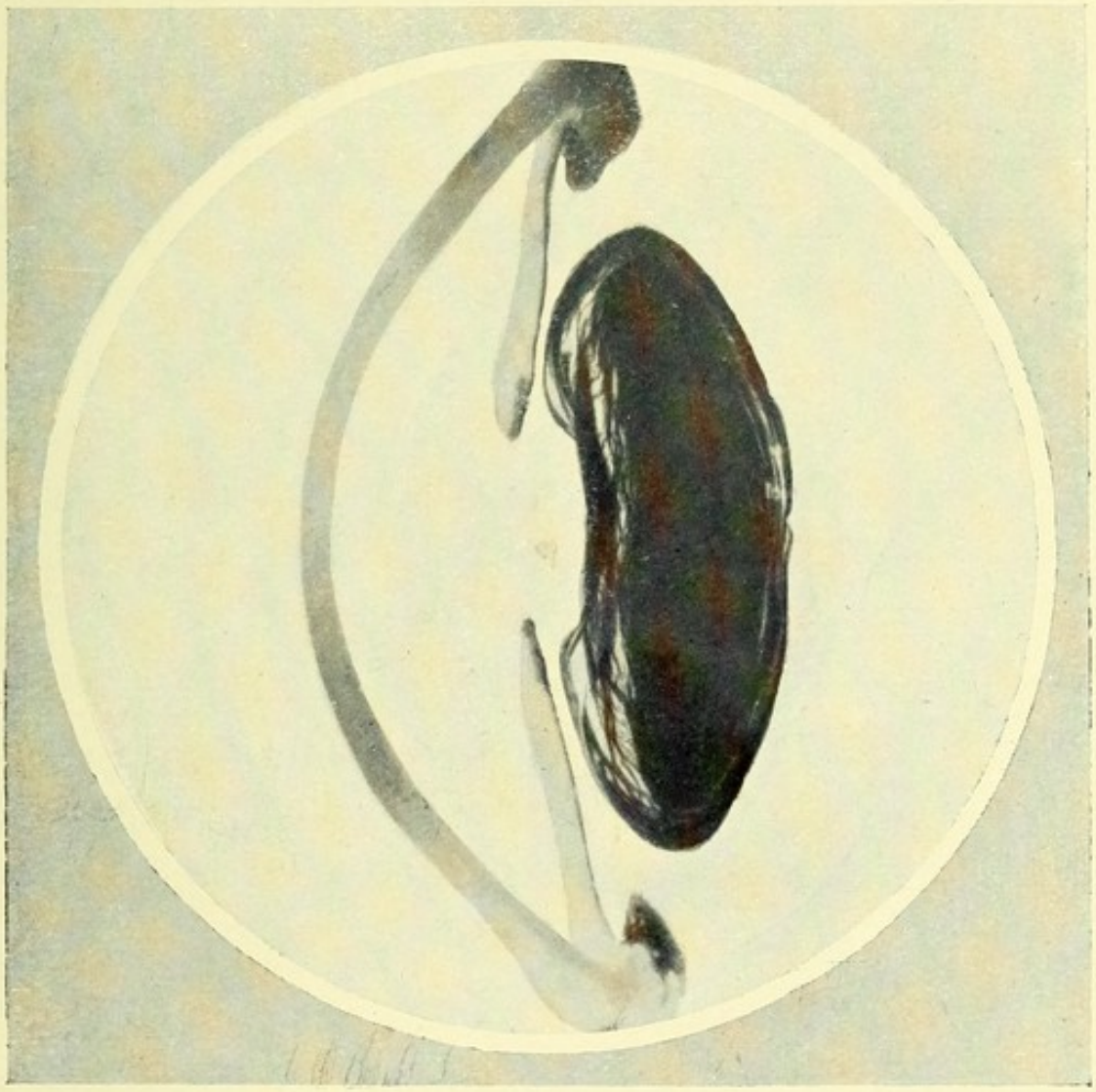
Some authors speak of an anterior and a posterior glaucoma, the former including those cases in which the external or congestive signs are well marked, and the latter those which present no congestive symptoms, but in which there is excavation of the optic disc. The bond of connection between such diverse examples lies in the increase of tension, and many cases occur

which mark intermediate stages between the one group and the other.

Granted the increase of tension, there is no difficulty in explaining all the symptoms met with in a clinical picture of glaucoma, and, given the blocking of the filtration spaces, either anterior or posterior, it is easy to account for the increase of tension ; but the real difficulty lies in finding a satisfactory explanation of the initial changes that lead up to those gross pathological lesions. Eyes in the early stages are, of course, not available for pathological investigation : when examination becomes possible the stage is advanced and the glaucoma absolute, and then naturally many of the lesions must be looked on as consequences rather than initial causes. In few diseases is the love of hypothesis more clearly displayed, and a theory quite satisfactory to one set of observers is just the opposite to another, probably because none perfectly explains the clinical picture of every case.

In explanation of the initial causes of glaucoma Priestley Smith has shown that the lens continues to grow up to the end of life, while the size of the eyeball, after a certain age, remains stationary. This being so, there must, with advancing years, be a corresponding diminution in the space round the lens ; and as glaucomatous eyes are, according

Plate XIII.



FRONT OF NORMAL EYEBALL TO SHOW THE CIRCUMLENTAL SPACE. ×6.

To face page 144.

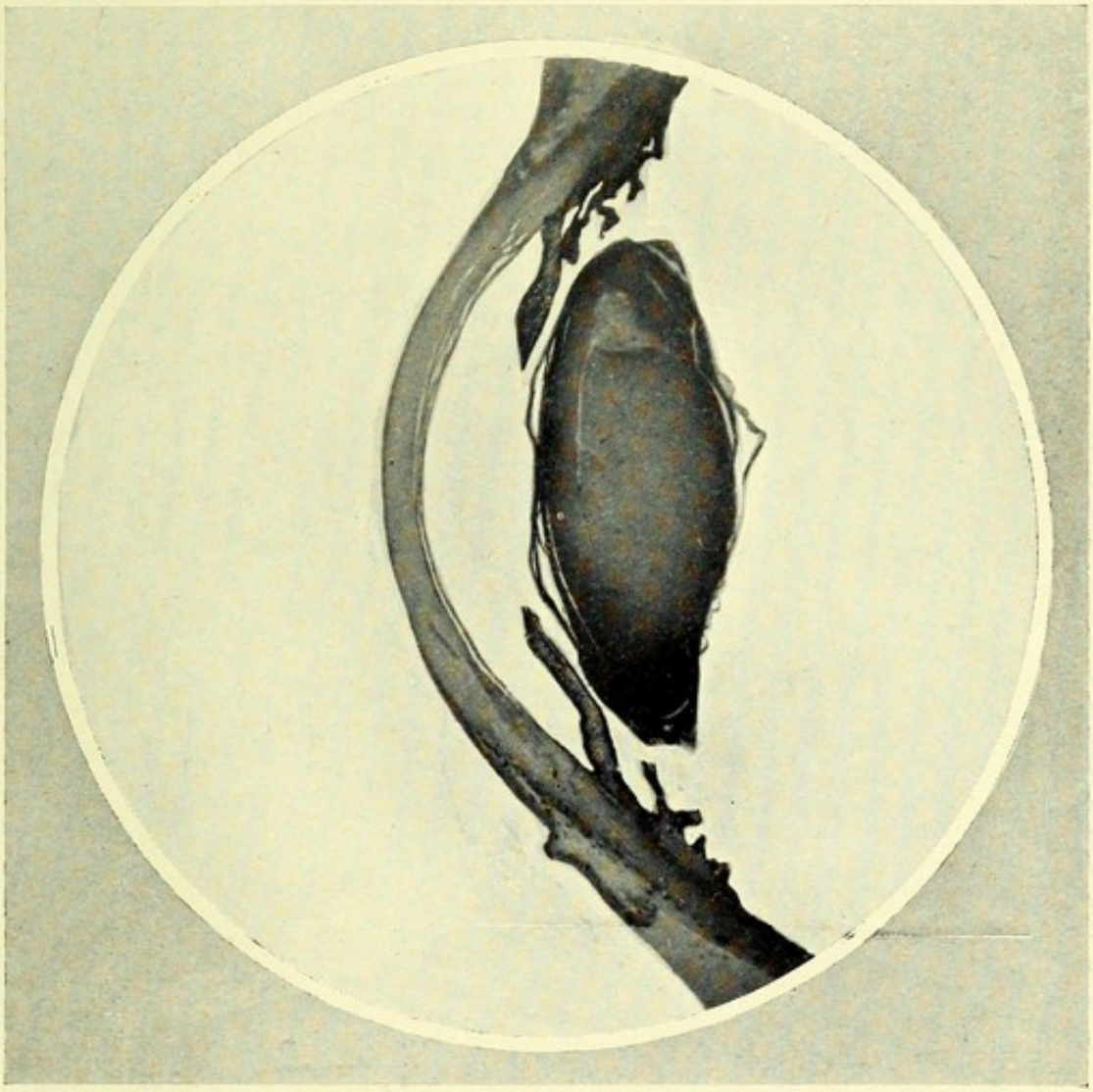
to the same authority, smaller than normal, this disproportion must, in course of time, become all the more marked. After a certain point, therefore, the lens becomes too large for the globe, and the slightest congestion of the ciliary processes will obliterate the circumlental space altogether. When this happens, the lens is pushed forward by the increased pressure in the vitreous chamber, the base of the iris becomes closely adherent to the posterior surface of the cornea, and the filtration spaces at the corneo-iridic angle are so pressed upon that their excretory function ceases. With the retention of the fluids, symptoms of glaucoma begin, and as long as these channels remain closed, the disease will continue to progress.

There are, however, other predisposing factors that require consideration. For example: (1) glaucomatous eyes are usually hypermetropic, and, when the circular fibres of the ciliary muscle are hypertrophied, a still further narrowing of the circumlental space must occur; (2) there is a gradual sclerosis of the pectinate ligament incident to advancing years, and Henderson in his recent papers on the pathogenesis of glaucoma attributes to this physiological process a preponderating rôle in the etiology of the disease; (3) as part of the general loss of elasticity in the tissues, so characteristic of old age, the sclerotic becomes

more rigid, and therefore will not yield, to the normal extent, at the time of increased tension ; (4) the arteries, from the same cause, lose their natural elasticity, and degenerative changes take place in their walls ; their length is in consequence increased, and the size of the ciliary body augmented, with the result that the circumlental space is again encroached upon. Considering, indeed, how closely glaucoma is allied to diseases such as gout, rheumatism, and probably syphilis (in all of which vascular changes are of frequent occurrence), and considering that the primary form almost invariably attacks both eyes, it would seem as if the root of the evil were to be traced to increased coagulability of the blood and to degeneration of bloodvessels reaching its maximum in the hæmorrhagic types of the disease. In the study of individual cases, however, there is often great lack of proper pathological evidence, and the numerous gaps necessarily give rise to much conjecture ; but if the conditions observed in the eye can be brought into line with what is known of general pathological processes the problem as a whole becomes simplified.

Primary glaucoma occurs only in eyes predisposed to attack, and, given the predisposition, everything, as Laqueur says, that "dilates the pupil or debilitates the patient" may precipitate

Plate XIV.



FRONT OF EYEBALL TO SHOW THE NARROW CIRCUMLENTAL SPACE IN A GLAUCOMATOUS EYE. ×6.

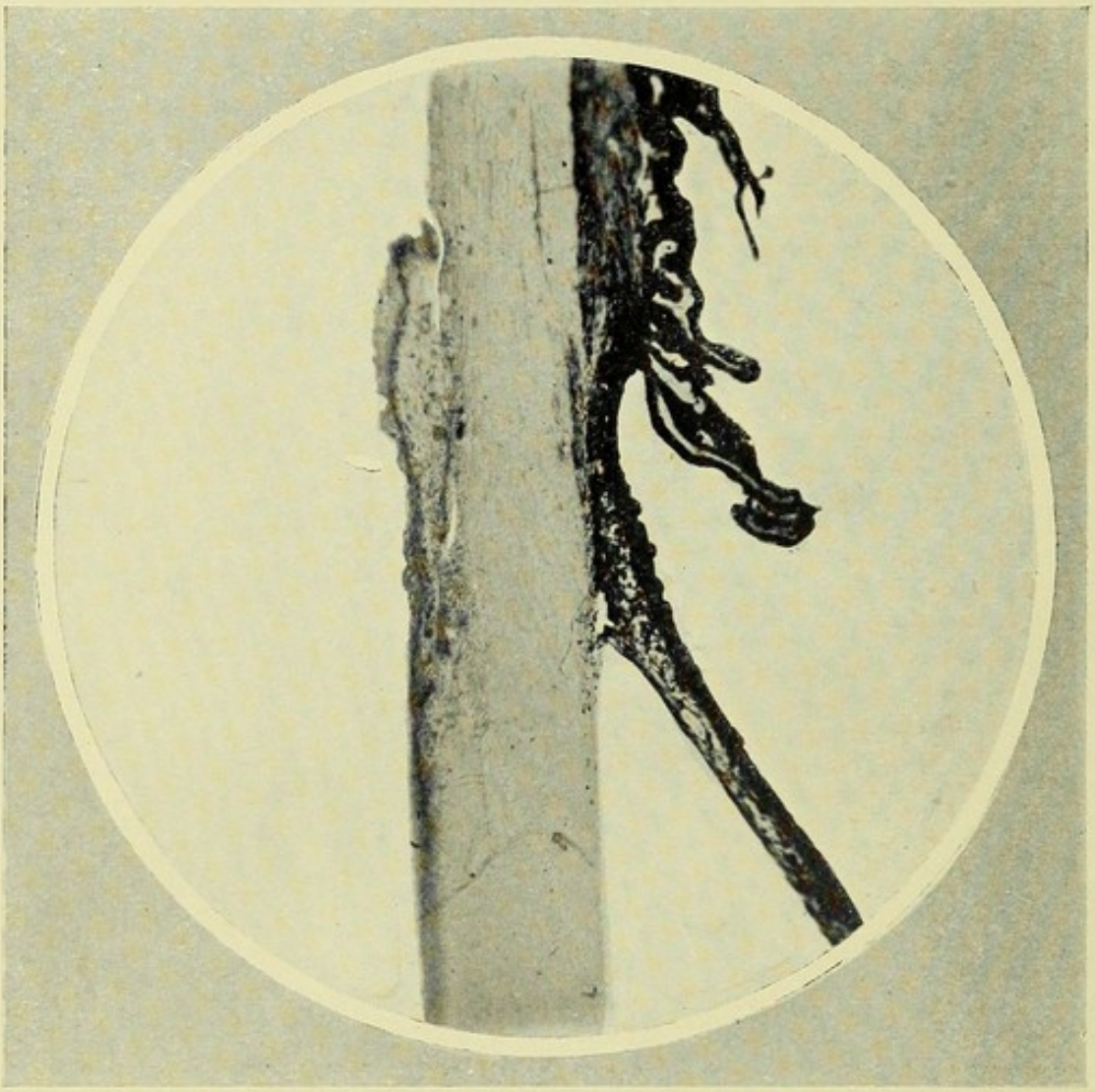
Compare with Plate XIII.

To face page 146.

a seizure. While the arthritic diathesis with its attendant arterio-sclerosis is the constitutional state which most frequently underlies the local manifestations of increased intra-ocular tension, the great variety in the clinical types of the disease makes it very difficult to formulate a working hypothesis which will include the whole pathology of glaucoma. At first sight it seems impossible to offer an explanation which will cover both the simple and the acute types, but if simple chronic glaucoma be recognised as the typical form of the disease, and all the congestive changes characteristic of the acute and subacute varieties be regarded as complications, the difficulties lessen considerably. In every case, whether it be simple or acute, the lens is too large for the eyeball, and the type assumed by the disease will be mainly determined by the manner in which the circumlental space is encroached upon. If obstruction be brought about gradually by an insidious process of sclerosis, degenerative changes occur slowly, uninterrupted by any great or sudden increase of intra-ocular tension. In the acute forms, on the other hand, something occurs which at a given moment completely upsets the equilibrium between secretion and excretion, with the result that hypertension occurs rapidly and is accompanied by all the signs and symptoms

of acute inflammation. True inflammation, however, occurs in no form of glaucoma. The phenomena are similar to those seen in thrombosis of bloodvessels, the sudden blocking of the vascular supply being indicated by acute pain, and followed by congestion, œdema, and infiltration of the tissues. There is both clinical and pathological evidence in support of the supposition that it is thrombosis, more or less extensive, that disturbs the normal balance between the inflow and the outflow of the ocular fluids. Some cases, which are preceded by thrombosis of the retinal vessels visible on ophthalmoscopic examination, are so well recognised clinically that they have received the name of hæmorrhagic glaucoma, and are regarded as a distinct type of the disease. Dr. George Coats, moreover, has demonstrated microscopically the presence of thrombosis of the central vein of the retina in eyes in which the diagnosis was made by the ophthalmoscope, and in which enucleation was necessary owing to loss of sight and severe suffering consequent upon the occurrence of acute glaucoma. Every case of thrombosis of the central vein of the retina, however, is not followed by destructive hypertension, but Coats has also demonstrated that, as a result of thrombosis, the fluids of the vitreous and of the aqueous become more albuminious than normal,

Plate XV.



TO SHOW THE BLOCKING OF THE CORNEO-IRIDIC ANGLE IN GLAUCOMA. × 30.

Compare with Plate XII.

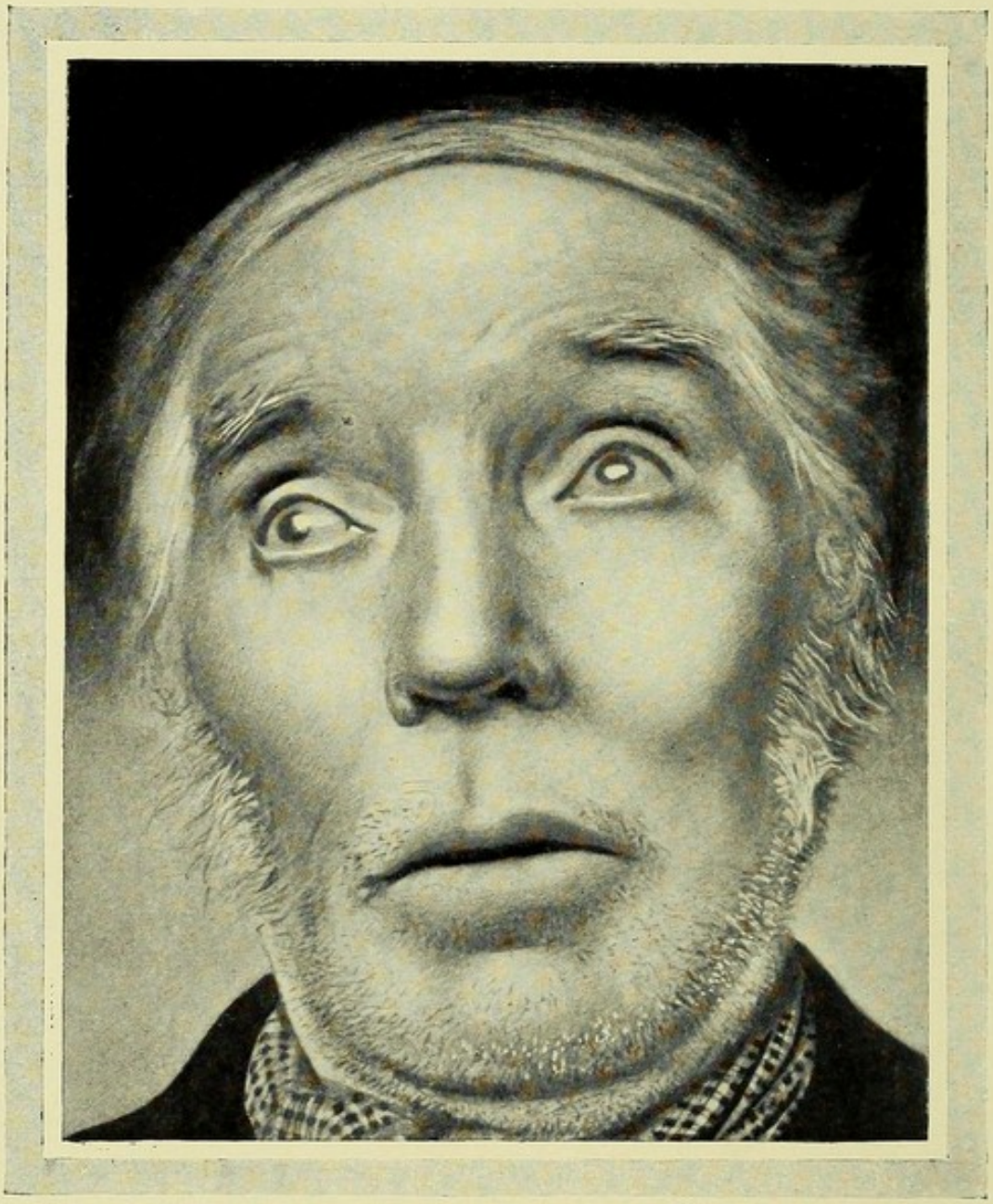
To face page 149.

and thus his observations are brought into line with the interesting experimental researches of Uribe Y Troncoso. The latter has demonstrated that albuminous fluids filter with great difficulty through the spaces at the corneo-iridic angle, and consequently are retained within the eye, whose tension gradually becomes increased. In consequence of this abnormal pressure, the circulation of the blood in the venæ vorticosæ, and in the veins of the retina, is hindered, transudation occurs, and œdema of the vitreous supervenes, with the result that the iris is pressed forward, and its base, coming in contact with the posterior surface of the cornea, obliterates the filtration angle. The adhesion is at first slight and does not involve the extreme periphery of the iris, but, if the hypertension be maintained, the root of the iris becomes firmly glued to the posterior surface of the cornea, and the spaces of Fontana and the canal of Schlemm are permanently blocked.

Thrombosis may occur as a result of disease of the bloodvessel walls, or in consequence of the circulation of toxins in the blood-stream, either or both of which conditions may readily arise in those who suffer from glaucoma. Coagulation of the blood within the vessels is favoured still further by anything that tends to produce stasis

in the veins, and, as has already been said, the onset of an acute glaucomatous seizure is usually precipitated by such emotions as grief, temper, or fear, especially in circumstances which depress the action of the heart. The occurrence of thrombosis cannot always be determined by means of the ophthalmoscope, for, granted that the conditions are favourable, there are no reasons why the formation of thrombus should be limited to the veins of the retina. Coagulation of blood is even more likely to take place in the vessels of the choroid, and, occurring there, to give rise to the same alteration in the ocular fluids as Coats has shown occurs after thrombosis of the central vein of the retina. If, then, this alteration in the composition of the ocular fluids due to thrombosis be the cause of acute glaucoma, the extent of the coagulation of the blood within the vessels offers a ready explanation of the varying severity of the attacks—how some are slight and pass off quickly, while others are so serious that sight is permanently lost within a few hours. To recapitulate, glaucoma, either in its simple or in its acute congestive forms, can occur only in eyes mechanically predisposed to the disease owing to narrowing of the circumlental space. In chronic simple glaucoma there is slow and gradual degeneration, and the disease may be regarded as an

Plate XVI.



PHYSIOGNOMY IN SIMPLE CHRONIC GLAUCOMA.

Reproduced from Plate XXXVI. in the Author's "Atlas of External Diseases of the Eye."

To face page 151.

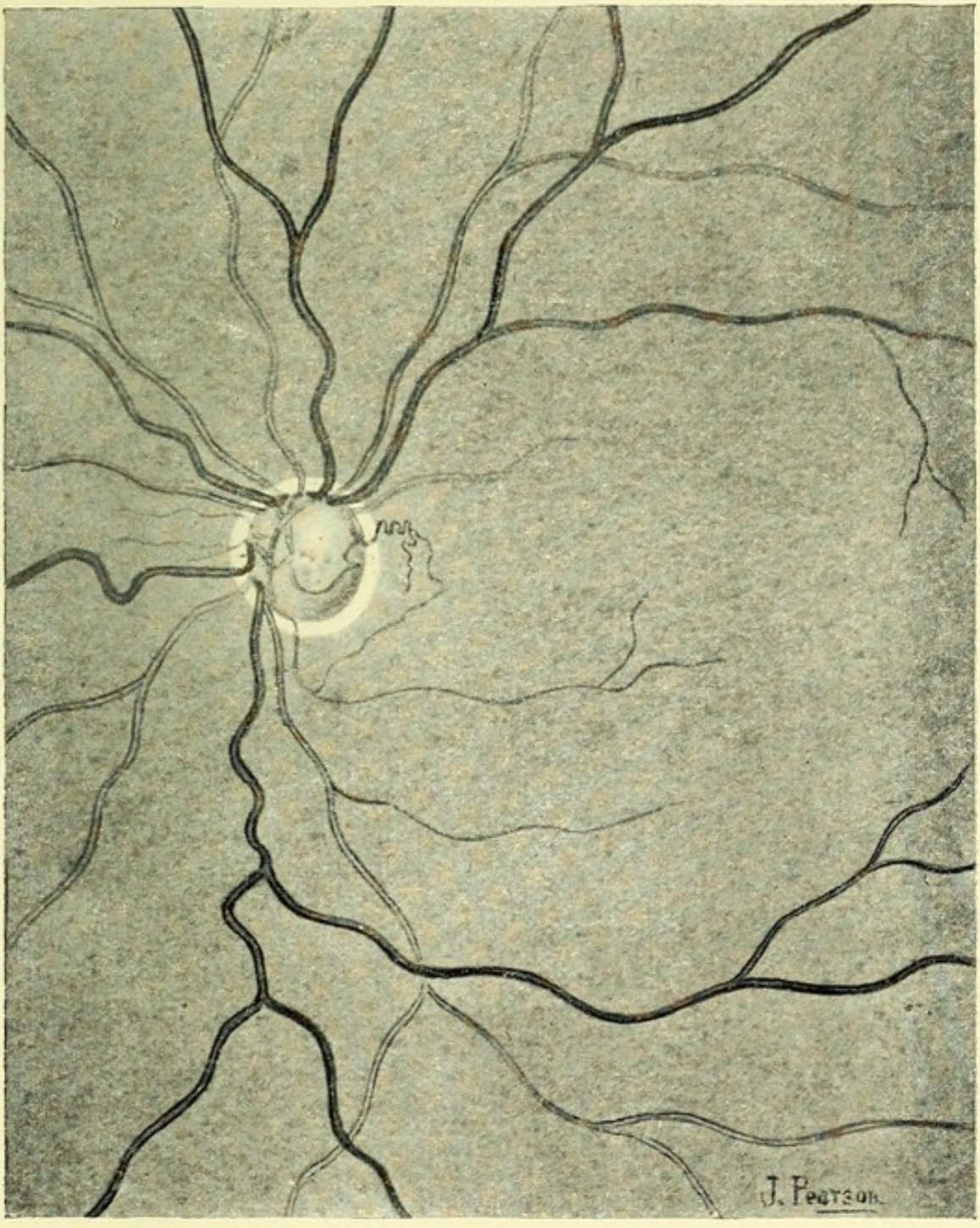
incident in general arterio-sclerosis. The acute congestive forms are probably always associated with thrombosis of the choroidal or retinal veins, and the severity of the attack will be proportionate to the extent of the thrombosis. It is convenient to divide all cases of primary glaucoma into the non-congestive and the congestive types, although it must be remembered that congestive complications may occur in any case of the disease.

1. *Non-congestive Type, or Simple Chronic Glaucoma.*—The three pathognomonic features in this type are moderate and intermittent increase of tension, excavation of the optic disc, and diminished visual acuity. The patients are usually over sixty years of age and consult the doctor on account of failing sight, and as they enter the room present, in advanced cases, a very characteristic physiognomy. They rarely complain of pain, but careful inquiry will elicit a history of some or all of the prodromal symptoms already mentioned. Frequently the vision of one eye is very defective, but, owing to the absence of any active discomfort, the patient has paid little heed to this, and has become alarmed only after the other eye began to fail. The better eye may present a healthy appearance, and the visual acuity may be normal; but, on testing,

the field of vision will be found restricted, especially on the nasal side and below, and examination by the ophthalmoscope will reveal characteristic cupping of the optic disc. If no pulsation of the retinal artery be visible, it will be induced at once by slight pressure on the globe. There may be increase in the intra-ocular tension, but very rarely indeed is the eyeball more than "tight" or "firm," and it is almost never of "stony hardness." In the eye in which the disease is more advanced, in addition to the symptoms just described, there will be some injection of the episcleral veins, a lessening of the sensitiveness of the cornea, and dilatation of the pupil, which presents a greenish reflex.

It sometimes happens that this greyish-green reflex is mistaken for senile cataract, and such an error in diagnosis is fraught with the most disastrous consequences. I can recall many men and women who came from remote country districts to have their eyes operated on for cataract. They had been gradually losing sight for a number of years, but the family doctor had told them that as they were suffering from cataract, nothing could meantime be done, and no operation was possible till they had become blind. They accordingly waited till, in one eye the loss of vision was complete, and in the other there was not sufficient

Plate XVII.



OPHTHALMOSCOPIC APPEARANCE OF CUPPING OF THE OPTIC DISC.

From a case of advanced chronic glaucoma.

To face page 152.

sight left to enable them to find their way about. The diagnosis had been entirely mistaken. An examination showed that the lenses were perfectly transparent, but that the optic nerves were deeply excavated; while their greenish-white colour told at once how much they were atrophied. Operation was of no avail—the disease was simple chronic glaucoma, which had been allowed to run its course until the vision was all but totally lost, and there was not the slightest hope of recovery. Until the ophthalmoscope is more generally used, such mistakes will continue to be made, though these are just the very cases which Mackenzie distinguished so carefully. They present no striking external symptoms, the pupillary reflex is well marked, and the tension is very variable, and probably at no time very high, so that, unless the ophthalmoscope be employed, accurate diagnosis is impossible.

Simple glaucoma may also be mistaken for atrophy of the optic nerve; von Graefe himself classed such cases under the title "Amaurosis accompanied by excavation of the optic papilla." The pathological distinction between glaucomatous excavation and cupping of the optic disc from atrophy pure and simple lies in the fact, already mentioned, that in the former there is backward displacement of the lamina cribrosa,

while in the latter that structure retains its normal position. As seen by the ophthalmoscope, also, the bloodvessels in the atrophic condition can be traced from the margin to the bottom of the cup, while in the glaucomatous they are hidden under the steep overhanging edges. In the former there is also no increase of tension, no pulsation of the retinal arteries, and an early implication of the colour sense.

Würdemann has recently recommended transillumination as a "valuable corroborative method of examination." He employs the transilluminator devised by himself and applies it "to the sclera at the outer canthus after application of two per cent. alypin or five per cent. cocaine solution, although the light may be passed through the lids for superficial examination. The pupil is thereby lighted up, and if the eye be looked at obliquely the ciliary body on the opposite side will appear as a dark ring, and the circumlental space as a clear ring at the root of the iris between the rounded margin of the lens and the ciliary processes. This is usually from five to six millimetres wide. If the lens diameter be increased, or if it be farther forward than normal, or if the ciliary processes be thickened by congestion, this space is encroached upon and may be obliterated." My own experience in the use of this method of

diagnosis is not yet sufficiently extensive to permit me to do more than draw attention to it, but it seems to offer a way of determining during life what is the approximate size of the circumlental space, the condition of which is, as has been said so often, the chief predisposing cause of glaucoma.

2. *Congestive Type, or Acute Glaucoma.*—The slow insidious progress of simple glaucoma is in vivid contrast to the rapid and striking outburst of the acute form of the disease. It is true that as a rule premonitory symptoms more or less pronounced have for a longer or shorter time been intermittently present, but these unfortunately have in most cases been disregarded, so that the seizure appears to come suddenly and without warning.

The patient may have gone to bed apparently quite well, but is awakened in the early hours of the morning by very severe pain in the forehead and in one eye. Almost immediately after the onset the eyeball becomes acutely inflamed, and feels as if it were too large for the socket ; the eyelids are œdematous ; there is profuse lachrymation ; and the sight of the eye rapidly becomes dim. The pain, accompanied by feverishness and persistent retching and vomiting, increases, and radiates with agonising severity along the branches of the fifth nerve. In some cases the second eye

is attacked a few hours after the first, and the patient's condition becomes critical in the extreme.

The danger is that the pronounced symptoms so common as accompaniments of an ordinary bilious attack may deceive the doctor, who has probably been called in haste; and the patient himself may add to the misapprehension, for he naturally connects the pain in the head with the vomiting and attributes the failure of sight to the biliousness. Almost invariably the eyes, if both unfortunately be attacked, are of stony hardness. There are extreme congestion and œdema of the ocular conjunctiva; the pupil is dilated, oval shaped, and irresponsive to light; and the anterior chamber is shallow. The cornea shows a smoky cloudiness, and in many cases is so insensitive that it can be touched with a feather without the patient being aware of the fact. The media are so hazy that the fundus cannot be illuminated by the ophthalmoscope, but unless there has been a prolonged period of pronounced premonitory symptoms the optic disc is not excavated after a single attack. The practitioner must be on his guard not to misinterpret the significance of this form of ocular inflammation, for to do so is fatal. The dilated pupil and shallow anterior chamber, associated with the stony hardness of the eyeballs,

are unmistakably characteristic, and ought to prevent glaucoma from ever being mistaken for iritis. Unfortunately, however, while that is so, such a mistake is far too common, and as the treatment for the one is exactly the opposite of that for the other, the error is a very serious one. Atropine is instilled, with the result that the symptoms are aggravated, and the patient's chances of recovering sight are materially lessened.

The severity of the symptoms varies in different cases. In the large proportion the acute symptoms pass off after a few days, but with the visual function sensibly diminished. The eye is always liable to future attacks, and after each the visual field is more and more contracted, and the optic disc becomes not only more deeply excavated, but also progressively atrophied from the recurrent hypertension, until at length sight is reduced to a bare perception of light. The most acute cases are described as fulminating, and in them glaucoma is seen in its most tragic form, its onset, course, and termination being the incidents of a few hours : after a single attack appearing with overwhelming suddenness vision is totally and irrevocably lost.

Intra-ocular hæmorrhage is not infrequently an accompaniment of glaucoma. In certain cases—which, according to de Wecker, form about

two per cent. of the whole—hæmorrhage constitutes such a marked feature that they have been grouped in a class by themselves. Hæmorrhagic glaucoma is, however, simply a local manifestation of a general state, and the following case very well illustrates the salient features of the condition.

A man, of forty-three years of age, was sent by his medical attendant to consult me on account of sudden loss of vision in his right eye. He told me that three days before, while sitting in his office writing, he suddenly became sick and giddy, and felt as if something had passed over his eyes. For a moment he could not make out what had happened, but after he had recovered from the giddiness, he tested each eye separately, and found that the right one was blind. There was, and had been, no pain in the eye, which to external appearance was quite normal, and the tension of the globe was not increased. Testing brought out that at the periphery of the visual field he could only make out large objects very imperfectly, and when he looked straight before him he could see nothing at all. Ophthalmoscopic examination showed the media to be quite clear, but there was a very pronounced hæmorrhagic retinitis. The optic disc was swollen and very indistinct in its outline, and hæmorrhagic blotches were seen in the retina and scattered all over the fundus, but

most abundantly round the optic nerve and the region of the macula. There was marked accentuation of the second sound over the aortic cartilage, but no valvular murmur could be detected. The apex beat was in normal position, and the area of cardiac dulness was not increased. The patient, however, complained of breathlessness on exertion, and as his father had died of apoplexy at the age of forty-six, he was naturally very apprehensive as to his condition. His urine was loaded with lithates, but contained neither sugar nor albumen. Kept in bed, and placed under treatment, he made at first all the progress that could be desired; his general condition was markedly improved by the rest; the eye remained quiet; the perception of light became stronger, and the retinal hæmorrhages were beginning to be absorbed; but, at the end of six weeks, suddenly and without any apparent cause, the eye became acutely painful, the ocular conjunctiva deeply injected, and the tension greatly increased. The fundus could not be illuminated by the ophthalmoscope, and perception of light completely disappeared. The suffering, in spite of treatment, was almost continuous, and relief was not obtained until the eyeball was enucleated. The left eye was quite normal, and during the remaining four years of the patient's life kept free from disease.

All experience goes to prove that primary glaucoma, whether in its non-congestive or congestive forms, when left to itself, invariably ends in complete blindness, and formerly the disease was looked upon as absolutely incurable. The aim of all treatment is to diminish the increased tension of the eyeball, and our therapeutic measures are divided into medical and surgical.

Medical resources are either general or local, and in every case are only palliative. They may delay, but it is doubtful if they ever prevent, the steadily progressive downward trend of the disease. At the best they are merely tentative, and although the long natural history of a case of chronic glaucoma prevents one from estimating accurately how much good they do, and how much they really prolong the course of the disease, yet it may safely be said that no case was ever cured by their means alone. Whenever a patient complains of symptoms significant of the prodromal stage of glaucoma, means ought to be taken at once to prevent the development of an attack. He must be warned of the gravity of the condition, but the information must be conveyed to him in such a way as not to produce any unnecessary alarm. He should be encouraged to believe that by taking proper care he can do much for himself to prevent the onset of a genuine

glaucomatous seizure. His habits and mode of life ought to be ascertained, and he must be cautioned against keeping late hours and warned to avoid excesses of every kind. Copious repasts of rich food accompanied by overindulgence in spirituous liquors are always injurious, and the excitements incident to the gaming-table are especially harmful. Business worries, domestic cares, an outburst of passionate rage, the depression occasioned by grief, or the exhaustion produced by want or overexertion, have, as has already been said, been rightly held responsible for the onset of many an acute attack, consequently the patient must be counselled to live as far as possible free from all exciting or depressing emotions. He ought to lead an active outdoor life, and attend with care to his digestion and the regular action of his bowels. The urine ought to be carefully and repeatedly examined, and any abnormal constitutional state rectified as far as possible. Alkalis, alternated with piperazine, salicylate of soda, iodides, and bromides, should be prescribed methodically and for a prolonged period, in accordance with the indications presented by the individual patient; and if there be a history of syphilis, hereditary or acquired, antispecific remedies ought always to be given. When the pulse is soft and the heart

feeble, there is no doubt of the value of strophanthus in doses of from eight to ten minims of the tincture frequently repeated, as advised by Zimmerman. The refraction also must be accurately estimated, and suitable spectacles prescribed. When an attack is impending, a brisk purge of calomel, followed in three hours by a saline draught, ought to be prescribed, and the instillation of myotics into the conjunctival sac must be begun without delay. The myotics in most general use are eserin and pilocarpin, and their favourable action depends for the most part upon their power of drawing the iris away from the corneo-iridic angle, and so opening up the filtration spaces and permitting the freer circulation of the intra-ocular fluids. As Henderson insists, however, the iris is an absorbing surface, which "varies inversely with the size of the pupil," consequently the myosis produced by eserin or pilocarpin not only increases the area of the absorbing surface, but also, according to the same authority, opens up the crypts in its loose stroma to allow for freer drainage. Myotics are of undoubted service in the early stages, a premonitory attack being at once brought to an end by the timely instillation of eserin, and their regular use when glaucoma is fairly established may hold the disease in abeyance for a considerable time. The sulphate and

the salicylate of eserin, being soluble in water, are the salts most frequently employed, but the pure alkaloid may be used dissolved in sterilised oil. The solution ought always to be freshly prepared, and should be just sufficiently strong to cause the pupil to contract; and the instillations should be repeated as often as is necessary to keep it contracted. The usual strength is from one-fifth to one per cent., and the instillations require as a rule to be made every two or three hours. Eserin, however, possesses several disadvantages, as its use, even in weak solution, is apt to cause severe pain in the eyeball and forehead, while its continued application frequently gives rise to acute follicular conjunctivitis. Pain may be avoided or mitigated, and the good effects much enhanced, by combining cocaine and adrenalin with the eserin, but the myotic must retain mastery over the pupil. As has been said before, however, one occasionally has patients with whom neither cocaine nor adrenalin agrees, and when that is so these drugs aggravate rather than alleviate the suffering induced by the eserin. In such circumstances the old-fashioned plan of adding glycerine, in the proportion of about ten per cent., to the solution of eserin enables its use to be continued without much discomfort.

Pilocarpin is not such a powerful myotic as

eserin, but the aqueous solution of its salts is more stable. It is employed as a rule in the form of the nitrate, and the usual strength is from one to two per cent. It never gives rise to painful contractions of the ciliary muscle, and it very rarely causes irritation of the conjunctiva. More recently the hydrobromide of arecolin and the sulphate of isophysostigmin in solution containing from one-half to one per cent. of the salt have been highly recommended. They contract the pupil more quickly than eserin, but the myotic action is not maintained so long. A combination of myotics is often more beneficial than the use of any one of them separately. Mydriatics are just as harmful in primary glaucoma as myotics are useful. An acute attack has followed the instillation of a single drop of atropine solution into a predisposed eye, and it is a golden rule in practice never to prescribe for a patient over forty years of age any drug that dilates the pupil, without first making certain that there is no increase in the tension of the eyeball.

When a glaucomatous attack is threatening, nothing is of greater value in preventing its onset than a soporific. Chloral-hydrate, from its power of lowering intra-ocular tension, is especially useful, and I have often seen very marked benefit follow the use of the ordinary chloral and bromide

draught, the patient awakening from several hours of sound sleep apparently quite well. At the beginning of a congestive attack it is necessary (in addition to using myotics, which ought always to be combined with from five to ten per cent. of dionine) to relieve pain by the application of fomentations and of leeches; and a hypodermic injection of morphia in the temple ought to be given at once, if the sufferings of the patient are severe. The combination of morphia and of chloral, however, must always be avoided, because the one intensifies the narcotic action of the other. The patient must be kept warm in bed, and the bowels ought to be freely moved as soon as possible. If within a few hours the attack shows no signs of abating, surgical intervention must be resorted to without delay, as the congestion at the corneo-iridic angle rapidly becomes greater and greater, and the patient's chance of recovering sight depends altogether on the promptitude with which the eyeball is opened and the strangulation relieved. If the practitioner cannot obtain assistance, he ought not to wait, but should at once puncture the sclerotic with a narrow Graefe cataract knife and allow some of the vitreous to escape. The patient should be told to look inward and upward, and the puncture should be made at the outer side of the eyeball between the

external and inferior rectus muscles about seven millimetres from the limbus corneæ. In order to avoid wounding the lens, the point of the knife must be directed towards the centre of the eyeball, and when the blade is in position the handle must be gently turned to cause the wound to gape sufficiently to permit a small quantity of vitreous to escape. When the tension of the eyeball is sufficiently lowered, the knife must be brought back to its original position and gently withdrawn. If the eye be thoroughly anæsthetised by holocaine, in one per cent. solution, and strict antiseptic precautions be taken, this operation can be performed without danger, and will give relief till the services of a specialist can be obtained. If the increased tension be not lowered, impaired sight or even blindness will almost inevitably result, but the hopelessness of the condition is at once removed by the performance of iridectomy : the all-important thing is that the case be taken in time.

Up to 1856 glaucoma was regarded as uncontrollable and incurable, but in that year von Graefe announced that the disease could be arrested in its progress, and even permanently cured, by the simple operation of iridectomy. No more beneficent discovery has ever been made in the whole realm of operative surgery, but

von Graefe arrived at it in a manner purely empirical, and even now, when the operation has stood the test of experience for more than fifty years, and thousands of sufferers from glaucoma have retained their sight by its means, authorities are undecided regarding the exact *modus operandi* of its curative action. To be successful, however, the operation must secure a reduction in the intra-ocular tension, and the rules von Graefe laid down for its proper execution are adhered to, with very slight modifications, by the great majority of operators. Iridectomy for glaucoma, especially in its acute congestive form, is undoubtedly one of the most difficult operations in ophthalmic surgery, and where success is only partial the cause often lies in faulty technique. Whenever there is even slight congestion I prefer to have the patient under chloroform, and before the general anæsthetic is administered I instil eserin, cocaine, and adrenalin, into both eyes. It is a great advantage to have the pupil well contracted, because this makes the iridectomy all the easier. It may also prevent accident to the sound eye, in which an operation has sometimes determined an attack of acute glaucoma, a result due, not so much to the operation itself, as to the nervous shock which so often follows surgical treatment. The iridectomy ought to be up-

wards, so that the coloboma may be hidden by the upper lid, but when the iris is much atrophied, the healthiest part ought always to be excised so that the operation may be the more perfectly performed. Von Graefe insisted strongly that the incision must be as peripheral as possible: the knife should therefore enter the eye at the angle of the anterior chamber, so as to permit the removal of the iris up to its periphery. As Berry has pointed out, however, too peripheral an incision is apt to lead to serious accidents—profuse hæmorrhage from wounding of the ciliary body, dislocation of the lens, or escape of the vitreous —and consequently the aim must be to make an incision just as peripheral as is compatible with safety. Some insist on the use of a narrow Graefe knife, but unless the anterior chamber is unusually shallow, I prefer a broad keratome. A keen edge is of more importance than the shape of the blade. In every case the incision must be wholly in the sclerotic, usually from one to two millimetres from the apparent margin of the cornea, and parallel to the limbus. The edges of an incision made with a keratome are smooth, and readily come together, so that the wound has no tendency to gape, and with ordinary dexterity and care there is not much risk of injuring either iris or lens. The aqueous must be allowed to drain

off very slowly in order to prevent prolapse of the iris and to avoid the danger of intra-ocular hæmorrhage. The piece of iris to be excised ought to be grasped by forceps at the margin of the pupil and slowly pulled out of the eye. The loop ought to be kept gently on the stretch and drawn towards one angle of the wound. De Wecker's scissors are then held parallel to the incision with the blades pressed down on the globe, and the iris is cut by a series of snips, the operator making sure that it is removed close up to its attachment. The corners of the cut iris must next be carefully replaced by a spatula, in order that no tags may become adherent to the cicatrix. As a rule the excised portion of the iris should include about one-sixth of its circumference. The anterior chamber may rapidly fill with blood, but that is of little consequence, as the hæmorrhage will soon stop and in two or three days the blood will be all absorbed. The eye should be bandaged carefully and the patient confined to bed for at least a week after the operation.

The most successful results are undoubtedly obtained when surgical intervention takes place at a time when the iris is sufficiently healthy to react perfectly to eserin, and when its base is simply in contact with, and not firmly adherent

to, the posterior surface of the cornea. Whenever the diagnosis of glaucoma is clearly established iridectomy should be performed, more especially if the fellow eye is blind from the disease. If, however, both eyes be affected, but the one much in advance of the other, the worse eye ought always to be operated upon first, in order to find out how it behaves after iridectomy, and thereby to obtain a reliable guide for the treatment of the other eye. Undoubtedly the most brilliant results after operation for glaucoma are obtained in the congestive forms of the disease in which there is considerable increase of tension. In these, iridectomy is speedily followed by relief to the pain, and by improvement in sight, in consequence of reduction in intra-ocular tension and clearing of the transparent media.

In chronic simple glaucoma, where the tension is never much above normal, the results of the operation are not so certain. As Risley points out, however, "increased tension of the eyeball is always relative," and probably "mild exacerbations of increased tension coming on especially in the night often pass without recognition by the patient." In chronic glaucoma the cupping of the optic disc is usually the result of hypertension, and consequently is the best guide in estimating the probable result of an operation.

The contraction of the visual field, on the other hand, is a measure of the amount of atrophy of the optic nerve, which obviously must be permanent in spite of any form of treatment. My clinical experience has taught me that in every form of genuine glaucoma iridectomy is the safest procedure, and the earlier the operation is performed the more satisfactory the result. In simple glaucoma the operative technique is as easy, as it is difficult in the acute congestive form of the disease; and if the operation be productive of no active good, I do not think I have ever seen it do harm. Delay is dangerous, because every case of simple glaucoma may at any time become complicated by a congestive attack, which an iridectomy would in all probability have prevented. A single congestive attack may, if it be fulminating, destroy vision completely, and even in milder cases, where the patient regains sight after a few days, the recovery is never complete, and each succeeding relapse leaves greater visual incapacity than before. The most that we can hope to do is to restore vision to that point at which it was before the occurrence of the acute attack immediately preceding the operation.

Unfortunately, a good result does not always follow an iridectomy for acute glaucoma : on the contrary, in some cases the vision is worse after

the operation than before it. In most instances, however, post-operative accidents are the result of faulty technique due to restlessness on the patient's part, and consequently they can in great measure be averted by having him fully under the influence of chloroform. The chief accidents to be feared are traumatic cataract, or the occurrence of intra-ocular hæmorrhage. When the anterior chamber is unusually shallow and the lens pressed forward, there is always difficulty in introducing the knife, and if the section be not made with great care and dexterity, the point of the blade may come into contact with, and so rupture, the capsule of the lens, with the result that a traumatic cataract will form. In eyeballs which have become distended, as in buphthalmos, the ligament of the lens may be so loose, that, when the aqueous escapes, the lens is driven forward and the force is sufficient to rupture the zonule. The dislocated lens may then present itself at the operation wound and require to be extracted, if it does not escape of itself. In cases in which vascular degeneration is advanced, hæmorrhage is very liable to occur at the time of the operation. If, as has already been said, the blood flows into the anterior chamber, it may prove a troublesome complication and delay the various steps of the operation, but it is never really serious. It is

quite different, however, when the bleeding comes from the retinal or choroidal vessels, for then sight may be destroyed by a hæmorrhage into the macula, or the eye itself may be ruined in consequence of a large expulsive hæmorrhage which detaches the retina and may cause both lens and vitreous to be extruded *en masse* upon the patient's cheek. One of the gravest dangers in simple glaucoma is when a sudden deterioration of vision takes place soon after the iridectomy. Von Graefe himself noticed that when such a misfortune happened it was always in cases where the visual field had, before the operation, been contracted nearly up to the fixation point, and became further encroached upon by the contraction that subsequently occurred. Such a result is most disappointing, as the loss of central or direct vision renders the patient, who was before probably able to read, now practically blind. The lesson to be learnt from such cases is the necessity for early operation, before the contraction of the field has advanced so far as to approach near to the macular area.

The most disastrous complication of all, however, is where the glaucoma is found to be malignant. The percentage of such cases is fortunately small, and the patients are most usually women who are approaching, or have reached, the period

of the menopause. Unfortunately this is a complication that cannot be foreseen, but its onset should be suspected if the iridectomy be followed immediately by severe inflammatory reaction. The anterior chamber becomes permanently abolished, the eye is acutely painful, and vision is speedily lost completely. The suffering continues for weeks or even for months, and then, as the pain subsides, the globe softens and is destroyed by phthisis bulbi. In connection with such cases Schweigger says that "the cause of the unsatisfactory results of the operation must be in some obscure structural anomaly inherent in the eye itself," and as a result of his own experience he has laid it down as a rule that "when *Glaucoma malignum* attacks one eye it follows iridectomy in the other eye, even when the second eye is not affected for years after the first." He also says that "experience teaches us that in all cases of chronic glaucoma affecting both eyes, it is advisable first of all to operate upon the worse one, even if it should be absolutely blind. Should this be followed by the normal healing process, the second eye may be operated upon without the least apprehension."

It sometimes happens that the scleral wound, instead of healing firmly and smoothly, bulges to form a cystoid cicatrix, which yields to any sudden

increase of intra-ocular pressure, and, permitting aqueous to filter through it, acts as a kind of safety-valve to the eye. Every operator of experience can recall cases where the intermittent relief of hypertension through a cystoid cicatrix was very beneficial. Berry quotes a very interesting case which he has had under observation for nearly twenty years, in which the cystoid scar "has its efficacy as a filter increased from time to time by the habit which the patient has acquired of forcibly rubbing his eye when he notices it become obscured. This causes a trickle of aqueous humour to escape, of which the patient is conscious, and which is immediately followed by the disappearance of haze." Such a means of diminishing quickly any sudden increase of intra-ocular tension is undoubtedly of great value in individual cases, but it must not be forgotten that a cystoid cicatrix brings danger to the eye, in so far that it may readily be the point of departure of ocular suppuration. If, however, it were possible to form a filtration cicatrix which would at the same time be free from all risk of pyogenic infection, that would undoubtedly be a great gain; for many eyes which now gradually deteriorate as a result of the recurrence of high tension subsequent to iridectomy would be permanently cured. In these circumstances von

Graefe was in the habit of making a second iridectomy diametrically opposite to the first, and thus in many instances succeeded in arresting the disease. It is probable that in the second operation a healthier piece of iris was excised than at first, because undoubtedly, in glaucoma, the more degenerate the structure of the iris the less successful is the iridectomy. Henderson has also recently pointed out—and the observation is an interesting and important one—that "after an iridectomy the iris stump shows no signs or vestiges of a cicatrix whatsoever," and from this he argues that "the operation of iridectomy opens up a permanent channel for the intra-ocular fluids to drain away—a channel which will not be influenced by the state of the pupil, and which will always be effective if the operation is performed before the iris tissue becomes atrophied and degenerated."

De Wecker considered the section of the sclerotic of more importance than the excision of the iris, and devised an operation which he called anterior sclerotomy. It is performed differently by different operators, one of the most important modifications being that of Galezowski, who practised what he termed equatorial sclerotomy; but the aim of all is the same, to make an incision in the sclera at the periphery of the anterior

chamber, but to leave the iris intact. Sclerotomy is a more difficult operation to perform than iridectomy, and I have no hesitation in saying that I place much more reliance upon the latter, except in cases of hæmorrhagic glaucoma or of buphthalmos. In these last, indeed, the risk of disaster following the opening of the eyeball and excision of the iris is so great, that the surgeon is often placed in a difficult position when he has to decide what ought to be done. In the majority of instances it will be most prudent to decide not to operate. Sclerotomy is useful chiefly in those cases in which an iridectomy has already been performed with an unsatisfactory result, and here a scleral puncture at the site of the iridectomy may completely relieve hypertension and subdue pain. Moreover, if necessary, the operation may be repeated over and over again. Quite recently two other important operative departures have been made, the one by Herbert, who isolates by cuts with a very narrow knife a wedge-shaped piece of sclerotic, and aims at producing a filtration cicatrix to which the iris is in no part adherent; and the other by Lagrange, who excises a piece of the sclerotic to form a *cicatrice filtrante* in the immediate neighbourhood of the canal of Schlemm. At first the latter combined the sclerectomy with a large iridectomy, to avoid pro-

lapse of the iris; but more recently he has, in chronic glaucoma when no appreciable increase of tension can be detected, advocated a simple sclerectomy. He believes that the filtration cicatrix thus produced is only a fistulous opening in the eye, or rather a series of microscopic fistulas which are invisible to the naked eye. These two operations are still on their trial, and though their originators claim much for them, no opinion can be pronounced on their value until it is seen how permanent are the results obtained.

In eyes where the pupil is dilated and will not contract with eserin, and where the iris is atrophied and the anterior chamber very shallow, posterior sclerotomy, to permit of an escape of vitreous and the formation of a leaking subconjunctival scleral wound, is sometimes attended by much success; and I thoroughly agree with Priestley Smith in his recommendation that when hypertension is great the sclerotic should be punctured as a preliminary to iridectomy. The combination of the two operations is often of the greatest value, and permits the excision of the iris to be made with perfect safety in circumstances where otherwise the risk might be considerable. Finally, when an eye is blind from glaucoma, and continues to be painful in spite of all treatment, nothing but optico-ciliary neurectomy remains, if the patient

is to be relieved from his suffering and yet to retain his eye. In these circumstances, however, enucleation is the more prudent course, as the globe, in consequence of the steady progress of glaucomatous degeneration, is sooner or later almost certain to give trouble.

As the object of this chapter is to give my personal experience in the treatment of glaucoma, I shall not describe the numerous other methods of operating that have been devised and practised, and I simply mention resection of the cervical sympathetic, first practised by Jonnesco of Bucharest, because it is strongly advocated by Abadie, who it will be remembered believes irritation of the sympathetic in the neck to be the cause of chronic glaucoma. It is a difficult operation, and not without danger to life.

Treatment by myotics and general diathesic treatment must, more especially in simple glaucoma, be methodically continued after operation. Every means must be taken to avert the progress of general arterio-sclerosis, upon which, as we have said, glaucoma so largely depends. The patient must recognise his limitations and live well within them.

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