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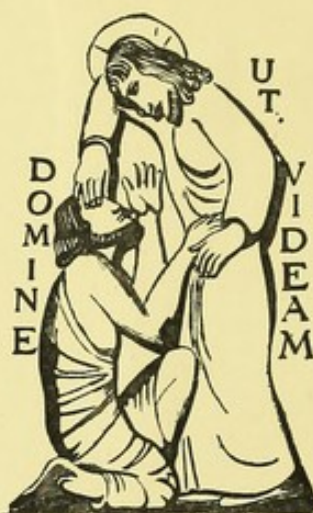
by

A. Maitland Ramsay, M.D.

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Atlas of External Diseases of the Eye

By
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Fellow of Faculty of Physicians and Surgeons, Glasgow ; Ophthalmic Surgeon,
Glasgow Royal Infirmary ; Professor of Ophthalmology, St. Mungo's
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Margaret College, University of Glasgow

With 30 full-page Coloured Plates, and 18 full-page Photogravures



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To

THOMAS REID, M.D., LL.D.,

SENIOR SURGEON TO THE GLASGOW EYE INFIRMARY
AND WALTONIAN LECTURER ON DISEASES OF THE
EYE IN THE UNIVERSITY OF GLASGOW,

WITH ADMIRATION

FOR HIS EMINENT SERVICES

TO OPHTHALMOLOGY, AND IN GRATITUDE

FOR UNVARYING KINDNESS AND VALUABLE ASSISTANCE,

THIS BOOK IS DEDICATED BY

THE AUTHOR.

Preface.

THE plates in this Atlas are, with the exceptions mentioned in the text, executed from photographs of actual cases, most of which occurred in connection with my work at the Charlotte Street Branch of the Glasgow Eye Infirmary; and were originally prepared to illustrate my lectures on eye diseases at Queen Margaret College. It is hoped that, in their published form, they may be found useful to medical men in general practice, who may not have many opportunities of visiting the wards and clinique of an ophthalmic institution.

Obviously photographs present only the phase of the disease existing at the time, and leave preceding and subsequent stages unrepresented, while some conditions are too acute to permit of the patient's being photographed. I have therefore endeavoured to make the letter-press not only descriptive of, but also complementary to, the plates, so as to give as faithful a clinical picture as possible of all the diseases dealt with.

The chromo-lithograph plates are from photographs taken, and coloured, from life by Mr. A. H. Geyer under my personal supervision, and have been reproduced on stone by Messrs. Maclagan & Cumming, lithographers, Edinburgh, under the superintendence of Mr. William Cathie. The plates in photogravure are the work of Messrs. T. & R. Annan, Glasgow.

In addition to the acknowledgments made in the text, I have to thank Mr. William Melven, M.A., for much help in the revision of the proofs.

A. M. R.

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Eczema of the Eyelids.

(ἐκζεῖν, to boil.)

French, *Eczéma des paupières*. German, *Eczem der Augenlider*.Italian, *Eczema delle palpebre*.

AMONGST the poor, and especially amongst the children of the poor, no form of eye disease is more frequently seen than that depicted in the accompanying illustration. Though usually described as a blepharitis (Plate II., Fig. 1) or ophthalmia tarsi, it is essentially an eczema of the lids, its signs and symptoms—redness, swelling, exudation leading to the formation of crusts, itching, etc.—being similar to those presented by eczematous inflammation of the skin of other parts of the body. It frequently originates as a complication and sequela of measles, scarlet fever, or hooping-cough, and often occurs in those whose occupations expose the eyes to sudden alternations of heat and cold, to dust, or to irritating vapours. It is aggravated by indulgence in alcoholic stimulants, by improper forms of food, and by want of personal cleanliness. Girls are affected rather more frequently than boys, and, as a rule, the most severe forms of the disease are met with in those whose skin is naturally delicate. When weakly or scrofulous children are attacked, there is always more or less inflammation of the conjunctiva, particularly when the eczema appears during the course of any of the exanthemata. In such cases the conjunctivitis may be very pronounced, and both eyes are usually implicated. The margins of the lids are the parts chiefly involved, and hence the name blepharitis marginalis. A similar condition may be frequently observed in children otherwise to all appear-

ance strong and healthy who suffer from inflammation of the eyelids whenever they read or write. If the use of the eyes for near work be given up, the inflammatory symptoms pass away, only to reappear whenever the strain begins again. Here obviously the blepharitis is due to an error of refraction, and will not be relieved by any form of treatment, until suitable spectacles have been provided.

At the commencement of the attack the borders of the lids feel hot and uncomfortable, and are red and somewhat swollen, as if the patient had been weeping. This is the stage of simple blepharitis or "blear eye." During the day, fine bran-like scales form at the roots of the eyelashes, and during the night the eyelids get stuck together by the increased secretions from the sebaceous and other glands. The formation of little pustules at the roots of the eyelashes marks a further stage of progress, and the hypersecretion is then so abundant that the cilia are matted into pencils, and after sleep the lids are so firmly glued together that they cannot be separated until the crust, which has formed by the drying of the discharge, has been softened by bathing with hot water, or, preferably, with hot alkaline solution. When these crusts are removed, a raw bleeding surface, due to little ulcers at the roots of the eyelashes, is exposed along the border of the lid (blepharitis ulcerans). There are now much heat and itching of the eyelids, and, as a consequence, increased lachrymation, the tears overflowing on to the cheek, and irritating the skin until an eczematous eruption is produced.

If the disease be not arrested, the ulcers eat into the hair follicles, and the eyelashes drop out. Many of them never grow again, owing to the complete destruction of their root sheaths, and in this way the lids may be denuded of cilia, such bald condition of the eyelids being known as madarosis (*μαδάρσις*, bald, without hair). When the hair follicles are only partially destroyed, cilia are reproduced, but they are sickly and stunted, irregular in their distribution, and so altered in direction that they tend to grow towards the eyeball. Inflammation results, and this new source of irritation adds greatly to the patient's suffering—trichiasis (*θρίξις*, a hair).

ECZEMA OF THE EYELIDS.

pages 1-3.

ECZEMA OF THE EYELIDS.

Pages 1-2.



The more protracted the inflammation, the greater is the infiltration of the margin of the eyelid (blepharitis hypertrophica), and at length the intermarginal space becomes obliterated, and the lid no longer presents a clean-cut edge, but becomes rounded and swollen, and bordered by a raised rim of fleshy-looking conjunctiva. After the disease has reached this advanced stage it is termed tylosis (τύλος, a lump, a callus). Such changes in the shape of the eyelid always produce a certain amount of eversion, with consequent misplacement of the puncta lachrymalia, and when there has been considerable eczematous inflammation, the ectropion (Plate III., Fig. 1) is aggravated by cicatricial contraction of the skin of the lid. As a result, the tears are not sucked up by the canaliculi, but keep dropping constantly upon the cheek, the eyes being always suffused with water. The constant wiping that follows increases the irritation, and the supervention of conjunctival inflammation adds to the patient's distress by inducing a certain amount of photophobia, with the consequent formation of a habit of partial closing of the eyelids, and wrinkling of the brows, in order the better to protect the eyes from the full glare of light.

PLATE II.

Figs. 1 and 2. Blepharitis Marginalis.

(βλέφαρον, an eyelid.)

Inflammation of the edge of the eyelid.

Synonyms : Ophthalmia tarsi, or Tinea tarsi; Lippitudo.

French, *Blepharite*. German, *Augenliderentzündung*. Italian, *Blefarite*.

Fig. 1. The edges of the eyelids are of dusky-red colour, considerably swollen, and smeared with a sticky discharge, which from exposure to the air becomes converted into a dirty-yellow crust, in which the cilia are almost completely buried. In spots from which the dried secretion has been removed, pustules and small ulcers are visible at the roots of the eyelashes. The removal of the scabs covering these ulcers is followed by bleeding, and the darker coloration seen here and there in the crust covering the margin of the eyelid is due to the admixture of blood with the abnormal secretion from the Meibomian glands. During the removal of the discharge many of the cilia are loosened and fall off, but as the disease is, in the illustration, shown in its earlier stages, the loss of the eyelashes is not noticeable. The ocular conjunctiva is unaffected.

Fig. 2 shows the association of marginal blepharitis with inadequacy of the tear passages and inflammation of the nasal mucous membrane. The disease is usually described as a "lachrymal catarrh," and in contrast to the ordinary forms of blepharitis, in which as a rule both eyes suffer simultaneously, it generally affects one eye only. There is usually also a history of "cold in the head," which had been present for a longer or shorter time before the eye symptoms appeared.

DISEASES OF THE EYELIDS.

Fig. 1. Blepharitis marginalis.
page 4.

Fig. 2. Lachrymal Catarrh.
page 4.

Fig. 3. Hordeolum.
page 5.

Fig. 4. Chalazion.
page 7.

Fig. 5. Ectropion.
pages 11-14.

Fig. 6. Ectropion.
page 9.



Then, after exposure to cold, more especially if the patient be heated, there is a sensation as if grains of sand were in the conjunctival sac, and an itchy feeling, followed by a burning sensation, is experienced in the eyelids. The lids become slightly swollen, are of a dusky-red colour, and show traces of ulceration along their margins. There is first excessive lachrymation, and then after a time a slight mucous discharge, which adheres to the roots of the eyelashes and seals the lids together during sleep. The conjunctiva is injected, and the caruncle and semilunar fold are red and swollen. When the eyelid is pulled outwards, the lachrymal papilla is seen to be enlarged, and the punctum is dilated and patulous. Pressure over the tear-sac usually causes a regurgitation of clear watery fluid through the lower canaliculus. There may be spasmodic closure of the eyelids from inability to look at the light. If the patient be much exposed to cold and damp these symptoms persist for a long time, the discomfort being some days greater, other days less, but never entirely gone, and always aggravated by the necessarily constant use of the handkerchief to keep the eyes dry, and by the rubbing, induced by a desire to relieve the intolerable itching. The swelling of the conjunctiva tends to separate the punctum from the eyeball, and so if the disease be not controlled by treatment, a vicious circle is established, and the symptoms repeat themselves.

Fig. 3. Hordeolum.

(*Hordeum*, barley.)

A localised inflammation at the edge of the eyelid, usually originating in connection with a hair follicle, and as a rule terminating in suppuration.

Synonym: Sty or Stye. (A.S. *steigan*, to rise.)

French, *Orgeolet*. German, *Gerstenkern*. Italian, *Orzajuolo*.

THOUGH a sty is regarded as a very trifling ailment, it is often accompanied by an amount of suffering out of all proportion to the size

of the little boil that is causing it. The severity of the pain may disturb sleep, and give rise to symptoms of general feverishness. Fortunately, however, the distress is of brief duration, for the suppuration soon reaches its height, and from the moment that the skin breaks, and a drop or two of pus escapes, the pain begins to subside. Styes are, however, prone to occur in crops, and this tendency is specially seen in those whose digestive organs are at fault, and who suffer from habitual constipation. The illustration was taken from a boy in whom styes occurred one after another in rapid succession over a period of months. It gives, therefore, a clinical picture of the disease in its various stages. In a predisposed person, after exposure to a cold wind with dust flying, or to a bright light; or after overuse of the eyes, especially if the patient be hypermetropic, there comes a feeling of heat and itching of the lids. If the eyes be rubbed, pain is felt at a particular spot, which soon afterwards swells. This swollen part is of an angry red colour, and may attain considerable size; while the pain, which was at first sharp and cutting, soon becomes dull and throbbing. After a time, varying from twenty-four hours to three or four days, a yellowish coloration appears round the roots of the eyelashes surmounting the most prominent part of the sty, the skin gives way, and a few drops of purulent matter escape; and immediately thereafter the pain subsides, and the swelling lessens, till in the course of a few days the spot, partially denuded of eyelashes, is marked only by a cicatrix.

The general swelling of the lids is often much greater than is represented in the drawing, and is, indeed, occasionally so intense as to mask completely the localised swelling. The latter is, however, always to be detected on careful palpation. Sometimes the inflammatory oedema of the lids and surrounding parts is so pronounced that, at first sight, it might be mistaken for acute inflammation of the lachrymal sac, but here again palpation helps to make the diagnosis clear; for in hordeolum the tenderness is limited to a point or points along the margin of the eyelid, while in lachrymal inflammation it is confined to the region of the

tear-sac. As a rule the bulbar conjunctiva remains unaffected, except in the case of stytes which form at the outer canthus. These, from the pressure they cause on the bloodvessels and lymphatics, are always complicated by a considerable amount of oedema of the ocular conjunctiva.

Fig. 4. Chalazion.

(χάλαξα, hail.)

A tumour—granuloma—of the tarsal cartilage, which originates as a result of obstruction and subsequent inflammation of a Meibomian gland.

Synonyms: Meibomian cyst; Tarsal tumour; Hailstone.

French, *Chalazion*, *grêlon*. German, *Hagelkorn*. Italian, *Calazio*.

A CHALAZION was formerly regarded as a hordeolum which had not gone on to suppuration; but, both as regards position on the eyelid, origin, and subsequent progress, each disease presents signs and symptoms quite distinctive and easy of recognition. A hordeolum always occurs at the margin of the eyelids, in line with the eyelashes, whereas a chalazion is placed within the edge of the lids, along the line of the Meibomian glands. When one of these glands becomes obstructed, inflammation of the wall is set up by the retained secretion, and this irritation, spreading to the parts adjacent, produces proliferation of the surrounding tissues, which brings about a gradual swelling of the tarsus. A chalazion occurs much more frequently in adults than in children, and may develop in both upper and lower eyelids, although its most frequent position, as is shown in the illustration, is in the centre of the upper lid. It is in many instances solitary, but in those who, from digestive and other derangements, are specially liable to the disease, several may be present at the same time, and occasionally there may be one, or more than one, placed symmetrically on the right and left upper or lower lids.

As a rule a chalazion develops slowly. It is hard and circumscribed, rolls under the finger like a lead pellet or a hailstone, and seldom exceeds the bulk of a split pea. It is non-inflammatory and quite painless, and patients complain more of the disfigurement which it produces than of any actual discomfort.

When it attains a certain size, however, it interferes to some extent with the movements of the eyelid, the conformation of which is altered, more especially when several are present at the same time. The skin covering a chalazion is freely movable, and at first is unchanged in appearance, but as the tumour grows it gradually becomes of a more or less livid red colour. When the eyelid is everted the conjunctiva corresponding to the site of the chalazion is seen to be red and swollen, and, in the more advanced cases, a bluish-grey spot occupies the centre of this area, and indicates that the tarsus is becoming thinned by the pressure of the tumour. When perforation occurs, a gelatinous substance escapes, but this is only the central softened portion of the chalazion, and if the harder and more resistant peripheral parts be not removed fleshy granulations will sprout from the interior, and form a fungoid excrescence upon the inner surface of the eyelid. A small chalazion of the lower lid, more especially when situated near the inner canthus, is nearly always wholly cartilaginous, whereas those which attain a larger size have their contents often wholly liquid. The swelling is then either a cyst or an abscess. In the former case it is filled with a yellowish-brown fluid; in the latter, with pus.

Fig. 5. Ectropion.

This figure is described under Plate III., page 11.

Fig. 6. Entropion.

(ἐν, in, and τρέπειν, to turn.)

Inversion of the edge of the eyelid.

French, *Entropion*. German, *Entropium*. Italian, *Entropio*.

INVERSION of the eyelid may be due to spasm of the orbicularis palpebrarum muscle, or it may be produced by cicatricial contraction of the eyelid.

Spasmodic entropion usually affects the lower lids only, and the inversion may be so complete that the eyelashes become hidden from view. It has been recorded that some individuals can by an effort of will induce contraction of the ciliary portion of the orbicularis, and cause both lower lids to become completely inverted. The disease is usually seen in old people whose tissues are lax as a result of senile changes. In such cases it may be determined by the application of a bandage, and often proves a troublesome complication after operation for the extraction of cataract. Spasmodic entropion is seen also in persistent strumous ophthalmia, and in bad cases of this disease the blepharospasm is so pronounced that the edges of both upper and lower lids are turned against the globe. In none of these cases, however, is there any organic change in the structure of the lid itself, and the entropion at once disappears whenever the lid is drawn away from the eyeball.

Cicatricial entropion is produced by wounds which involve the edge of the lids, and more particularly by burns, which, when severe, produce so much cicatricial contraction that the lid is greatly destroyed and becomes fixed to the eyeball—symblepharon (σύν, together, and βλέφαρον, an eyelid)—Plate XXIII., Fig. 1. It is seen also after those diseases of the conjunctiva which are followed by cicatricial changes, more particularly after granular ophthalmia, in the late stages of which the normal conjunctiva is replaced by a development of connective tissue, which by

its contraction produces incurvature of the tarsal cartilage, and consequent inversion of the free margin of the eyelid.

In every case of entropion the cilia are misdirected—trichiasis; *θρίξ*, a hair—and rub against the eyeball, and as a result of this irritation the cornea becomes inflamed. Severe corneal complications—opacity, vascularity, ulceration—are more common in entropion of the upper lid, and consequently in these cases the danger of impaired eyesight is greater than in those where the inversion is confined to the lower lid. It must be remembered, however, that trichiasis may exist without any displacement of the palpebral margin.

Ectropion.

(ἐκ, out, and τρέπειν, to turn.)

Eversion of an eyelid so that its conjunctival surface is exposed.

French, *Ectropion*. German, *Ectropium*. Italian, *Ectropio*.

EVERSION of the eyelids may be produced by many different causes, and may vary much in degree. It may be temporary or permanent, and affects the lower lid much more frequently than the upper. It may, on the one hand, be so complete as to draw the eyelid away from the eyeball in its whole extent, or it may, on the other, be so slight as to simply bring about a displacement outwards of the lower punctum lachrymale; while the patient complains more of the constant overflow of tears than of anything else. In severe cases of granular ophthalmia both eyelids may for the time being become completely everted, as a result of the extreme inflammation of the conjunctiva, which protrudes as a fleshy mass through the palpebral fissure; and in ophthalmia neonatorum there is often spasmodic ectropion.

The more permanent forms of eversion, however, result from cicatricial contraction of the skin of the eyelids and of the parts adjoining; from morbid changes in the lids themselves; from senile atrophy of the skin and the palpebral portion of the orbicularis muscle; or from paralysis of the facial nerve.

1. *Ectropion due to Cicatricial Contraction.*

Cicatricial ectropion is usually the result of burns by fire, by mineral acids—*e.g.* in cases of vitriol throwing—or by the fixed alkalies,

more especially quicklime; and the amount of eversion depends upon the severity of the original injury. In scrofulous children the adherent cicatrix consequent on the healing of the diseased bone after caries at the lower and outer, or upper and inner, orbital margin, is a very frequent cause of eversion. Syphilitic or tubercular ulcerations of the lids are also invariably provocative of ectropion. When the ectropion is due to any of these causes both upper and lower eyelids may suffer alike; but when the upper lid is implicated there is much more risk of corneal complications than when the lower only is affected, because the eyeball instinctively tends to seek for protection by rolling upwards. It is, however, often very remarkable how far the lower lid can be raised to cover the cornea when, from eversion, the upper has become inefficient.

Fig. 5 of Plate II. is an illustration of a case of complete eversion of the right lower eyelid. The patient was a lad 17 years of age, who, during an epileptic fit, fell into a fire, and burned his face severely. The photograph was taken a year after the accident, and depicts the hideous deformity which had been produced during the process of cicatrisation. The lower eyelid was drawn away from the globe and fixed to the cheek. The tarsus was intact, but had become much elongated, and a curved elevation, somewhat whitish in colour and fringed with eyelashes, marked the new position of the border of the lid. The palpebral conjunctiva was wholly everted, and the mucous membrane, as a result of constant exposure, had become so red and hypertrophied as to present the appearance of raw flesh. Whenever an attempt was made to close the lids a gap necessarily remained open below, and the eyeball became inflamed from want of its natural protection. Owing to the displacement of the puncta lachrymalia there was constant epiphora, and tears mixed with secretion from the inflamed conjunctiva overflowed continually on to the cheek and irritated the skin. Round about the orbit, however, the integument had been so completely destroyed by the burn that nothing but cicatricial tissue remained, and, in consequence, the graft

DISEASES OF THE EYELIDS.

Fig. 1. Blepharitis hypertrophica.
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Fig. 2. Senile Ectropion.
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Fig. 1. Blepharitis hypertrophica.
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Fig. 2. Senile Ectropion.
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of skin necessary for the repair of the ectropion had to be taken from another part of the body—in this case the forearm.

2. *Ectropion from Morbid Changes in the Eyelids themselves.*

Fig. 1 is a typical example of ectropion from this cause. The patient, a woman 21 years of age, had suffered from constant inflammation of the edges of the eyelids after an attack of measles in early childhood. She had paid no attention to the disease, which had gradually increased until the whole of the structures of the margin of the eyelids had become inflamed—blepharitis hypertrophica. The borders of the lids were red and swollen, and instead of the edges being clean-cut, each coöpting perfectly with its fellow, they had become rounded, and the well-marked space which is normally present, between the line of the cilia and the openings of the Meibomian glands, was obliterated. Many of the eyelashes had fallen out, the follicles being permanently destroyed; and the cilia which remained were, more especially in the left upper eyelid, diseased at their roots and consequently stunted in growth, and so misdirected that their free extremities rubbed against the eyeball. Both the lower lids were everted, and the conjunctiva, as a result of exposure, was hypertrophied and granular, and had lost much of its normal sensibility. Owing to this alteration in the form and position of the eyelids, they did not close perfectly during sleep; and partly from exposure due to this cause, and partly from the constant lachrymation, the ocular conjunctiva of the left eye had become so inflamed and irritable as to induce an amount of intolerance of light sufficient to cause the patient to keep the lids partially closed, and to produce a reflex contraction of the pupil.

3. *Ectropion from Senile Atrophy.*

Fig. 2 represents the eyes of an old woman, who had suffered for many years from blepharitis marginalis, and in whom, as a result of

senile changes, the skin of the lids had become relaxed, and the palpebral portion of the orbicularis muscle had lost its normal tonicity. The lower eyelids had, in consequence, fallen away from the globes, and the everted conjunctiva had become almost cuticular, and presented a sarcomatous appearance. The eyes were constantly bathed in tears which collected like a film over the surface of the cornea, and interfered with vision. The frequent use of the handkerchief in connection with this excessive watering had aggravated the conjunctivitis, and induced considerable oedema of the caruncles and semilunar folds, which tended still further to increase the eversion of the nasal extremity of the lid, and to separate the punctum from the surface of the eyeball.

4. *Ectropion from Paralysis of the Seventh Cranial Nerve.*

This is treated of in the description accompanying Plate IV.

Lagophthalmos.

(λαγώς, a hare, and ὀφθαλμός, an eye.)

A condition in which the eyelids cannot be closed.

Synonym: The hare's eye, because it was believed that hares slept with their eyes open.

French, *Lagophthalmie*. German, *Hasenauge*. Italian, *Lagoftalmia*.

INABILITY to close the eyelids may arise from several causes. For example, the cicatrization after a burn may so contract the lids that they cannot be closed, or the cicatrix remaining after disease of the bones may drag the upper or lower eyelid, or both, away from the globe, and fix them so firmly to the orbital margin as to render it impossible for them to cover the eye. In both of these examples the lagophthalmos will be complicated by ectropion. In other cases, such as severe exophthalmic goitre (Plate XLIII.), or orbital tumour (Plate XLIV.), the lids will not close, even during sleep—not through any failure of their own position and mobility, but owing to the great prominence of the eyeballs. Another inducing cause is paralysis of the seventh cranial nerve, and this is the form of lagophthalmos that has been chosen for illustration. In the case shown there was inability to close the right eye, and the paralysis of the orbicularis palpebrarum was accompanied by palsy of the other muscles supplied by the facial nerve.

The lesion producing the paralysis may be central or peripheral, and it is always important to try to localise it as accurately as possible. A central lesion may be cortical, intracerebral, or nuclear, while a peripheral

may affect the nerve in its course through the temporal bone—intracranial—or after its exit from the skull by the stylo-mastoid foramen—extracranial. As a rule, it is not difficult to distinguish a peripheral lesion from one of central origin, for in the former the paralysis is complete—involving all the branches of the nerve—and is, in most instances, confined to one side of the face; whereas in the latter the loss of power is not absolute—the branch supplying the orbicularis palpebrarum usually remaining intact—and both sides of the face may be affected. If such an incomplete palsy of the muscles of one side of the face exists by itself—*monoplegia facialis*—it is most probably due to a lesion of the cortex; but as a rule it is accompanied by paralysis of the limbs of the same side of the body, and presents a clinical picture which can with difficulty be distinguished from a similar group of symptoms produced by disease of the internal capsule or of the crus cerebri. Under such circumstances, however, associated symptoms are usually present to aid the diagnosis.

When the site of the lesion is in the pons, the facial paralysis is usually more profound than when it is due to implication of the seventh nerve in other parts of its intracerebral course. In pontine lesions, moreover, the paralysis of the face may be on the side opposite to that of the limbs, and when this “crossed paralysis” occurs, the lesion must obviously be situated in the lower part of the pons, that is, below the point where the fibres of the facial nerve have crossed from one side of the brain to the other. When, however, facial paralysis is connected with spinal disease, or associated with paralysis of any of the ocular or other cranial nerves, there is usually a lesion of the nucleus. Whether a peripheral lesion implicates the nerve in its intracranial or in its extracranial course, the paralysis of the muscles supplied by it is complete. Injury during passage through the aqueduct of Fallopius is generally caused by suppuration of the middle ear and disease of the adjoining portion of the temporal bone; and the exact site may be determined by giving heed to the presence or absence of

LAGOPHTHALMOS.

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LACOPHTHALMOS.

PLATE IV



LAGOPHTHALMOS

certain concomitant symptoms, such as paralysis of the palate, abnormal acuteness or impairment of hearing, diminished salivary secretion, or alteration in the sense of taste.

It is in its extracranial course, however, that the nerve is most liable to injury, as, after it emerges from the stylo-mastoid foramen, it lies nearer the surface. It is therefore readily pressed upon by any tumour at the angle of the jaw, or injured by an accident or during a surgical operation, and its function even becomes frequently suspended after exposure to cold. This last is the form illustrated by the plate, and is usually described as due to rheumatism. The chill, however, can only be regarded as the immediate exciting cause of the disease, the true predisposing cause, whether rheumatic, syphilitic, or other, being found in the blood condition existing at the time.

The usual history of a case is somewhat as follows: The patient, while heated, sits down at an open window, or exposes himself to a draught while travelling. He may or may not be conscious of a little stiffness of neck afterwards, but, even if he be, thinks, as a rule, nothing of it. In a few hours, however, he is considerably alarmed to find that he has lost power over the muscles of one side of his face. Try as he will he cannot shut his eye or wrinkle his brow on the affected side. He cannot close his lips firmly, as in the act of whistling, nor can he blow out his cheeks, and when he laughs his face is drawn to the sound side so that the mouth is twisted, the affected side remaining quite flat and expressionless. He may experience difficulty in swallowing, as food tends to lodge between the gum and the cheek, or sometimes, owing to paralysis of the palate, to regurgitate through the nose. The eyelids are never closed, even during sleep, and consequently the eyeball is unprotected from dust, and exposed constantly to the air, with the result that conjunctivitis and corneal ulceration supervene. These complications are aggravated by the constant epiphora due to ectropion, and in severe cases the cornea may be completely destroyed.

On account of the slight eversion of the lids, the palpebral fissure is wider than normal, and consequently the eyeball appears more prominent on the affected, than it does on the sound, side. Patients usually complain that the eye feels cold, but apart from this there is no disturbance of sensation except where paralysis of the seventh nerve is complicated by lesion of the fifth. Under these circumstances the cornea is liable to suffer severely—neuro-paralytic keratitis. In this connection, however, it is of interest to mention that herpes zoster now and again occurs as a complication in peripheral paralysis of the facial nerve.

As a rule rheumatic facial paralysis passes off in the course of a few weeks, but its duration is extremely variable. The electrical condition of the paralysed muscles is, however, the best guide in prognosis, for if there be no change in their reaction to either the faradic or the galvanic current, the case will probably terminate favourably in from one to three weeks; whereas, if the "reaction of degeneration" be found, recovery is likely to be delayed for many months. Should secondary contractures and spasmodic twitchings of the muscles supervene, the time will probably be still more extended, and, indeed, complete recovery may never take place.

PLATE V.

Ptosis.

(πτῶσις, a falling.)

A drooping of the upper eyelid.

French, *Ptosis*. German, *Lähmung des Levator palpebrae superioris*. Italian, *Ptosis*.

PTOSIS may be complete or partial, confined to one side or bilateral. While it is sometimes the result of purely mechanical causes, it is at others due to paralysis of the oculo-motor nerve, and cases may thus be divided into spurious and genuine. For clinical purposes it is, however, more convenient to distinguish five separate groups, namely, the hypertrophic, the traumatic, the congenital, the senile, and the paralytic.

1. *Hypertrophic or Ptosis Adiposa*.

Here the lid, through bulk and increased weight, becomes so relaxed and pendulous that it falls over the eye. The levator palpebrae superioris is quite unable to raise it, and the deformity is most prominent on the temporal side. If the relaxed skin be pinched up between the finger and thumb, the patient can by a strong effort raise the eyelid, but if the support be withdrawn the lid falls at once into its former position. In this group may also be included those cases of drooping of the upper eyelid which are the result of chalazion, abscess, oedema, haemorrhage, or inflammation, more especially erysipelas and trachoma.

2. *Traumatic Ptosis.*

This occasionally occurs after penetrating wounds of the upper eyelid, when the levator palpebrae or its nerve has been injured. Unilateral ptosis that has existed from the time of birth is often attributed to the pressure of the forceps during a prolonged and difficult labour.

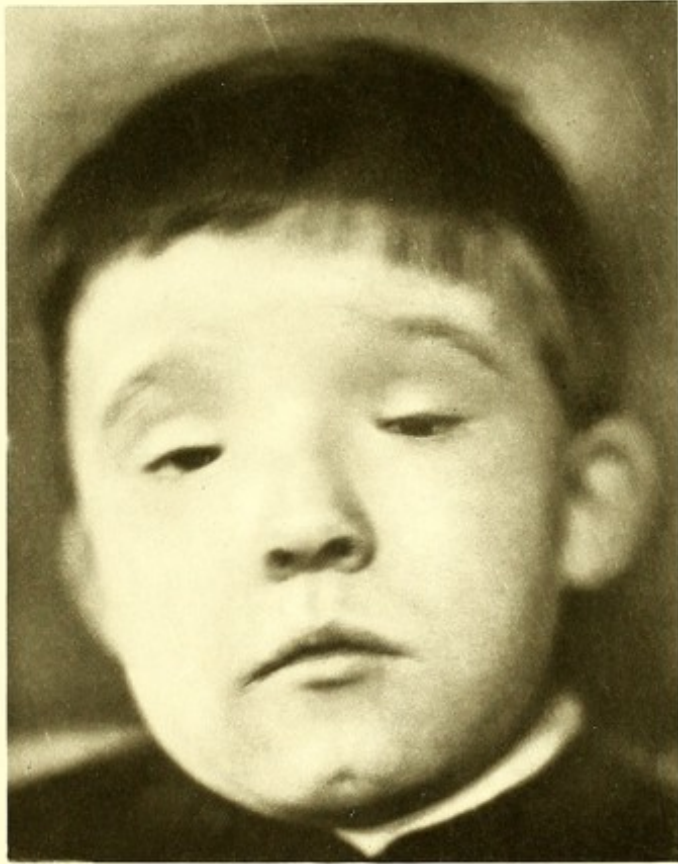
3. *Congenital Ptosis.*

This is the form of the disease illustrated in the plate. It is usually partial, affects both eyes, and is often hereditary. It is frequently associated with paralysis of the superior recti muscles, and occasionally co-exists with flattening of the bridge of the nose, and the presence of a semilunar fold of skin covering the inner canthus—epicanthus (ἐπί, upon, καθός, the corner of the eye). It is characterised by an atrophic condition of the affected eyelids, and is due either to a defect in the development of the levator palpebrae superioris, or to a congenital abnormality of the nerve centres. In a well marked case the upper lids droop so much that they almost cover the pupil, and in order to see better the patient gets into the habit of throwing the chin forward, and forcibly contracting the frontalis muscles. This attitude is very characteristic, and not less so is the anxious expression produced by the wrinkling of the skin of the forehead, and the elevation of the eyebrows, due to the over-action of the frontalis from the constant effort of the patient to raise the upper lids. In this connection may be mentioned those cases of unilateral ptosis, where, as a result of some disorder in the central nervous arrangements, the lid cannot be raised by the strongest effort of the will, but the eye opens involuntarily with the contraction of the facial muscles—*e.g.* the affected lid moves synchronously with the opening of the mouth. A slight drooping of the upper lids may appear about puberty. This peculiarity often runs in families, and for the most part affects females rather than males.

PTOSIS.

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PLATE V



PTOSIS

4. *Senile Ptosis.*

It sometimes happens that the power of the levator muscle gradually diminishes with advancing years, so that the upper lids droop, and are raised only with great difficulty. As a result the palpebral fissure is narrowed, and the closing eyelids interfere with sight. In the aged there is also a superabundance of flaccid skin, the presence of which still further impedes the action of the levator muscles. As presbyopia approaches, patients often complain of difficulty in opening the eyes on first wakening from sleep in the morning. This transient ptosis, which may be so complete that the lids require to be raised by the fingers, is simply an evidence of eye-strain, and passes off speedily after the patient begins to use suitable spectacles.

5. *Paralytic Ptosis.*

This is due to a lesion of the oculo-motor nerve. The paralysis may affect the whole nerve or only some one or more of its branches. If the whole be affected, ptosis is complete, and when the paralysed eyelid is raised by the finger the patient at once complains of double vision and of giddiness. The eyeball is markedly divergent, and cannot be moved inwards, upwards, or downwards. The pupil is moderately dilated, and does not contract when exposed to the light, and as the ciliary muscle is also paralysed, the power of accommodation is lost, and the patient is unable to read. It occasionally happens that both third nerves are affected, but rarely are both paralysed completely.

Paresis, or paralysis of the ocular muscles, may be due to injury, or to pressure from tumours, etc., within the orbit, or it may be consequent upon the existence of such blood states as diphtheria, rheumatism, or syphilis. The lesion may be peripheral or central, the former being characterised by the absence of all cerebral symptoms, the latter almost invariably by their presence. When due to syphilis it indicates in many

instances the commencement of degenerative changes in the cerebro-spinal system. The paresis may be so slight that no squinting is noticeable, but if the patient sees with both eyes, he at once complains of double vision. It is well to remember that this diplopia may be of brief duration, and that it may pass off without the aid of medicine, but nevertheless it is of serious import, and the more transitory it is the worse the prognosis, for then it is to be regarded as an early symptom of disease of the spinal cord, more particularly *tabes dorsalis*. This transient diplopia is occasionally accompanied by contracted and unequal pupils, and under such circumstances its significance becomes all the graver. In other cases the paralysis is much more profound, and one muscle after another becomes affected until all the extra-ocular muscles are involved, and the *ophthalmoplegia externa* is complete. Similarly the muscles inside the globe may be paralysed, giving rise to complete *ophthalmoplegia interna*. In syphilitic cases the prognosis is the less favourable the longer the interval of time between the primary infection and the appearance of the diplopia; and naturally more serious results are to be feared in those who from carelessness on their own part, or from other causes, have not been subjected to a thoroughgoing course of antisyphilitic treatment at the outset.

Now and again reflex ptosis results from irritation of some branch of the fifth nerve. Quite recently I was consulted by a young man on account of slight drooping of the left upper lid. On the same side there was a decayed and painful molar tooth, which I advised him to get extracted, and within two days after this operation, the eyelid resumed its natural position.

Ptosis due to hysteria is also well recognised, but a much more important variety is that known as recurring ptosis. The nature of this disease is mysterious. At regular intervals there is complete paralysis of the oculo-motor nerve. Each attack lasts from a few days to several weeks, and then passes off completely, only, however, to return again after a longer or shorter lapse of time. The disease attacks females

oftener than males. It may appear in infancy or early childhood, and although it usually passes off as middle age is reached, it may persist throughout the whole of the patient's life. The attacks vary in frequency: when they occur but seldom they are usually of long duration. In the case of a girl who was under my observation the disease had existed from early childhood. It always affected the right side, and each paroxysm was ushered in by severe headache and vomiting. The attack lasted from three to four days, and then passed off, to return again, however, after an interval of a month. Here the disease seemed closely allied to migraine.

PLATE VI.

Naevus Maternus.

A birth-mark on the skin.

Synonyms: Mother's mark; Strawberry mark; Port wine stain; Erectile tumour; Telangioma (τέλος, end, ἀγγείον, vessel).

French, *Naevus*. German, *Muthermal*. Italian, *Neo-materno*.

IN its broadest acceptation the term naevus maternus includes every mark upon the skin which has existed from birth, but as ordinarily understood the name denotes simply the presence of a tumour composed wholly or in great part of blood-vessels. Such tumours occur most frequently in the skin or subcutaneous tissues, and the integuments of the head and face are a favourite seat for their development. They are occasionally seen in the eyelids, where, as the illustration shows, they may attain a large size, and implicate both the upper and lower lid. For clinical purposes a natural classification is into cutaneous and subcutaneous; but as the tumours vary in appearance according as arteries or veins predominate in their structure, they are also divided into the arterial and the venous. Many naevi are congenital, others appear shortly after birth, and still others develop later in life, more particularly about the time of puberty. Occasionally, but not often, they seem to result from injuries. Some after a time disappear spontaneously, while others attain a certain size and then remain stationary. Not unfrequently, though for no very apparent reason, they may, after lying dormant for a long time, suddenly begin to grow, and spread actively and steadily until they become very large. It is a wise rule therefore to remove even small naevi from the eyelids with as little delay as possible.

NAEVUS MATERNUS.

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NAEVUS MATERINUS.

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Although composed almost wholly of blood-vessels, naevoid tissue is of low vitality, and much more vulnerable than that of normal structures. After an injury, possibly at first considered trivial, the skin over a naevus may ulcerate deeply, thereby giving rise to profuse haemorrhage, or during a severe illness its whole structure may slough, or undergo cystic degeneration.

Cutaneous naevi are popularly called "port wine stains," and are superficial discolorations of the skin, varying, as arteries or veins predominate, from bright scarlet to deep purple. As a rule the more superficial they are the brighter the red. Some are so small that they are mere minute specks, others so extensive as to cover not only the eyelids but also the greater part of the face. A cutaneous naevus of large size may implicate the choroid, and is besides very disfiguring. When small they are usually situated on the skin level, but when more extensive they may project beyond the healthy integuments, and present a somewhat uneven surface.

A subcutaneous or cavernous naevus is spoken of as an erectile tumour. It usually forms a spongy, painless swelling, which presents two very characteristic signs. First, it swells up and becomes tense under the influence of vascular excitement, and if the patient be a child this increase in size is always apparent during the act of crying. Second, the naevus can be emptied of blood by the application of pressure, and for the time being the swelling disappears, reappearing whenever the pressure is withdrawn.

When the skin covering the tumour is implicated there is marked discoloration, and in addition to the minute network of vessels which shines through the substance large tortuous veins are to be seen traversing the surface. In a case of naevus of the lower eyelid which was recently under my care the tumour was most pronounced on the conjunctival surface, and extended deeply into the orbit. When this is so it usually constitutes a form of aneurism by anastomosis, and is far more formidable than the ordinary subcutaneous naevus. In these cases pulsation can

often be felt, and a humming sound may be detected by means of the stethoscope (Plate XLII.).

A naevus may have its seat in the conjunctiva or the caruncle, and in the child whose portrait illustrates this subject there was a large conjunctival naevus hidden from view beneath the swelling of the upper lid.

Oedema of the Eyelids.

(οἰδεῖν, to swell.)

A swelling produced by the effusion of serous fluid into the cellular tissue.

French, *Oedème*. German, *Wassergeschwulst*. Italian, *Edema*.

THE peculiar structure of the skin of the eyelids, and the absence of fat from its connective tissue, render it very liable to oedema. This ought not to be regarded as a disease *per se*, but should rather be looked upon as a sign of some other local or constitutional affection. The swelling, which sometimes rapidly becomes so great as to cause complete closure of the eye, may be either acute or chronic.

Acute oedema is very often symptomatic of a local lesion. It accompanies all forms of acute inflammation of the conjunctiva, more particularly those attended by profuse muco-purulent or purulent discharge (Plates XV. and XVI.). It occurs as a sequel to injuries—*e.g.* a blow, a burn, a bite or a sting from an insect, etc.,—occasionally follows surgical operations upon the tear passages, and may be so great after rough or awkward handling in syringing the lachrymal sac, as to cause the patient considerable alarm. A fugitive and occasionally recurrent form, which from the amount of itching almost invariably accompanying it, bears a close resemblance to urticaria, is met with in those whose digestion has become upset through abuse of stimulants. The general oedema produced by the irritation of a styne (Plate II., Fig. 3) or other circumscribed inflammation of the lid, may (especially where there is marked chemosis of the ocular conjunctiva) be so great as to conceal the local swelling.

Chronic oedema, on the other hand, is seen most frequently in the course of affections of the heart, liver, or kidneys, and a puffiness of the lids on rising in the morning is often present, especially at the menstrual period, in young women who are weakly and anaemic. The same appearances may arise from long continued use of arsenic—arsenical oedema—and this should always be remembered in diagnosing a case where there is persistent oedema of the eyelids, and it may be also of the extremities, though repeated examination has failed to disclose any evidence of either cardiac or renal disease.

Chronic oedema may also be due to local causes. It is occasionally symptomatic of chronic inflammation or other disease of the nasal mucous membranes, and it also occurs as a sign of necrosis, or of tumours of the orbit. It may be limited to slight puffiness, or be so great that the lids cannot be opened. After repeated attacks of erysipelas the skin of the eyelids sometimes becomes greatly hypertrophied, and there results a solid oedema, which may steadily increase until a condition resembling elephantiasis (*ἐλέφας*, an elephant) of the eyelids is reached. In these cases the hypertrophy is apt to progress even after the thickened skin has been removed, so that in order to reduce the deformity the redundant folds have to be repeatedly excised.

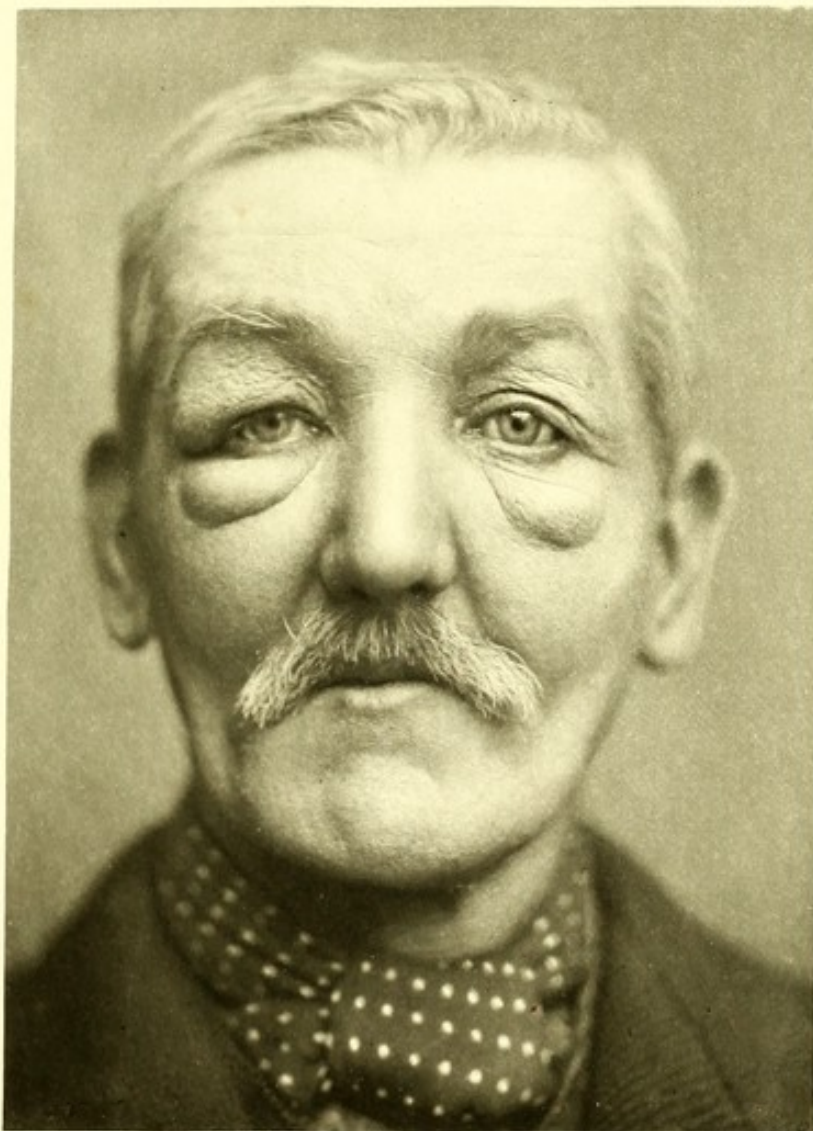
The swelling is soft, puffy, and smooth, differing from that seen in emphysema (*ἐμφυσᾶν*, to inflate) by the absence of the characteristic crackling on palpation. In the chronic form there is no discoloration of the skin, but in the acute there may be subcutaneous ecchymosis (*ἐκ*, out, and *χεῖν*, to pour), and when it is a part of an acute conjunctival inflammation the skin, semi-transparent from over-distension, is more or less red. These cases are also accompanied by chemosis (*χημν*, a gaping) of the ocular conjunctiva. Pressure upon the swelling leaves a distinct pit, which may in some cases remain for a considerable time after the finger has been removed.

OEDEMA OF THE EYELIDS.

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OEDEMA OF THE EYELIDS.

PLATE VII



OEDEMA PALPEBRARUM

Syphilis of the Eyelids.

(σὺς, a pig; φίλος, loving. The word was introduced by Sauvages, and is taken from Syphilus, a shepherd, who figures in Fracastor's "Siphilidis," published in 1530.)

Synonyms : Palpebral Chancre; Morbus Gallicus.

French, *Syphilis des paupières*. German, *Siphilis der Augenlider*. Italian, *Lue delle palpebre*.

SHOULD syphilitic poison gain entrance to the system through the eye, the primary sore forms upon the eyelids or conjunctiva, the favourite seat of the chancre being at the inner canthus. The disease is met with in persons of all ages, is seen in men oftener than in women, and the lower lid is more frequently affected than the upper. In many instances the infection is purely accidental and non-venereal, and the patients have no suspicion of the nature of the sore. Often therefore the source of the contagion can be traced only with difficulty; sometimes it cannot be determined at all.

The most frequent modes of communication, however, are undoubtedly the finger, the mouth, the tongue, or previously contaminated sponges, towels, etc. From this it will be readily understood how medical men suffer so frequently from this particular form of chancre. While a doctor is brushing a syphilitic throat, he may receive infection from the accidental fall of saliva on his face through the patient's coughing; or after touching a syphilitic sore he may accidentally carry his finger to his eye, and thereby inoculate himself. Some time ago I was consulted by a dentist, who told me that seven

years previously, while extracting a tooth, his face was bespattered with blood and saliva. Some weeks afterwards a typical chancre formed on the right lower lid at the inner canthus, and this was in due course followed by all the usual symptoms of secondary syphilis. Infants and young children are often infected by being kissed by a nurse suffering from mucous patches in her mouth. The disease may be spread through the practice common among the lower classes of removing foreign bodies from the eye by means of the tongue. Should there be mucous patches about the lips of the operator, the contagion is immediate. Cases of palpebral chancre also arise from the common custom of incising the skin and sucking out the effused blood from a bruise about the eye. "Fasting spittle" or urine, both of which are frequently applied by the poor to inflamed eyes, may also be a source of contamination, and as these remedies are employed when the edges of the eyelid are inflamed and partially denuded of epithelium, the syphilitic poison will gain all the more ready access to the system. It has been affirmed that extra-genital chancres, and more particularly those occurring upon the eyelids, are apt to be followed by specially severe secondary symptoms; but my own experience does not tend to confirm the statement.

The following case will serve as a typical description of chancre of the eyelid: W. T., aged six, from whom the accompanying illustration (Fig. 1) was taken, came under my care in August, 1896. On the left lower lid was an ulcer, which was said to have commenced as a little pimple upon the palpebral margin. It involved the middle two-thirds of the lid, the edge of which was partially eaten into, and denuded of eyelashes; was clearly circumscribed, its edges being hard and somewhat elevated; and was covered by a greyish crust, the removal of which left a raw surface, which bled freely (Fig. 2). There was marked oedema of the ocular conjunctiva, and marginal blepharitis had for several months affected both upper and lower lids on the right side. The gland in front of the left ear was distinctly swollen, but not tender

SYPHILIS OF THE EYELID.

Fig. 2. Chancre of the Eyelid.
page 30.

Fig. 3. Gumma of Conjunctiva.
page 31.

Fig. 1. Chancre of the Eyelid.
page 30.

Fig. 4. Lupus of the Eyelid.
page 32.

Fig. 5. Epithelioma of the Conjunctiva.
pages 32 and 35.

SYPHILIS OF THE EYELID.

Fig. 2. Chancre of the Eyelid.
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Fig. 3. Gummata of Conjunctiva.
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Fig. 1. Chancre of the Eyelid.
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Fig. 4. Lupus of the Eyelid.
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Fig. 5. Epithelioma of the Conjunctiva.
Pages 32 and 33



to touch. The appearance at once suggested chancre of the eyelid, but all the history that could be obtained was that the boy had received a scratch from a girl's finger-nail three weeks before. From what could be learned of the child's home surroundings, however, it is more than likely that he was infected by one of his own relatives, who kissed the eyelid after it had been scratched.

Grey powder and quinine, half a grain of each three times a day, were prescribed, and the sore was dusted with iodoform, but in spite of this treatment the ulcer gradually increased in size, and the sub-maxillary, cervical, and supraclavicular glands became swollen on the left side. Like the swollen pre-auricular gland, these also were hard, freely movable, and painless. A fortnight afterwards, a papular rash, distinctly coppery in colour, appeared over the chest, and in a few days covered the whole body with the exception of the face. There was no sore throat. The powders were now (18th September) stopped, mercurial inunction was begun, and the ulcer dressed with black wash. Improvement set in almost immediately, and in three weeks' time the eruption had disappeared, the ulcer had in great part healed, and the glandular swellings had become markedly reduced in size. By the end of October all that remained of the chancre was a small erosion along the border of the lid. The mercurial inunction was then stopped, and small doses of biniodide of mercury were prescribed. When the patient was last seen (February, 1897) the glandular swellings were quite gone, and the only trace of the chancre was along the margin of the lid, where there was a slight loss of substance, and seemingly permanent disappearance of the eyelashes.

Figure 3 represents the eye of a woman who had suffered severely from syphilis during the early years of her married life. All secondary symptoms had disappeared, but as a result of the illness her general health had greatly deteriorated, and she had been left in an ailing condition. Her eye had never given her any trouble

until a few weeks before I saw her, when a swelling was noticed. This, which was in the left lower retro-tarsal fold, was hard, painless, and nodulated, and spread rapidly over the lower part of the eyeball. Its surface was traversed by several large tortuous blood-vessels, and the conjunctiva covering it was red and fleshy-looking. When the lower lid was everted, and the eye-ball rotated upwards, an ulcer with ragged edges, and covered by a greyish-yellow slough, was exposed to view. The eye continually watered, and there was slight muco-purulent discharge. The cornea was not affected. The swelling disappeared rapidly under the influence of antisyphilitic medicines, and in a few weeks no trace of it could be detected.

Figure 4. Lupus of the Eyelid (Latin, *lupus*, a wolf).—Of all the various forms of ulceration of the eyelids, the tubercular is that most apt to be confounded with the syphilitic. They closely resemble one another, and both are accompanied by a hard and painless enlargement of the pre-auricular gland. In lupus, however, the margins of the ulcer are not so hard as in chancre, and there is nearly always associated with it similar ulcerations of the skin of the nose, the lips, or the cheek. This comparatively rare disease often begins in the palpebral conjunctiva. It progresses slowly, and as it creeps along the surface it also eats into the substance of the lid. It is usually accompanied by a considerable amount of inflammation, so that the whole lid becomes red and swollen. The ulcer is usually saucer-shaped, and is surrounded by an irregular raised margin. When free from discharge, the surface is pale red in colour, bleeds readily, and is somewhat tender to touch.

Figure 5 represents an epithelioma of the ocular conjunctiva of nine months' duration. The patient was under the care of Dr. Argyll Robertson, to whom I am indebted for the illustration.

Epithelioma of the Eyelids.

(ἐπί, upon, and θηλή, a nipple.)

A malignant tumour consisting chiefly of epithelial cells, and forming primarily in cutaneous or mucous surfaces.

Synonyms: Cancer of the eyelids; Epithelial cancer.

French, *Epithélioma des paupières*. German, *Epithelioma der Augenlider*.

Italian, *Epitelioma delle palpebre*.

EPITHELIOMA develops most commonly at the junction of skin and mucous membrane. It is oftenest seen in the lips, but not unfrequently attacks the edges of the eyelids. Primarily it consists of an overgrowth of epithelium, which, alike in skin and mucous membrane, has the peculiar cell formations known as "nests." In its earliest stages the disease may appear either as a wart, a fissure, or a nodule, but in every case ulceration occurs sooner or later, and gives rise to an open sore, with hard and "rampart-like" edges. These three clinical forms of epithelioma are identical in their microscopic structure, and all of them tend to infect the lymphatic glands in the neighbourhood, and to recur after they have been excised. They vary, however, in the rapidity of their growth and the extent of the ulceration, as well as in the degree of malignancy, according as the disease has originated in the papillae, or the glands of the skin, or mucous membranes, or has involved from the beginning the whole thickness of the integument. When the glandular structures are primarily involved, there is an ulcerating, warty growth projecting from the surface. This progresses slowly, and consequently admits of

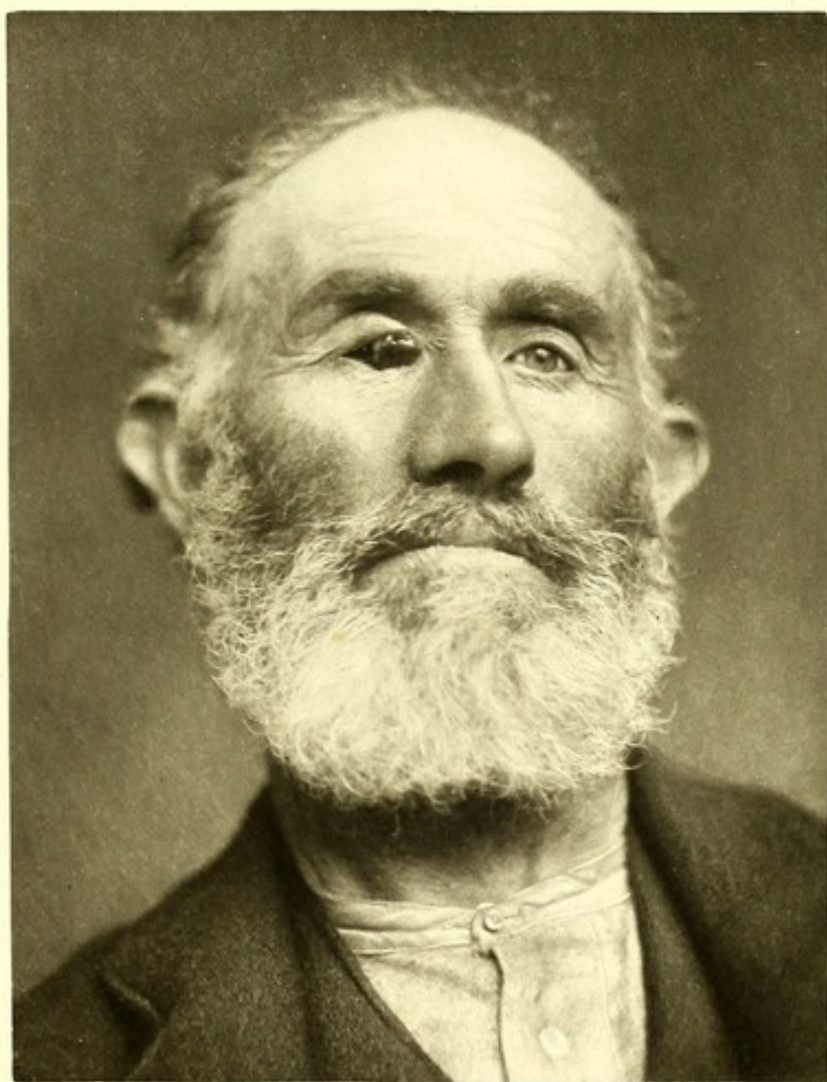
a much more favourable prognosis than is possible when the skin is involved in its whole thickness, for then the disease burrows both deeply and widely. No structure except cartilage is able to resist the rapid spread of its attack. From the surface of the ulcer there comes a constant foetid discharge, and every now and then, as the disease eats through the walls of the blood-vessels which lie in its way, free haemorrhage occurs. Every case of epithelioma will, if left to itself, terminate fatally, as the steadily progressive ulceration and frequent bleeding exhaust the patient's strength. A fatal issue is sometimes also hastened by the occurrence of complications incidental to the infection of the neighbouring lymphatic glands, and the dissemination of the disease through other parts of the body.

The form of the disease chosen for illustration is the superficial or papillary. The patient was a farm labourer, sixty-five years of age. Early in the summer of 1897 he noticed a little growth about the size of a split-pea projecting from the edge of his right upper eyelid. He showed it to his medical attendant, who told him it was a wart, and there and then snipped it off with a pair of scissors. Very soon, however, there appeared in the same place a swelling, which grew rapidly, though its full extent was concealed until the upper lid was everted, when a tumour about the size of a hazel-nut could be seen growing from the ciliary border to which its base was firmly attached, though its main portion was non-adherent to, and could be easily separated from, the palpebral conjunctiva. The base was hard and cartilaginous, but the surface of the unattached portion was spongy and friable, roughly lobulated, and so vascular that it bled on the slightest touch. The cutaneous surface of the lid was unaffected, and the skin was freely movable over the tumour, but the ocular conjunctiva opposite the growth was much injected, while its inter-palpebral portion at the inner side of the cornea was degenerated, and of a reddish grey colour, forming a pseudo-ptyerygium. There was no enlargement of the neighbouring lymphatic glands.

EPITHELIOMA OF THE EYELID.

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PLATE IX



EPITHELIOMA

Epithelioma of the conjunctiva (Plate VIII., Fig. 5) is a comparatively rare disease. Usually it begins as a small pimple at the corneo-sclerotic border, but it sometimes develops in a cicatrix. It is seldom seen before the age of forty. The tumour rarely attains a large size, but it quickly ulcerates, and assumes those appearances characteristic of epithelioma in other parts of the body. It usually infects both the pre-auricular and the submaxillary glands, and as a rule recurs speedily after excision. It may be mistaken for syphilitic ulceration, but in epithelioma the patient is usually more advanced in years, the progress of the disease is slower, and the lymphatic glands are longer in becoming implicated.

PLATE X.

Rodent Ulcer.

(Latin, *rodere*, to gnaw.)

A slowly progressive ulcer, usually affecting the upper part of the face, and destroying the tissues which it invades.

Synonyms: Jacob's ulcer; Cancerous ulcer of the face; Cancroid ulcer.

French, *Cancroïde*. German, *Cancroid*. Italian, *Ulcera rodente*.

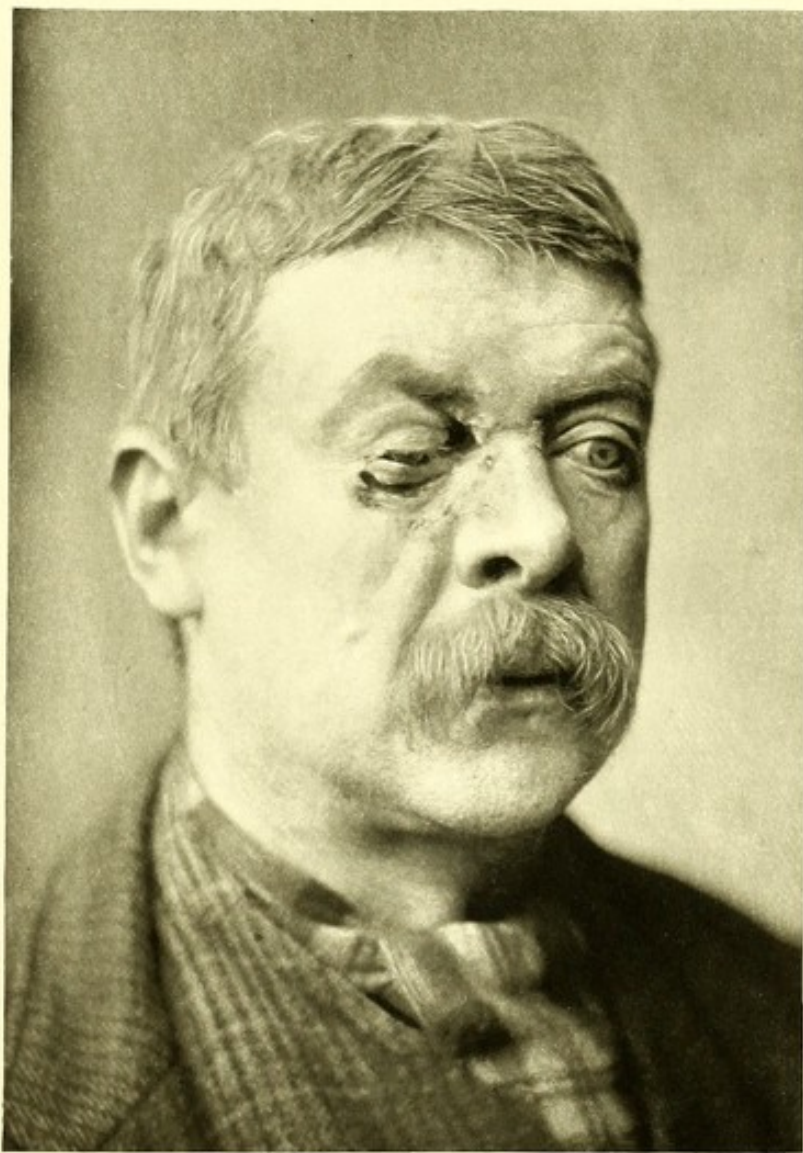
THE microscopic appearance of the tissues invaded by rodent ulcer hardly differs from that of those affected by epithelioma, and hence some authorities regard the disease as simply a variety of the latter. Since, however, its clinical features—slow ulceration, extending over many years, and not causing infection of the lymphatic glands in its neighbourhood—are so peculiar, it is better to describe it as non-cancerous, and to call it by a perfectly distinctive name. Moreover, although it is locally malignant, and destroys every tissue which it attacks, yet if in its earliest stages it be freely excised, it does not recur. It is usually seen in elderly patients, and the glands of the skin of the lower eyelid, near the inner canthus, are probably the most frequent point of origin.

Commencing as a soft tubercle covered by smooth skin, the growth at first somewhat resembles a wart, and in this condition it may remain for years, and attract but little attention. As the patient grows older, however, an ulcer develops, with edges sharply cut and hard, but not markedly elevated. Superficial at the outset, it penetrates deeply in the end, and its dry and somewhat glossy surface is frequently covered by a reddish-brown scab. In epithelioma (Plate IX.) there is usually an overgrowth of tissue accompanying the process of ulceration, but in rodent ulcer there is no such overgrowth, as the disease, when once fairly

RODENT ULCER.

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PLATE X



RODENT ULCER

started, does nothing but destroy. There may at first be cicatrisation and healing, but this is only for the time being, as the disease breaks out afresh, and sooner or later makes steady progress.

In the patient from whom the illustration was taken, the disease had existed for at least eight years, for more than six of which it was practically at a stand-still. After that time, however, it began to strike deeply and to progress steadily, destroying the inner end of both the upper and lower lids, and causing by the side of the nose a deeply excavated ulcer.

The following is a description of a case which came under my observation at a very advanced stage. The patient was a man of about seventy years of age. He had suffered from rodent ulcer for many years, and not only were both the upper and lower eyelids on the right side destroyed, but the eyeball itself had been eaten into and had burst, and the bones bounding the inner wall of the orbit and the side of the nose had been denuded of their periosteum, and were becoming carious. Such was the deplorable condition of this patient when I first saw him, and for nearly four years I was able to watch the further progress of the disease, which, in spite of all that could be done to prevent it, steadily extended its boundaries. It crept down the cheek, and, after destroying the soft parts, laid bare the bones, in part so completely that, through a hideous opening into the right nasal fossa, the turbinals were entirely exposed to view. Nor did the disease confine its ravages to the right side of the face, for, crossing the bridge of the nose, it reached the left eyelids, and after partially destroying them, invaded the orbit. The left globe was attacked, and the ulceration, creeping along the conjunctiva, seriously involved the cornea. The patient's state was then most pitiable. He was almost blind, and his suffering was so acute that he could get rest neither by day nor by night, except by the use of large quantities of laudanum. His palor was like that of death, his emaciation extreme, and after at least twelve years of continuous suffering, he died from sheer exhaustion.

PLATE XI.

Diseases of the Tear Passages.

Synonyms: Lachrymal catarrh (*lachrymalis*, from *lachryma*, a tear); Blennorrhoea of the lachrymal sac (*βλέννος*, mucus, and *ρῆν*, to flow); Mucocoele (*mucus*, mucus, and *κῆλη*, a tumour; Dacryocystitis (*δάκρυον*, a tear, and *κύστις*, a bladder).

French, *Maladies des voies lacrymales*; German, *Erkrankungen der Thränenorgane*; Italian, *Malattie delle vie lacrimali*.

SOME people suffer almost constantly from "watery eye." Any exposure to wind or light stimulates secretion so greatly that tears are continually gathering on the edge of the lower eyelid; and this takes place, of course, all the more readily when there is any congenital narrowness of the lachrymal passages, *e.g.* when the bridge of the nose is flat and depressed, or when the features are very sharp. The excess of moisture renders vision indistinct, the constant wiping of the eyes produces considerable irritation, and a certain amount of conjunctivitis develops (Plate II., Fig. 2). The watering and inflammation always increase with exposure to cold winds, but, as a rule, pass off when the weather becomes warm. An examination of the nose should always be made in such cases, for in nearly every one the nasal mucous membrane will be found to be involved. The nostril on the affected side may be dry and slightly inflamed, or there may be a swollen and oedematous condition of the spongy tissue covering the inferior turbinated bone; and as the disease travels towards the eye, the lining membrane of the lachrymal duct becomes swollen and the calibre of the passage contracted. When the upper eyelid is everted, the retro-tarsal fold may be found hypertrophied, and there is hyper-secretion of mucus from the Krause's

glands which it contains. In other cases persistent watery eye seems to be due to some optical defect, and then lachrymation is always greatest after reading or writing. By far the most common cause, however, is either some displacement of the puncta, or some obstruction in the canaliculi.

In all injuries involving the inner canthus—*e.g.* wounds, burns, etc.—the puncta, the canaliculi, and even the lachrymal sac are very liable to be implicated, and after cicatrisation their function may be found to have been very seriously interfered with. In dealing with any such case it is therefore necessary, from the outset, to pay special attention to the condition of the tear passages, and to take every available means to ensure the maintenance of their permeability. The inferior canaliculus is the larger, and plays the more important part in excretion, so that when its punctum is displaced much lachrymation follows, even though the orifice of the superior duct is in accurate apposition to the eyeball. Displacement of the puncta may arise from want of tone in the fibres of the orbicularis palpebrarum, a condition frequently seen in the aged, the result of shrinking of the tissues from senile atrophy (Plate III., Fig. 2); or it may occur in paralysis of the facial nerve (Plate IV.). Eversion of the eyelids may take place from many different causes, and the ectropion thus produced turns the puncta outwards, and withdraws the mouth of the canaliculus from the lacus lachrymalis, with the result that the conjunctival surface may become cuticular. Should the lids be inverted in consequence of burns, wounds, granular conjunctivitis, etc., the puncta are again in a faulty position, and the tears collect at the caruncle and trickle over on to the cheek. A similar result may be brought about by the separation of the lid from the eyeball through chronic thickening of the palpebral conjunctiva, enlarged caruncle, or polypoid or other tumour of the conjunctiva situated near the inner canthus. The puncta are occasionally congenitally absent, or they may be obliterated from disease of, or injury to, the eyelids. It rarely, however, happens that both upper and lower are destroyed, the latter being generally the

one that is closed. Inflammatory swelling of the lining membrane of the canaliculi may become so pronounced as to obstruct the excretion of the tears; or a foreign body—*e.g.* an eyelash—may find its way into a canaliculus, most frequently the upper, and not only form a complete barrier to any outflow, but also set up considerable inflammation. The canaliculi may also be obstructed by the formation of calculous deposits in their interior—dacryoliths.

As has been already said, many of these disturbances are of nasal origin. Chronic hypertrophic rhinitis is responsible for the occurrence of many conjunctival affections, and may be the cause of eye symptoms that are purely reflex. Certain cases which present a well-defined clinical picture have been grouped under the name of "lachrymal catarrh" (Plate II., Fig. 2). There is a history of "cold in the head," which had been present for a longer or shorter time before the eye symptoms showed themselves. Then, after some exposure to cold, more especially when the patient has been heated, there is a sensation as if a foreign body had entered the conjunctival sac, and an itchy feeling in the eyelids is followed by a burning sensation. The lids swell slightly, turn dusky red, and may have ulcerated edges. There is excessive lachrymation, and, after a time, a slight mucous discharge, which may be so abundant as to glue the lids together during sleep, is seen adhering to the roots of the eyelashes. The conjunctiva is injected, and the caruncle and semilunar fold are swollen. When the eyelid is pulled outwards the lachrymal papilla is seen to be enlarged, and the punctum is dilated and patulous—very characteristic symptoms. Pressure over the tear sac usually causes regurgitation of clear watery fluid through the lower canaliculus. There may be slight spasmodic closure of the eyelids and inability to look at the light. If the patient be exposed to cold or damp, such symptoms may persist for a long time, the discomfort being some days greater, other days less, but never entirely gone, and always aggravated by the necessarily constant use of the handkerchief, or by the rubbing of the eyelids to try to obtain

DISEASES OF THE TEAR PASSAGES.

Fig. 1. Abscess of Lachrymal Sac, and Mucocoele.
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Fig. 2. Acute Dacryocystitis.
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Fig. 3. Fistula lachrymalis.
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relief from the intolerable itching. The swelling of the conjunctiva also tends to separate the punctum from the eyeball, and, if the disease be not controlled by treatment, a vicious circle is developed, whereby the disease is perpetuated.

Catarrh of the Lachrymal Sac and Stricture of the Nasal Duct.

After a "watery eye" has persisted for a time, it may have been for months or even years, a slight swelling is observed at the inner canthus, over the region of the lachrymal sac. This, at first insignificant, becomes more and more conspicuous as the disease progresses. It is painless, and the skin (which is at the outset of a natural colour, but may subsequently become inflamed) glides freely over it. When the tumour is pressed upon, its contents pass downward into the nasal duct, and the swelling disappears. In a few hours, however, there is a return to the former condition; a fresh accumulation of tears has formed, and by-and-by this, mixed with catarrhal discharge, produces irritation, which at length passes into inflammation of the wall of the sac. As the tumour grows larger a point is reached when, the nasal duct having become blocked, the contents can no longer be pressed downwards into the nose, but regurgitate through the puncta and overflow the eye. The discharge usually consists at first of glairy mucus, like white of egg, streaked with pus; but this after a time becomes turbid and more distinctly purulent. The name blennorrhoea, however, which is often applied to this form of disease, implies, not that there is a specific inflammation analogous to blennorrhoea of the conjunctiva, but only that the secretion contains pus. Under the microscope the discharge is seen to swarm with micro-organisms of many kinds, and it is so virulently infective that when it comes into contact with an abrasion of the cornea purulent infiltration speedily occurs. Contact with an operation wound is still more dangerous. After operations

for cataract, the eye has been, in many cases, lost through suppuration arising from a latent blennorrhoea, and to operate when the tear passages are not permeable is simply to court disaster. The discharge irritates the conjunctiva, which becomes more or less inflamed; and owing to the ophthalmia tarsi which frequently co-exists, the caruncle and semilunar fold are red and swollen. Whenever one eye alone is thus affected suspicion ought at once to fall upon the lachrymal passages as the cause of the evil.

As the tumour becomes larger, pressing fails to empty it, as the canaliculi are blocked as well as the nasal duct. The walls of the sac become relaxed and thinned from the pressure of the accumulating discharge; and a swelling of a bluish-grey colour, of a size varying from a horse-bean to a walnut, fluctuant, and grooved on its anterior surface by the internal palpebral ligament, forms at the inner canthus. This is called a mucocele, and is usually painless, but may produce much disfigurement (Fig. 1, left eye). It causes constant lachrymation, and patients often complain of dryness of the nostril on the same side. When a catarrh of the tear sac has existed for a long time, periostitis, followed by caries of the lachrymal bone, always occurs; so that when a probe is passed along the canaliculi it strikes against bare bone.

Blennorrhoea of the lachrymal sac is more frequent among women than men, and more especially in those who, like washerwomen, are exposed to considerable alternations of heat and cold. It is also more likely to occur in those whose systems are low, and that is probably why diseases of the tear passages are so common among women who are nursing children. In some instances it is clearly connected with syphilis or tubercle, and in such cases caries of the bones surrounding the nasal duct always occurs at an early stage of the disease. It is sometimes met with in infants, and being then due to a congenital narrowness of the nasal duct, passes off, as a rule spontaneously, as soon as the tear passages become fully developed.

Acute Dacryocystitis and Lachrymal Fistula.

In most instances acute dacryocystitis appears as a complication in the course of chronic catarrh of the tear sac, and comes on as a result of exposure to cold (Fig. 1, right eye, and Fig. 2). It may, however, also occur after any injury in the neighbourhood of the sac; in the course of affections of the nasal mucous membrane—especially in subjects whose health has broken down, and more particularly where there is syphilitic disease of the nose; or after measles and scarlatina. Occasionally infants are born with dacryocystitis, or suffer from it within a few weeks of birth. The onset of the disease is usually marked by shivering and rise of temperature, and there is intense pain in the region of the sac, where the skin becomes red and oedematous. Between the root of the nose and the inner canthus a swelling appears, so painful that the patient shrinks the moment it is touched, and at first well defined, but becoming, as the surrounding tissues are involved, more diffuse and extending to the eyelids and cheeks. The symptoms of local inflammation are sometimes so severe that the disease has been mistaken for erysipelas, an error all the more likely to be made should the initial feverishness be great. As the size of the swelling increases, the skin assumes a more angry red, and becomes glistening from the tension to which it is subjected; the tumour, at first firmly elastic and resistant, becomes fluctuant, and, at a point below the internal palpebral ligament a yellowish spot appears, over which, if no operation be performed, the skin gives way and a passage is opened for the escape of the purulent contents of the sac. The bursting of the abscess brings immediate relief, and if the opening in the skin be large enough to permit of the free escape of the pus, the swelling and redness soon subside. Should the nasal duct be permeable the opening will close and the cure be complete; but if, as often happens, the opening into the abscess cavity remains, tears and muco-pus continue for a long time to escape through the false passage

thus formed (Fig. 3). In cases which have been long neglected, especially in scrofulous and syphilitic subjects, the adjacent bones become carious, and inflammatory swelling, and sprouting granulations, appear round the fistula. In a few rare cases the abscess perforates the lachrymal bone, when its contents escape into the nose.

Though acute dacryocystitis may be mistaken for erysipelas, it is not, as a rule, at all difficult to distinguish the one from the other. In the former the general febrile disturbance is not so great, the redness and swelling rarely pass over the nose to the other side of the face, and the presence of a well-defined tumour at the inner canthus is quite pathognomonic. The disease may also be confounded with abscess at the root of the canine tooth, but in the latter the inner canthus is free from tenderness and circumscribed swelling, though tumefaction of the canine fossa can be readily detected by palpation. In hordeolum or ordinary "stye" the oedema of the eyelids and the parts around may be very great, but palpation will show that the tender spot is not over the tear sac, but at a point on the margin of the eyelids, where in a day or two a suppuration will form and burst. In the accurate diagnosis of all tumours, abscesses of the skin, boils, etc., in the neighbourhood of the sac, and likely to be mistaken for inflammation of it, the absence of a history of previous watery eye is of the first importance.

The illustration in Fig. 1 was taken from a woman, twenty-nine years of age, who said that she had always enjoyed good health, and who certainly presented no signs of any constitutional weakness. The bridge of her nose was flattened, and this anatomical configuration naturally gave rise to congenital atresia of the tear passages. From childhood she had been greatly troubled by "watery eyes," and for several years she had observed that there was a slight swelling at each inner canthus, over the region of the lachrymal sac. These swellings, which were quite painless, gradually increased in size. When they were pressed, fluid passed into the nose and throat,

and they disappeared for several hours. As they increased in size it became impossible to empty them thus into the nose, but when pressure was applied their fluid contents overflowed the eye. As will be seen from the photograph, which was taken when the patient was first seen, the left lachrymal sac was very much distended (mucocoele), the swelling being about the size of a hazel-nut, bluish-grey in colour, quite painless, and fluctuant on palpation. It almost entirely disappeared when pressed by the finger, a very considerable quantity of glairy muco-purulent fluid escaping at the same time from the canaliculi into the conjunctival sac. The mucocoele on the right side suddenly became intensely painful and the skin covering it of a bright red colour. The sac had suppurated, and as a result of the implication of the tissues immediately around, the swelling had become larger. On its anterior surface a yellowish spot, situated below the inferior margin of the internal palpebral ligament, marked the place where the skin was about to give way to permit of the escape of the pus. When a probe was passed the nasal duct was found to be firmly blocked and its bony walls were extensively necrosed.

PLATE XII.

Empyema of the Frontal Sinus.

(ἐν, within; and πύον, pus.)

A collection of pus in the frontal sinus.

French, *Empyème du sinus frontal*. German, *Empyem der Stirnhöhle*.

Italian, *Empiema dei seni frontali*.

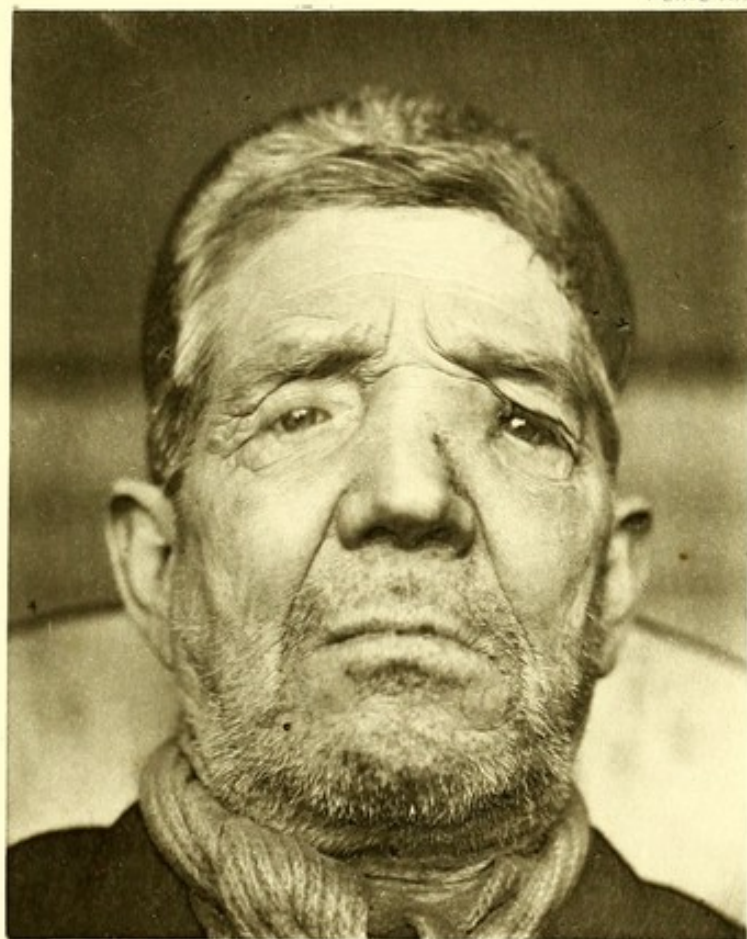
THE air spaces of the skull occasionally become enlarged as a result of inflammation followed by suppuration. In the early stages such cases are very difficult to diagnose, and consequently it is always important to obtain an accurate account of the onset. The protuberance at the inner angle of the eye in the case chosen for illustration was due to empyema of the frontal and anterior ethmoidal sinuses, and resembled in appearance and in situation a greatly distended lachrymal sac. There was, however, no previous history of lachrymation; the swelling was considerably larger than an ordinary mucocele, and could not be made to disappear on pressure; and there was no regurgitation of mucus or tears through the puncta lachrymalia.

Suppuration of the frontal sinus may be acute or chronic. It is usually confined to one side, and is always preceded by inflammation of the nasal mucous membrane. The rhinitis may have been due to an injury; or have developed as a result of syphilis or of tubercle; or it may have appeared during the course of influenza, glanders, typhoid fever, pneumonia, erysipelas, etc. The first symptom is pain at the upper part of the nostril and between the eyebrows, from which it may be reflected along the branches of the trigeminus. It is aggravated by coughing or stooping the head, and is at times so severe and so

EMPHYEMA OF FRONTAL AND ANTERIOR ETHMOIDAL SINUSES.

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EMPHYEMA OF FRONTAL AND ANTERIOR ETHMOIDAL SINUSES

constant as to preclude all possibility of rest either by day or by night. It may be accompanied by one or more reflex ocular symptoms, such as photophobia, blepharospasm, oedema of the upper lid, hyperaemia of the conjunctiva, dilatation of the pupil, or asthenopia.

If at this stage the nose be carefully examined, pus may be seen dropping from the sinus into the corresponding nostril, and, contrary to what obtains in ozaena, the foul odour of the discharge is distressing to the patient, unless, as a previous result of the disease, the sense of smell has been lost. The free escape of the pus relieves the pain and mitigates the other symptoms; but it frequently happens that the discharge is pent up within the sinus, whose bony walls become thinned, yield to the pressure, and bulge to the outside. In this way the cavity of the orbit may be encroached upon to such an extent as to bring about considerable displacement of the eyeball. The pus, finding its way into the anterior ethmoidal cells, may burst into the orbit and cause an abscess; or a direct communication may be established between the air cells and the surrounding tissues, with the result that, whenever the patient sneezes, coughs, or blows his nose, these become infiltrated with air, and produce more or less extensive orbital emphysema—*ἐμφυσᾶν*, to inflate.

An empyema of the frontal sinus, if left to itself, will in all likelihood burst externally, through the skin covering the naso-orbital angle and the inner half of the upper eyelid; but now and again the rupture takes place into the cranial cavity, while in a very small proportion of cases there is, as in mastoid disease, a progressive infection of the cranial bones, leading to intracerebral suppuration, or even to general pyaemia.

The following case, which was under my care in 1895, is a typical example of empyema of the frontal sinus. The patient was a woman, twenty-two years of age, who complained that for more than a month she had been suffering from a dull, heavy pain in her forehead and over the temporal region of the right side. She was unable to assign

any cause for it, but stated that for a considerable time she had been troubled by a foul-smelling purulent discharge from her right nostril. Latterly this had not been nearly so profuse, but the pain had come, and a swelling had appeared at the upper and inner aspect of the right orbit. At this time also she began to be annoyed by diplopia. The orbital swelling had steadily increased in size, and with its growth the eyeball had become unnaturally prominent and displaced outwards and downwards. No abnormality, however, was detected in the fundus oculi, and the vision of the eye was quite normal. The tumour was painful on percussion, and though on palpation it presented a pretty uniformly hard and somewhat nodulated surface, yet at its inner and upper part there was an area which was distinctly soft and fluctuant. When the overlying tissues were dissected, and the surface of the tumour exposed, its outer wall was found to consist of a layer of bone as thin as an egg-shell. In several places the osseous structure had completely disappeared, and a purplish-red membrane bulged through the gaps thus left. As the dissection proceeded this was accidentally punctured, when there was an escape of a large quantity of stinking pus. The projecting wall of the sinus was clipped away with scissors, and when the cavity was exposed, its lining membrane was found to be extensively diseased. The parts were thoroughly cleansed with weak carbolic solution, and a free communication was established between the sinus and the nose. The eyeball gradually resumed its normal position in the socket, and two months afterwards, when the external wounds were healed, there was no trace of exophthalmos. The downward and outward displacement of the globe had also disappeared so completely, and the action of the extra-ocular muscles was so perfect, that in no position of the eyes could diplopia be induced.

TUMOUR OF THE BASI-SPHENOID.

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TUMOUR OF THE SPHENOID

Diseases of the Sphenoidal Sinus.

French, *Maladies du sinus sphénoïdal*. German, *Krankheiten der Keilbeinhöhlen*.

Italian, *Malattie dei seni sfenoidali*.

IN the body of the sphenoid are two sinuses of variable size, separated by a partition of thin bone. Each opens into the superior meatus of the nostril on its own side, and is lined by a prolongation of the nasal mucous membrane, being thus brought into direct continuity with the other air spaces of the face. The sphenoidal sinus is therefore liable to those inflammatory diseases which have just been described in connection with Plate XII. as attacking the frontal and ethmoidal. In 1897 a case was under my care in which all these sinuses were simultaneously implicated. The patient was a woman twenty-four years of age. When she was sixteen she began to suffer from blennorrhoea of the left lachrymal sac, accompanied by chronic rhinitis and extensive necrosis of the bones in the neighbourhood of the tear sac. With treatment her symptoms disappeared, and she remained comparatively free from discomfort for nearly four years. About the end of that time, however, she became much troubled by a purulent discharge from the left nostril, which lasted for a year and then gradually ceased. With its cessation there appeared at the inner canthus a swelling which increased in size for some months and then burst to the outside. There was at once a free escape of pus which lasted for six months and then ceased. The external opening closed at the same time and the patient thought her recovery complete. There was, however, only a brief respite, for in a few weeks the swelling reappeared, and, increasing steadily, encroached upon the cavity of the orbit, and produced a downward and outward displacement of the eyeball.

The sight became affected, and ophthalmoscopic examination revealed distinct signs of a commencing optic neuritis. At this time—January, 1897—the swelling, which was soft, fluctuant, and somewhat painful on pressure, occupied the space between the outer border of the left nasal bone and the inner canthus. It was freely incised through the skin, and when the cavity was probed it was found that the ethmoid was extensively diseased, and that a narrow channel filled with pus extended backward into the left sphenoidal sinus. In order to permit of more effective drainage a large portion of the middle turbinal bone was removed from the left nostril, and the parts were kept thoroughly clean with weak antiseptic lotions. The patient made most satisfactory progress, and had, a year after the operation, practically recovered.

The occurrence of optic neuritis in this case is easily explained when it is remembered how thin is the layer of bone separating the sphenoidal sinus from the optic foramen. It is quite probable that inflammation may reach the nerve directly from the cavity of the sinus, and if that be so, the sudden appearance of retro-bulbar neuritis after exposure to cold receives a very reasonable explanation. Cases where this happens are specially characterised by the fact that pain is felt when the eyes are moved, and when the globes are pressed backward into their sockets; and in further support of the theory that in such instances the disease has travelled from the nose to the sphenoidal sinus and thence to the optic nerve, it may be stated that frequently there is a distinct history of previous cold in the head. Moreover, as age advances, the bones atrophy, and gaps may form in the walls of the sinus, thereby leaving its mucous membrane exposed. It is well known that after fracture, and more particularly after caries and necrosis of the body of the sphenoid, infective meningitis may occur and lead to thrombosis of the cavernous sinus. When this does occur the ocular symptoms are preceded by rigors, high temperature, rapid pulse, and vomiting, and the patient complains of severe head-pain, more especially along the course of the supra-orbital and supra-maxillary

branches of the trigeminus nerve. In a very short time exophthalmos appears, accompanied by chemosis of the ocular conjunctiva, and oedema of the eyelid and side of the face. Soon there follow ptosis, squinting, dilatation of the pupil, and, it may be, complete ophthalmoplegia externa and interna, while the pressure of the swollen tissues upon the optic nerve gives rise to inflammation so severe and destructive as to result in complete atrophy of the papilla. Similar symptoms may arise in connection with phlegmon of the orbit, but in thrombosis, although they are usually at first unilateral, they frequently later on become bilateral, owing to the extension of the thrombus from the one side to the other through the sinus circularis.

The illustration, for which I am indebted to Dr. Robert Kennedy, was taken from a patient suffering from sarcoma of the basi-sphenoid; and I have to thank Dr. Alexander Paterson, in whose wards she was in the Western Infirmary, for permission to publish it. Tumour of the sphenoid is, in its very earliest stages, difficult to diagnose, for while yet confined within the walls of the sinuses its presence is indicated only by the occurrence of head-pain. As the growth increases it distends the body of the sphenoid and causes pressure on the adjoining structures, the optic nerves, as they pass through the optic canal, being usually amongst the first to suffer. Sight is early affected: there is inflammation of the optic nerve, accompanied by contraction of the visual field, and ending in optic atrophy. Still growing, the tumour bursts through the walls of the sinus, enters the naso-pharynx and the ethmoidal cells, and invades the orbit from behind. It pushes the eyeballs forward, and in its further progress separates the orbital cavities from each other, and, appearing externally, causes great disfigurement. If the tumour be malignant, and if the patient does not succumb early to the disease, the general circulation becomes infected, and metastatic growths develop in other organs of the body.

PLATE XIV.

Conjunctivitis.

Inflammation of the Conjunctiva.

Synonyms: Ophthalmia; Taraxis (*ταράσσειν*, to trouble).

French, *Conjonctivite*. German, *Bindehautentzündung*. Italian, *Congiuntivite*.

THE conjunctiva is, when healthy, perfectly transparent, for although it is abundantly supplied with both blood-vessels and lymphatics, these are so small that with one or two exceptions they are invisible, and in no way modify the whiteness of the underlying sclerotic. If, however, a particle of dust or any other irritant enters the conjunctival sac, the capillaries become at once congested, and, in proportion to the amount of the hyperaemia, the "white of the eye" is concealed by an intricate meshwork of injected blood-vessels (Fig. 1). Redness of the "white of the eye" is therefore one of the earliest, as well as one of the most characteristic, signs of conjunctival inflammation; though every eye that is red is not to be regarded as suffering from conjunctivitis.

Careful examination will, however, readily distinguish injection of the superficial or conjunctival vessels from hyperaemia of those which are more deeply placed. In the former condition the redness is of a brick-red tint, and is most intense in the region of the retro-tarsal fold. The congested vessels are comparatively large and tortuous, and are arranged in the form of a network (Fig. 2) freely movable with the ocular conjunctiva. Pressure will, for the moment, drive the blood away and expose the sclerotic. In the latter condition, on the other hand, where the deeper structures — *e.g.* the cornea or the iris — are

CONJUNCTIVITIS.

Fig. 1. Foreign body in the Cornea.
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Fig. 2. Catarrhal Ophthalmia.
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Fig. 3. Pustular Ophthalmia.
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Fig. 4. Diphtheritic Ophthalmia.
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Fig. 5. Follicular Conjunctivitis.
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Fig. 6. Granular Ophthalmia.
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CONJUNCTIVITIS.

Plate 14.

Fig. 1. Foreign body in the Cornea.
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Fig. 2. Catarrhal Ophthalmia.
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Fig. 3. Pustular Ophthalmia.
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Fig. 4. Diphtheritic Ophthalmia.
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Fig. 5. Follicular Conjunctivitis.
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Fig. 6. Granular Ophthalmia.
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attacked, the redness is rose-pink in hue, and forms a zone round the cornea. The distended vessels are minute and hair-like, and lie in the episcleral tissue under cover of the conjunctiva, pressure upon which does not materially diminish the amount of the vascularity (Plate XXIX., Fig. 5). In some instances superficial and deep injection co-exist, but as a rule it is easy to determine by careful inspection which of the two predominates.

From the exposed position of the eye upon the face the conjunctiva is constantly exposed to noxious influences, and must, in consequence, necessarily suffer frequently from inflammation. The forms that the conjunctivitis may assume depend upon three different factors: (1) the part of the conjunctiva primarily affected; (2) the exciting cause; and (3) the constitution of the patient.

1. The differences in the histological characters of the palpebral conjunctiva, the bulbar conjunctiva, and the retro-tarsal fold, become much more pronounced during inflammation.

2. Of recent years much attention has been given to the study of the bacteriology of conjunctival diseases, and specific micro-organisms have been found to be invariably associated with certain inflammations. It is not possible, however, in the light of our present knowledge, to classify all forms of conjunctivitis on this basis alone.

3. Diathesis undoubtedly plays an important part not only in influencing the course of the inflammation, but also in determining the particular form it may assume. For example, conjunctivitis occurring in a strumous patient is usually characterised by the presence of pustules or phlyctens on the bulbar conjunctiva, whereas in a gouty subject the inflammation is limited for the most part to the palpebral conjunctiva, and is characterised by the occurrence of active hyperaemia, which is transient but recurrent, at times markedly periodic, and accompanied by chalky deposits in the Meibomian glands.

Active hyperaemia is the starting-point of all conjunctival inflammations. In Fig. 1 it is obviously due to the irritation produced by a

foreign body—"a fire"—on the cornea. The eye is red and waters, especially when exposed to the light, and winking causes a sharp pain; but at this stage there is no discharge, and all the symptoms speedily disappear after the exciting cause has been removed. When, however, the conjunctivitis passes the stage of simple hyperaemia, discharge and other inflammatory products are developed, and the special form which the inflammation will assume depends largely upon the behaviour of these products.

1. If the palpebral conjunctiva be primarily affected, the inflammation will be accompanied by discharge, and also by hypertrophy of the papillae found there under normal conditions. The nature of the discharge is determined by the exciting cause—*e.g.* if the special aetiological factor in the case be the bacillus of Weeks, then the discharge will be muco-purulent or catarrhal (Fig. 2, and Plate XV.): if the gonococcus, then it will be distinctly purulent or blennorrhagic (Plate XVII.): if the Klebs-Loeffler bacillus, then it will be so plastic and fibrinous as to coagulate on the surface, forming a false membrane—croupous—and in its most severe forms causing necrosis of the conjunctiva—diphtheritic (Fig. 4).

After the subsidence of any of these forms of inflammation the papillae, which are the distinctive histological features of the palpebral conjunctiva, shrink in ordinary circumstances to their normal dimensions. Under certain conditions of health, however, and with insanitary surroundings, and probably owing to the presence of a specific micro-organism, they continue to increase in size until the conjunctiva gets studded with "sago-grain" granulations—trachoma (Fig. 6, and Plate XXI., Fig. 1). At a later stage a development of connective tissue takes place both in the papillae and in the granulations, until in course of time the whole conjunctiva gets converted into cicatricial tissue, which, during the process of contraction, implicates the deeper structures of the lids, thus producing deformity of the tarsal cartilage with inversion of the eyelashes (Plate XXI., Fig. 2). In all acute inflammations accompanied by dis-

charge the ocular conjunctiva is invariably implicated, while in trachoma, pannus affects the conjunctival covering of the cornea (Plate XXII., Fig. 5).

2. If the bulbar conjunctiva be primarily affected, the inflammation is unaccompanied by discharge, but its products collect into little localised heaps which usually form the termination of a leash of blood-vessels (Fig. 3). In this group are included all the eruptive varieties of conjunctivitis, or those which are generally spoken of as strumous ophthalmia (Plates XIX. and XX.).

3. If the retro-tarsal fold be primarily affected, the lymphoid tissue, which is normally present there in small quantity, rapidly increases under the stimulus of inflammation, and collects into round pinkish translucent bodies about the size of a pin head, projecting from the surface of the conjunctiva—follicular conjunctivitis (Fig. 5). These follicles are for the most part in the retro-tarsal fold, and are arranged in rows parallel to the border of the lid. They may be very numerous, but are rarely visible until the lower lid is everted. If, as sometimes happens, the inflammation extends to the palpebral conjunctiva, they will be accompanied by catarrhal discharge. In its most typical form, however, follicular conjunctivitis presents but little redness of the eye, and its chief symptoms are sensations of itching and heat, and difficulty in seeing to read or sew by artificial light. It occurs for the most part in children at school, and both eyes are usually affected. An acute attack may be excited by the long continued use of either atropine or eserine, but the disease occurs far more frequently, and may even appear in epidemic form, as a result of over-crowding and bad ventilation. It always runs a prolonged course, is very liable to relapse, and undoubtedly predisposes to attacks of other forms of conjunctivitis.

PLATE XV.

Muco-purulent Conjunctivitis.

Inflammation of the Conjunctiva accompanied by muco-purulent discharge.

Synonyms: Catarrhal ophthalmia; Catarrhus oculi; Ophthalmia purulenta mitior.

French, *Ophthalmie catarrhale*. German, *Bindehaut Katarrhe*. Italian, *Oftalmia catarrale*.

CATARRHAL OPHTHALMIA is the commonest of all conjunctival inflammations. It is often spoken of as "a cold in the eye," and certainly atmospheric conditions exercise considerable influence on its occurrence. The onset takes place most frequently when the weather is changing from warm to cold or *vice versa*, especially when east winds prevail. The inflammation is very contagious, spreading widely as a result of direct inoculation from common wash-hand basins, sponges, towels, etc. In this way children at school are very liable to attack, and may in turn carry the disease to their homes. Occasionally it is epidemic, and many outbreaks are ushered in by measles or scarlet fever. Very obstinate cases may arise from inflammation of the nasal mucous membrane spreading along the tear passages, and the catarrh may also be due to such unsuspected causes as incipient presbyopia, hypermetropia, and astigmatism. Among other aetiological factors may be mentioned chemical irritants, misdirected eyelashes, and foreign bodies, more especially such as have lain for a time in the conjunctival sac, concealed by a swollen fold of the upper fornix. Catarrhal conjunctivitis often forms also a troublesome complication in such diseases as lagophthalmos and ectropion, where the eyeball is deprived of the natural protection of the lids. The

MUCOPURULENT CONJUNCTIVITIS.

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disease is also prone to occur in those whose system is run down, and a very trivial exciting cause will determine an attack after indiscretions in diet or the abuse of alcoholic stimulants.

Catarrhal ophthalmia usually affects both eyes, though not simultaneously, the second being attacked just as the first begins to recover. As a rule it runs a mild course in from three days to as many weeks, but the symptoms are in adults almost invariably more severe than in children. There is first a sensation of itching in the lids, and a feeling as if a gritty substance had entered the conjunctival sac. So intense is the latter sensation that it is often very difficult to convince the patient that there is no foreign body in the eye. The lids are red and swollen along their edges, and occasionally the oedema is so great that they remain closed, and the upper overlaps the lower. The palpebral conjunctiva is congested, and as its transparency is lost the Meibomian glands are not distinguishable. In severe cases the retro-tarsal fold is much swollen, and the ocular conjunctiva so full of turgid blood-vessels that the "white of the eye" is hidden by a brick-red or scarlet network, freely movable upon the sclerotic, the meshes becoming larger as the fornix is reached (Plate XIV., Fig. 2). Thrombotic spots and minute haemorrhages are frequently present, and in acute cases there is considerable chemosis. The muco-purulent secretion, which is one of the most characteristic features and appears very early, may be so slight as merely to seal the lids together during sleep, or in the day-time to form little strings of mucus hidden in the retro-tarsal fold, or a small yellow bead at the inner canthus. In severe cases the discharge is much more profuse, light yellow in colour, creamy in consistency, hanging about the eyelashes, and forming, when dried by exposure to the air, a thick crust at their roots. Occasionally, especially after measles, there is very little hyperaemia of the ocular conjunctiva, but the lids are much swollen, and when they are separated, a watery secretion streaked with pus gushes out. The discharge is always very contagious, the specific bacillus being that known as the bacillus of Weeks. There is not, as a rule, much photophobia.

unless corneal ulceration be present, and sight is interfered with only in so far as can readily be accounted for by the presence of a flake of muco-pus on the surface of the cornea.

Inasmuch as muco-purulent discharge may be present as a complication even in forms of conjunctivitis—*e.g.* pustular and follicular (Plate XIV., Figs. 3 and 5)—in which the discharge is, as a rule, not sticky but watery, and as the neurotic, arthritic, and scrofulous diatheses modify its symptoms and also its course, it is convenient for clinical purposes to distinguish three distinct types of the disease apart from simple catarrhal ophthalmia.

1. *Neurotic : Spring Catarrh.*

This variety occurs in predisposed persons during the early summer months, and is often coincident with the form of nasal catarrh known as "hay-fever," or "rose-cold." Once it has shown itself, there is always a chance of its recurrence during the hay-season. The symptoms are those of a simple conjunctivitis, but the discharge is slight, there is intense pericorneal injection, and photophobia is very pronounced. The whole conjunctiva is thickened by overgrowth of epithelium, forming greyish elevations around the cornea, and in severe cases covering the tarsal conjunctiva of the upper lid with flattened granulations.

2. *Arthritic : Catarrho-rheumatic Ophthalmia.*

Here, in addition to the ordinary symptoms of catarrhal conjunctivitis, there are signs of inflammation of the deeper structures of the eyeball. The onset is usually sudden, and most frequently occurs after the patient has been exposed to cold when heated, and especially if the head be covered with perspiration. There is both superficial and deep congestion of the vessels over the sclerotic, the discharge is more mucous than purulent, and there is always great intolerance of light. Pain, which

during the day may be slight, or even absent altogether, always becomes much aggravated at night. It is often strikingly periodic, coming on in the early hours of the morning, lasting in its full intensity for a longer or shorter period, and then gradually abating and passing off as daylight approaches. The suffering is in many instances so intense that at night the patient is compelled to walk constantly to and fro. Located not so much in the eyeball as in the forehead, the temple, the cheek, and the side of the nose, the pain is dull and throbbing in character, and relief is obtained by cold, rather than by hot, applications. Ulceration of the cornea and iritis are frequent complications, and in elderly persons the corneal ulceration may be further complicated by the occurrence of onyx (ὄνυξ, a nail), and hypopion (ὑπό, under, and πύον, pus).

3. *Scrofulous: Strumous-Catarrhal Ophthalmia.*

Here the catarrhal conjunctivitis occurs in association with the signs and symptoms of a tubercular constitution. A description of the disease is given in connection with Plates XIX. and XX.

PLATES XVI., XVII., XVIII.

Ophthalmia Neonatorum.

Synonyms: Purulent conjunctivitis of new-born children; Gonorrhoeal ophthalmia; Blennorrhoea of the conjunctiva.

French, *Ophthalmie purulente des nouveau-nés*. German, *Purulente Augenentzündung der neugeborenen*. Italian, *Oftalmia purulenta dei neonati*.

PURULENT OPHTHALMIA may occur at any time of life, but the course of the disease is so much modified by the age of the patient that it is convenient to draw a clinical distinction between the purulent conjunctivitis of the adult and that of the newly born child.

It has its origin in specific contagion, and in all virulent cases a special micro-organism—the gonococcus of Neisser (Plate XVII., Fig. 2)—is found not only in the pus cells but also in the superficial layers of the conjunctival epithelium. All cases are not, however, necessarily of gonorrhoeal origin, for severe attacks may occur where inoculation has taken place from non-venereal discharge. In its commonest form the disease is met with in infants whose eyes have been inoculated from the mother at the time of delivery; and though under these circumstances it usually makes its appearance during the first two or three days of life, yet it may set in either earlier or later, and exceptional cases are on record where, after a tedious labour with early rupture of the membranes, infection seems to have been *in utero*, and purulent discharge was well established when the child was born. If the first symptoms of the disease appear later than the fifth day the probability is that infection has occurred, not at birth, but subsequently, by means of fingers, cloths, or sponges, which have been contaminated by coming in contact with

OPHTHALMIA NEONATORUM.

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lochial discharge. Infection may also pass from one child to another; and the disease be spread broadcast, by the neglect of an ignorant or careless nurse to keep her hands thoroughly clean while in charge of a case.

Both eyes usually suffer, but in most instances one sooner and more severely than the other. The first signs are redness of the lids and lachrymation, and thereafter the eyelids soon become swollen and glued together by sticky discharge. After twenty-four, or at most forty-eight, hours, the redness is intense and the swelling so great that the eyes cannot be opened. The upper lid is distended and overhangs the lower, and the pus, from exposure to the air, dries into a crust which conceals the eyelashes (Plate XVI.). When the crust is removed and the lids separated, the purulent secretion which has been pent up in the conjunctival sac gushes out so profusely that it wells over on to the cheek, and may even spurt into the operator's eyes. After this has been washed away there remains hidden in the upper retro-tarsal fold a stringy muco-pus which is dislodged with difficulty. A few minutes after the eyes have been carefully bathed, a thin yellowish fluid mixed with blood collects rapidly in the conjunctival sac, and in less than an hour the purulent discharge is as profuse as ever. In some cases the secretion becomes plastic and adheres so firmly to the palpebral conjunctiva that its removal leaves a bleeding surface.

The conjunctiva lining the eyelids is acutely inflamed, bright red in colour, and so much swollen that its normal transparency is lost. The hypertrophied papillae are easily seen by the naked eye, and bleed very readily. The ocular conjunctiva is also red and oedematous, but chemosis of the eyeball is greater in the adult than in the newly born. In the former it is often so intense that when the eyelids are separated a crimson fleshy collar is seen encircling the cornea and threatening its vitality from the very outset (Plate XVII., Figs. 4 and 5).

The eyes will, unless cleansed with unfailing regularity, be kept continually bathed in pus, which will macerate and directly infect the cornea.

The main object of treatment is to keep the cornea intact, and with skilled care from the beginning this may be readily accomplished, and the inflammation should run its course in from three to six weeks. The first sign of improvement is a diminution of the purulent discharge, and as this shows itself the swelling of the lids subsides, and the child begins to open its eyes of its own accord. The palpebral conjunctiva, which is now thrown into folds and ridges studded with papillary granulations, will not however be restored to its normal condition for a considerable time, and spasmodic ectropion may temporarily remain even after the discharge has ceased. In a child at one time under my care, both upper lids remained for several weeks partially everted, and in the act of crying, as well as during sleep, the eversion of the left lid was complete.

A disease attended by inflammatory symptoms so acute, and by purulent discharge so profuse, is, as may be imagined, accompanied by constitutional disturbances, and though these vary according to the healthiness of the child in other respects, there are always present fretfulness, restlessness, disturbed sleep, and (if the symptoms be neglected and the illness prolonged) progressive emaciation, indicated by depressed fontanelles and drawn and shrunken features.

If the disease be allowed to run its course untreated, corneal ulceration is inevitable: the lividity of the swollen eyelids, and the great quantity and greenish coloration of the purulent discharge, at once indicate the grave character of the case. It is at this period very difficult to separate the eyelids so as to obtain a good view of the cornea, and obviously such cases require very careful handling, as any awkward manipulation may precipitate perforation of the eyeball with all its serious consequences. At an early stage there is infiltration of the cornea, at first white, afterwards yellow, and as the epithelial covering gets destroyed pus begins to collect between the layers, and an ulcer forms, extending over the surface, and, if not checked, penetrating also deeply into its substance until the whole of the epithelium and the substantia propria are washed away, and nothing but the more resistant

OPHTHALMIA NEONATORUM.

Fig. 2. Gonococcus.
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Fig. 3. Pyramidal Cataract.
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Fig. 1. Pyramidal Cataract and Distention of Eyeball.
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Fig. 4. Chemosis of Ocular Conjunctiva.
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Fig. 5. Necrosis of the Cornea.
pages 61 and 63.

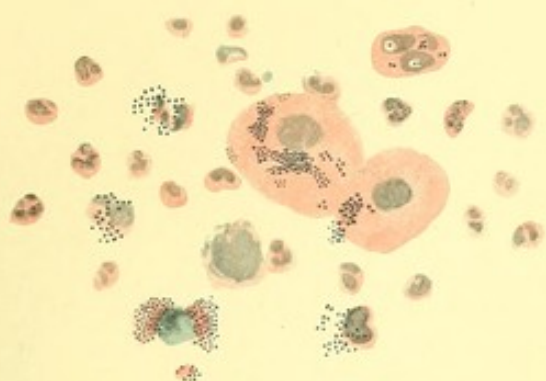
Fig. 2. Gonococcus.
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Fig. 3. Pyramidal Cataract.
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Fig. 1. Pyramidal Cataract and Distention of Eyeball.
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Fig. 5. Necrosis of the Cornea.
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Fig. 4. Chemosis of Ocular Conjunctiva.
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Descemet's membrane remains. By and by this also gives way, and the iris becomes exposed. In the worst cases, ulceration, commencing at the margin, advances steadily until it forms a complete ring, and as the ulcer may be in great part concealed from view by overlapping of the oedematous bulbar conjunctiva, the critical condition of the eye is not appreciated until the cornea, its nutritive supply being completely cut off, separates *en bloc* (Plate XVII., Fig. 5). Such a complication is followed by complete prolapse of the iris, and as the lens and vitreous humour usually escape at the same time, the eyeball ultimately shrivels.

As long as perforation has not occurred, energetic treatment may arrest the ulceration, and, the recuperative power of the cornea being at this early age very remarkable, the eye may recover its usefulness far beyond what might have been anticipated.

As soon as the ulcer begins to heal, its base becomes smooth; the dirty yellow colour disappears, being replaced by a pearly white; the breach of surface gradually fills up and becomes coated over by a new formation of epithelium, and only a smooth white cicatrix—leucoma (λευκός, white) remains to mark the site (Plate XXV., Fig. 4). In an infant it is wonderful how completely even a dense leucoma may clear up, and the transparency of the cornea be more or less restored; but when perforation does occur the eye is always permanently damaged, the amount of the destruction produced depending upon the site of the ulcer and the behaviour of the prolapsed iris.

The following are the most common sequelae to ophthalmia neonatorum with perforating ulcer of the cornea:

Leucoma adherens with pyramidal cataract (Plate XVII., Fig. 3).—The patient was a man over sixty years of age, who had in the centre of the right eye—the result of purulent conjunctivitis in infancy—a dense white leucoma to which the iris was adherent. An iridectomy had been performed many years ago, and through the opening thus made in the upper part of the iris a large pyramidal cataract was visible, with its base fixed upon the anterior capsule of the lens, and its apex drawn out

into a fine white thread attached to the posterior surface of the cornea. These appearances are not difficult to interpret. During the progress of the ophthalmia neonatorum an ulcer formed in the central area of the cornea, and increased in depth until it caused perforation. After the escape of the aqueous humour the cornea became flattened, and lay in contact with the anterior capsule of the lens, and the two got glued together by an outpouring of inflammatory exudation. The opening being thus sealed over, the re-accumulating aqueous restored the anterior chamber, and as the cornea became pushed forward into its natural position the plastic inflammatory exudation was drawn out, and so a pyramidal mass was left stretching between the anterior capsule of the lens and the posterior surface of the cornea. Usually the cornea breaks away from the cataract, the apex of which thus becomes free.

Adherent leucoma from the iris coming in contact with the breach of surface accompanying marginal corneal ulceration (Plate XXVI., Fig. 3).

—In such cases it often happens that perforation checks the virulence of the disease, and immediately thereafter recovery begins. During the process of healing, however, the iris gets drawn towards the ulcer and becomes firmly fixed to the cicatrix so that the pupil is hidden behind the leucoma. Sight may be restored by iridectomy (Plate XXV., Fig. 6), though, from the injurious action of the inflammation on the nutrition of the eyeball, more especially of the optic nerve and retina, the improvement in vision may come far short of what was anticipated. The following example may be given: In October 1893 I operated on a boy four years of age, who, as a result of ophthalmia neonatorum, suffered from a leucoma adherens in each eye so large and dense as wholly to cover the pupil. The intra-ocular tension was good, and as there seemed to be a fair perception of light, the formation of an artificial pupil was determined upon. At the operation it was found that the vitreous was as fluid as water, and drained away slowly, so that the eyeballs partially collapsed; but in twenty-four hours the wound closed and the globes resumed their normal appearance. The child's vision

LEUCOMA ADHERENS AND STAPHYLOMA ANTERIOR
AFTER OPHTHALMIA NEONATORUM.

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was undoubtedly improved, but not sufficiently to enable it to distinguish even large objects distinctly.

Staphyloma anterior (Plate XVIII.).—This photograph represents a child nine months old, the history of whose case is briefly as follows: For some months before confinement the mother had suffered from a leucorrhoeal discharge, which, so far as she was aware, was non-venereal, and by this the child's eyes were accidentally inoculated during birth. Nothing abnormal was observed until three days after, when it was noticed that the right eye was inflamed and the lids glued together by a sticky discharge. Within a few hours the left eye became similarly affected. A permanganate of potash lotion was prescribed, but the treatment was carried out so inefficiently that the disease practically ran its course unchecked for nearly three weeks, when, during an awkward attempt to bathe the eyes, the mother noticed a clear substance (evidently the crystalline lens) escape from the right eye on to the cheek. She became so alarmed by the occurrence that without further delay she brought her baby to the hospital. It was at once evident from the profuse discharge and the brawny livid swelling of the eyelids that the case was one of very exceptional gravity. Every attempt to separate the lids caused the child to cry vigorously, with the result that spasmodic ectropion occurred. The inner surface of the lids was then seen to be fleshy and granular, and so great was the protrusion of folds of chemosed conjunctiva that the eyeball was almost hidden from view. By means of retractors, however, the lids were opened, and the globes fully exposed, when it was seen that the corneae were lost, and that the irides lay exposed and prolapsed. It was many weeks before the discharge ceased and the parts healed. The lithograph shows in the right eye a dense flat white cicatrix, and in the left, from which the lens had not escaped, an anterior staphyloma (σταφυλή, a bunch of grapes) so large and prominent that it interfered with the proper closing of the lids. As a result of the irritation thus produced, as well as from an increase in the intra-ocular tension, the child suffered much pain, which,

however, was at once relieved after abscission of the staphyloma and evacuation of the lens.

General Distension of the Eyeball.—Fig. 1 of Plate XVII. shows a girl ten years of age who had suffered from ophthalmia neonatorum. She has now marked nystagmus; the sight of the right eye is rendered very defective by a central opacity of the cornea and an anterior polar cataract, and the vision of the left is completely destroyed through general distension of the globe. The latter eye is unnaturally prominent; the cornea has become expanded, its normal transparency is gone, and the sclerotic surrounding it has become so stretched and thin that the choroid shining through gives it a slate-blue appearance. There is no anterior chamber, and the iris, so far as can be distinguished, lies closely against the posterior surface of the cornea, to which in the pupillary area it is firmly adherent. This condition is the result of inflammation of the uveal tract after purulent conjunctivitis, and was considered by the older ophthalmic surgeons to be a dropsy of the eyeball.

Strumous Ophthalmia.

Inflammation of the bulbar conjunctiva characterised by an eruption of one or more white-topped papules.

Synonyms: Phlyctenular or Pustular conjunctivitis; Eczema of the conjunctiva; Conjunctivitis lymphatica.

French, *Conjonctivite phlycténulaire*. German, *Conjunctivitis lymphatica, s. phlyktaenularis, s. scrofulosa*. Italian, *Oftalmia Scrofulosa*.

STRUMOUS OPHTHALMIA is essentially a children's disease, for in adults it is almost never seen except in those who have suffered from it in their early years. It sometimes appears during the period of dentition, and is most frequent during the first decade of life. It attacks girls oftener than boys, and occasionally comes on for the first time just before menstruation is established. Both eyes are usually affected—one in that case much more severely than the other—and as relapse is very apt to occur, a case may last for many months. Though children of all classes suffer, the disease is naturally much more common among the poor, and especially among those who from their earliest infancy have been improperly fed and scantily clothed; at one time unduly exposed to the vicissitudes of the weather, and at another confined in small and badly ventilated rooms.

Photophobia is one of the most characteristic and most distressing symptoms. The child generally sits in its mother's lap with its face closely pressed against her body, and every attempt at examination is met with struggles and screams, entreaties to have the light kept off, and efforts to shield the eyes with hands and arms. When the hands

are drawn away, the eyelids are kept tightly pressed together and their separation is most strenuously resisted. When at length they are partly opened there is a gush of tears, and a violent fit of sneezing expels a muco-purulent discharge from the nostrils.

If the disease has existed for a lengthened period, the eyelids, nose, and upper lip are markedly swollen, and in all probability the face is covered by an eczematous eruption. The excoriation of the skin leads to the formation at the outer canthus of a fissure which on any rough separation of the lids bleeds and causes much pain. Every care ought to be taken not to hurt the child unnecessarily, and its eyes may be best examined by placing the head between the surgeon's knees while the mother holds the arms against the body. It is then easy to depress the lower and raise the upper lid gently by means of retractors, but as the child persists in rolling its eyes upwards it is often difficult to obtain a good view of the cornea, and in very bad cases it may be necessary, before making the first examination, to administer an anaesthetic. When the balls are, after all this trouble, at last visible, one is often surprised to find how slight the local lesions really are. Even when photophobia is very distressing, and when the upper eyelids are swollen and their surface marbled by large congested veins, there may be hardly a trace of redness in "the white of the eye." In most cases, however, there are localised congestions, and the ocular conjunctiva is traversed by a leash of blood-vessels, running towards a minute phlycten (*φλύκην*, to bubble up) situated on the surface of the cornea often right over the centre of the pupil, which is always much contracted.

The phlycten is the most characteristic objective feature of this disease. In most instances it disappears after a few days and leaves no trace; but at other times its 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 takes place there is

STRUMOUS OPHTHALMIA.

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PLATE XIX.



STRUMOUS OPHTHALMIA

more or less active suffering and the 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 blood-vessels (Plate XXII., Fig. 1) spreads from the corneo-scleral margin to the ulcer, which soon becomes vascular and forms a red speck which may persist for a long time. In unhealthy children these phlyctenular ulcers are prone to suppurate, while pus collects between the layers of the cornea and accumulates in the anterior chamber. In these severe cases perforation may occur (Plate XXVI., Fig. 2) and be followed by a prolapse of iris so large that the eyeball is irretrievably damaged.

Although there is, in a typical case of strumous ophthalmia, always profuse lachrymation, there is no sticky muco-purulent discharge, unless the inflammation has spread from the bulbar to the palpebral conjunctiva—strumous-catarrhal. Whenever that occurs catarrhal symptoms are present, and the whole conjunctiva becomes injected. The congestion is especially marked at the limbus corneae, upon which as a rule there is an efflorescence of phlyctenulae. In most cases there is also injection of the lymphatics. As a rule both the redness and the eruption disappear completely; but in unfavourable cases, more especially in those which have not been treated properly at the outset, ulceration leading to perforation may occur and give rise to partial staphyloma (Plate XX., Fig. 2).

Ophthalmia may be the earliest indication of a strumous diathesis, and this was so in the case of the child from whom Plate XIX. was taken. For the photograph I am indebted to Dr. John H. Teacher.

In cases where the conjunctival lesions are slight, severe subjective phenomena may arise from a source of irritation elsewhere than in the eye—*e.g.* in the stomach or bowels—and 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 sometimes there is a continual craving for food. The coated tongue studded with large red papillae shows the irritable condition of the mucous membrane of the whole intestinal tract. Almost invariably more is eaten than can be digested, fermentation results, the alvine secretions have an offensive smell and an unnatural colour, and the belly is distended. The urine is high-coloured, deposits urates, and often contains traces of sugar. The skin is pale and rough, the flesh hangs loosely on the bones, the hands and feet readily become cold, and the head perspires freely and often swarms with pediculi. The joints, both large and small, are very frequently destroyed by tubercular inflammation of their synovial membrane 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.

Fig. 1, Plate XX., illustrates many of the typical features of a mild case of strumous-catarrhal conjunctivitis. The patient was a girl of eleven years of age. Both eyes were affected, but the inflammation appeared first in the left, and had probably originated from chronic ulceration of the nasal mucous membrane, travelling to the eyes by way of the tear passages. There was marked injection of the ocular conjunctiva, most pronounced in the neighbourhood of well-defined elevations situated on the surface of the globe, and for the most part on the limbus corneae. These pustular elevations varied in size, the largest being no bigger than a pin head. They were of a yellowish grey colour, and were all covered by epithelium with the exception of one situated on the sclerotic at the outer aspect of the left eyeball, where a minute ulcer had formed. There was considerable hyperaemia of the palpebral conjunctiva, and although during the day there was no discharge visible, yet the eyelids always became glued together during sleep. Intolerance of light was not a marked symptom, but the eyes

STRUMOUS CONJUNCTIVITIS.

Fig. 1. Pustular Ophthalmia.
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Fig. 2. Ectasia Corneae.
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STRUMOUS CONJUNCTIVITIS.

Fig. 1. Postular Ophthalmia.
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Fig. 2. Ectasia Corneae.
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looked tender and presented a characteristically "watery" appearance. From the fact that the cornea was not implicated no serious symptoms supervened, but the pustules came and went in the usual manner and it was nearly six weeks before all traces of inflammation disappeared.

Fig. 2, Plate XX., was taken from a case of phlyctenular conjunctivitis, and shows the disastrous results which may follow corneal complications. The patient, a lad of about fifteen years of age, had, from early childhood, suffered from repeated attacks of pustular ophthalmia. During one of these the pustules which formed on the cornea and its limbus ulcerated, and the ulcers extended until a considerable area of the corneal surface was involved, and perforation occurred at the margin. This was followed by a large prolapse of the iris, and it was many weeks before cicatrization was complete. The eyes were irretrievably damaged. A whitish cicatrix to which the iris was firmly adherent occupied the lower aspect of each cornea. In the right eye it bulged forward—ectasia corneae (*ἐκ*, out, and *τείνειν*, to stretch)—so as to form a partial staphyloma, and almost entirely concealed the pupil, only the upper part of which dilated after the instillation of atropine. In the left eye the cicatrix was flatter and not so large, about two-thirds of the cornea remaining transparent, so that the iris was visible behind it.

PLATE XXI.

Trachoma.

(τραχύς, rough.)

A contagious inflammation of the conjunctiva, characterised by the development of papillae and granulations, which, after persisting for a long time, become ultimately absorbed, but leave cicatricial changes. These, if progressive, will in the long run bring about distortion of the lids, and xerophthalmos.

Synonyms: Granular conjunctivitis; Ophthalmia militaris; Egyptian ophthalmia.

French, *Trachoma*. German, *Granulation der Augenbindehaut*. Italian, *Trachoma*.

ALTHOUGH known from time immemorial, trachoma began to attract the serious attention of surgeons only during the Napoleonic wars, when it appeared in epidemic form among the troops of the contending nations. It disabled thousands of soldiers, who, on being disbanded, returned to their homes, and spread the disease among the civil population. In those days the form it assumed was very acute, and, as the contagion was conveyed by means of the secretion, the spread was most rapid where, as in public institutions, large numbers of people occupied the same sleeping apartments, and used wash-hand basins, towels, etc., in common.

Now-a-days the disease is rarely seen in this virulent shape, though as a chronic affection it is of frequent occurrence. Its natural home is in the countries of the East, and thence it has distributed itself over the whole civilised world. Damp and impure air exercise a great influence over its production, and while it is very prevalent in low-lying

GRANULAR OPHTHALMIA OR TRACHOMA.

Fig. 1. Granular Ophthalmia. Early stage.
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Fig. 2. Granular Ophthalmia. Late Stage.
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districts, it seldom or never occurs in regions like Switzerland. It is endemic among certain races, for example the Irish and the Jews, who, on account of poverty, live huddled together in small badly-ventilated houses, and pay but little attention to personal cleanliness.

The two forms of trachoma always described—the papillary and the granular—are in practice usually seen together. The accompanying plate gives illustrations of both the early and the late stage of the disease.

Patrick R., from whom Fig. 1 was taken, was an Irish labourer, aged forty-two, in destitute circumstances, and very dirty. For years he had from time to time been troubled with "cold" in his eyes (which were always unduly sensitive when exposed to light and wind), and almost every morning he found that his lids had become glued together during sleep. The pain had, for six months before he came under my notice, been very considerable, and his sight had gradually become so defective that he was unable to work. The lids were slightly swollen, and the palpebral conjunctiva was red and rough from the injection of its blood-vessels and the hypertrophy of its papillae. The ocular portion appeared normal, except for congestion of its larger blood-vessels, but in both eyes the cornea was nebulous throughout its whole extent, and its upper half was covered by a new formation of minute blood-vessels, which gave it the appearance of red velvet—pannus (Plate XXII., Fig. 5). Only after the upper eyelids were everted was the true nature of the disease discovered. The palpebral conjunctiva was thick and fleshy-looking, and studded with greyish-white granulations, which varied in size, and were largest and most closely packed together in the outer third of the retro-tarsal fold. These "sago-grain" like bodies were partially concealed by hypertrophied and highly vascular papillae. In the right upper eyelid a smooth whitish-yellow spot, situated near the border of the lid, marked the beginning of cicatricial changes which would, in the absence of appropriate treatment, have ultimately terminated in shrinking of the conjunctiva, and the alteration of its function as a mucous membrane (Plate XXII., Fig. 6)—xerosis.

Other sequelae of trachoma are illustrated in Fig. 2, which was taken from a man eighty years of age, who had been attacked by granular ophthalmia while serving in the army sixty years before. The disease had been at no time very acute, but the morbid changes in the conjunctiva had steadily progressed until the membrane lining the inner surface of the eyelid was almost completely destroyed and converted into cicatricial tissue. As a result of these changes the tarsal cartilage was markedly incurved, and the upper lids were completely, and the lower ones partially, inverted. The alteration in the shape of the tarsal cartilage was accompanied by change in position and direction of the cilia, and every movement of the lids caused the misplaced eyelashes to rub against the eyeball. The ocular conjunctiva was inflamed, and a puriform secretion was hanging about the margins of the eyelids. As a result of this constant irritation the cornea had become vascular through a new formation of blood-vessels from the limbus, and its surface was besides so rough and opaque that the iris could be seen through it only indistinctly, and the patient was in consequence so blind that he was unable to walk alone.

PLATE XXII.

Figs. 2 and 5. Pannus.

(*Pannus*, a rag, from $\pi\acute{\eta}\nu\omicron\varsigma$, the woof.)

A formation of vascular tissue beneath the epithelium of the cornea.

Synonym : Vasculo-nebulous cornea.

French, *Pannus*. German, *Entzündung der Hornhaut mit Gefässbildung* :

Pannus. Italian, *Panno della cornea*.

PANNUS consists of a new formation of blood-vessels and of round cells, which, under certain circumstances, develop between the corneal epithelium and Bowman's membrane. It is seen in some cases of strumous ophthalmia—*pannus scrofulosus* (Fig. 2)—and it forms one of the most characteristic signs of granular conjunctivitis—*pannus trachomatousus* (Fig. 5). In both instances it appears first at the upper aspect of the cornea, which, as the pannus grows, becomes grey, clouded, and rough, and is traversed by numerous blood-vessels. Whenever the area of the pupil is reached, vision is interfered with, and in bad cases the entire cornea may be covered. Such total pannus is usually of considerable thickness—*pannus crassus*—and completely conceals the iris, while the vascularity is sometimes so intense that the cornea seems to be covered by exuberant granulations—*pannus sarcomatosus*. In course of time a pannus undergoes absorption, and, when it is thin and recent, the natural transparency of the cornea will be restored; but in every instance where Bowman's membrane has been injured, the resulting ulceration produces alterations in curvature, and vision is permanently impaired by irregular astigmatism, and by the persistence of opacities and of blood-vessels,

which may, however, be so small as to require a magnifying lens for their detection.

Fig. 1 shows a leash of blood-vessels developing from the corneo-scleral margin, in connection with a localised injection of the ocular conjunctiva. It traverses the cornea to reach an ulcer situated at the lower and inner margin of the pupil. These new-formed vessels are quite superficial, and will disappear completely after the ulcer has healed. The ulcer itself is due to a phlycten, and although, when situated at the extremity of a fascicle of blood-vessels, it rarely perforates or extends its boundaries, yet it may persist for many weeks as a vascular speck, and give rise to most distressing photophobia and blepharospasm. When, however, as in Fig. 3, a strumous ulcer is situated towards the margin of the cornea, penetration readily occurs, and Fig. 4 shows an eye in which this has taken place. The aqueous chamber is empty, and the pupil is drawn towards the perforation, through which a small portion of the iris protrudes, forming a black point like the head of a fly, whence the name myocephalon (*μύια*, a fly, and *κεφαλή*, a head). This subject is dealt with more fully in the description appended to Plates XXV. and XXVI.

Fig. 6. Xerophthalmia.

(*ξηρός*, dry, and *ὀφθαλμός*, an eye.)

A dry, lustreless, condition of the conjunctiva, due to degenerative changes occurring in the advanced stages of trachoma.

Synonyms : Xerosis conjunctiva; Symblepharon posterius; Cuticular conjunctiva.

French, *Xérophtalmie*. German, *Trockene Augenentzündung*. Italian, *Xeroftalmia*.

THE illustration was taken from a man who had suffered from trachoma for many years. As a result of the long continuance of the inflammation, the conjunctiva had lost its natural moistness and become

CORNEAL COMPLICATIONS IN CONJUNCTIVAL DISEASES.

Fig. 1. Phlyctenular Ulcer.
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Fig. 2. Pannus Scrofulosus.
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Fig. 3. Ulcer Corneae.
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Fig. 4. Prolapsus Iridis.
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Fig. 5. Pannus Trachomatosis.
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Fig. 6. Xerophthalmia.
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CORNEAL COMPLICATIONS IN CONJUNCTIVAL DISEASES.

Fig. 2. Pannus Sclerosus.
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Fig. 1. Epithelial Ulcer.
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Fig. 4. Prolapsed Iris.
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Fig. 3. Ulcer Corneae.
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Fig. 6. Xerophthalmia.
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Fig. 5. Pannus Trachomatosis.
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cuticular, the absence of the proper secretion producing a sense of dryness and grittiness amounting almost to torture. The eyes were opened only with difficulty, as the retro-tarsal fold was partially obliterated, and the lid was bound to the globe by bands of cicatricial conjunctiva. There was marked trichiasis, the lower punctum was obliterated, and the caruncle was much shrunk. The cornea was flattened, opaque, and traversed by numerous large blood-vessels, and the vision in consequence so bad that the patient was barely able to grope his way about. The olive colour of the ocular conjunctiva was due to the long-continued use of nitrate of silver solution—argyria (*ἄργυρος*, silver).

PLATE XXIII.

Fig. 1. Symblepharon.

(σύν, together, and βλέφαρον, an eyelid.)

Adhesion of the eyelid to the eyeball.

French, *Symblépharon*. German, *Symblepharon*. Italian, *Simblefaro*.

SYMBLEPHARON is usually the result of a burn by red-hot metal, quicklime, or a mineral acid. It also follows diphtheritic conjunctivitis, trachoma, pemphigus, and, in rare instances, purulent ophthalmia. It may be partial or complete, and involve one or both eyelids. The injury which brings it about may at the same time cause destruction of the cornea, or adhesion of the eyelids to each other along their free margins—anchyloblepharon (ἀγκύλη, a bend or loop, and βλέφαρον, an eyelid).

The illustration was taken from a boy who was struck upon the right eye with a red-hot poker, and, as a result, the lower lid is partially adherent to the eyeball. Both the palpebral and ocular conjunctiva, including the retro-tarsal fold, were burnt, and the two raw surfaces thus placed opposite to each other united in the course of healing, and the eyelid became fixed to the eyeball. The morbid connection was formed by a bridge of granulation tissue, which was at first soft and fleshy, but gradually became, as the process of cicatrisation proceeded, firmer and more fibrous. The newly formed adhesion had also implicated the lower aspect of the cornea, and was so complete that it was not possible to pass an ordinary-sized probe between it and the eyeball. The pupillary

area was, however, very little encroached upon, and consequently vision was practically unimpaired; but the movements of the eye were interfered with, and this gave rise to diplopia, the discomfort from which was greatly intensified by the sense of dragging which was experienced whenever the eyeballs were turned.

Figs. 2 and 3. Pterygium.

(πτέρυξ, a wing.)

A hypertrophy of the conjunctiva, of triangular shape, expanding on the sclerotic and the cornea, with the apex directed towards the pupil.

Synonyms: The *Unguis* of Celsus; the Web of old English surgeons.

French, *Pterygion*. German, *Flügelzell*: *Pterygium*. Italian, *Pterygio*.

A PTERYGIUM is a localised hypertrophy of the conjunctiva and subconjunctival tissue, of triangular shape, and situated as a rule on the inner side of the eyeball, but occasionally, as shown in Fig. 3, with a smaller one also present on the outer side. The apex of the triangle encroaches upon the cornea, while its base is turned towards the canthus, and, spreading out, loses itself in the conjunctiva of the eyeball. The neck of the pterygium is red and vascular, but towards its upper and lower margins the fleshy appearance is lost, and it becomes more or less membranous. Fig. 2 represents a pterygium, the result of a burn of the conjunctiva and edge of the cornea by molten metal. Fig. 3 represents the eye of an elderly man, whose occupation exposed him to dust and heat. The pterygia were progressive, and were gradually pushing their way towards the centre of the cornea. There were slight irritation and watering of the eye, but as the area of the pupil was not yet encroached upon, vision was unaffected, and the only thing of which complaint was made was the disfigurement.

Fig. 4. Pinguecula.

(Pinguis, fat.)

A small yellowish elevation situated in the conjunctiva near the margin of the cornea, apparently, but not in reality, composed of fat.

Synonym : Pterygium pingue.

French, *Pinguicula*. German, *Pinguecula*. Italian, *Pinguecola*.

NOTWITHSTANDING its name a pinguecula contains no fat, but is composed of connective tissue and elastic fibres. It usually forms at the nasal side of the cornea, but is sometimes found, as shown in the illustration, on the temporal side as well. It rarely grows to a large size, but in many instances it is the starting-point for the development of a pterygium. It is oftenest seen in old people, but is, apart from the slight disfigurement to which it gives rise, of no consequence. In the figure a small raised patch of yellowish colour—xanthelasma (*ξανθός*, yellow, and *έλσμα*, a plate)—is seen in the skin of the upper eyelid. It is due to hypertrophy of the sebaceous glands with fatty degeneration of the subcutaneous connective tissue. It nearly always forms on the skin in the neighbourhood of the inner canthus, is rarely seen before the age of forty, and occurs very frequently in those who have in their earlier years suffered from “bilious headaches.”

Figs. 5 and 6. Tumours of the Conjunctiva.

French, *Tumeurs conjunctivales*. German, *Geschwülste der Bindehaut*. Italian, *Tumori della congiuntiva*.

BOTH benign and malignant growths may take origin from the conjunctiva. Of the former, dermoid tumours (Fig. 5) are the most frequent. As their name implies, they are composed of skin. They are always con-

DISEASES OF THE CONJUNCTIVA.

Fig. 1. Symblepharon.
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Fig. 2. Pterygium.
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Fig. 3. Pterygium.
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Fig. 4. Pinguecula.
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Fig. 5. Dermoid of Conjunctiva.
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Fig. 6. Melano Sarcoma of Conjunctiva.
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DISEASES OF THE CONJUNCTIVA.

Fig. 1. Sympblepharon.
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Fig. 2. Pterygium.
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Fig. 3. Pterygium.
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Fig. 4. Pinguecula.
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Fig. 5. Dermoïd of Conjunctiva.
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Fig. 6. Melano Sarcoma of Conjunctiva.
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genital, and may be accompanied by developmental anomalies both in the eye and other parts of the body. They lie in the line of the palpebral fissure, and are usually situated at the corneo-scleral margin on the temporal side of the eyeball. They vary in size, but are always solid, hemispherical in shape, whitish-yellow in colour, and have a smooth surface, which is for the most part studded with hairs. Apart from the conjunctivitis to which these last may give rise, a dermoid causes no irritation. It usually remains stationary, but now and again it tends to grow over the surface of the cornea. Under these circumstances it will be necessary to remove the tumour by careful dissection.

Of malignant growths, both epithelioma and sarcoma may take origin from the conjunctiva. The former has already been described (pp. 33-35), and is illustrated on Plate VIII., Fig. 5: of sarcoma, the common form—the melanotic—is depicted here in Fig. 6. The illustration was taken from the eye of a woman sixty-six years of age. She said that about 1862 a tiny tumour had been removed from her left eye, which had from that time given her no more trouble for nearly twenty years. A pigmented growth, about the size of a split pea, had then formed on the temporal side of the eyeball, at the corneo-scleral margin, and had afterwards increased in size. This was carefully dissected away, and the cautery applied to its site; but it soon recurred, and during the next four years operations for its removal were necessary on five different occasions. After each the tumour came back more quickly, and grew more and more rapidly, so that though it had been completely excised in October 1885, it was, by February 1886, again as large as a horse bean. It was black in colour and lobulated. It was growing from the original seat over the ciliary region at the temporal aspect, but in addition to overlapping, it was now for the first time partially adherent to the cornea. Although the eye was quite serviceable for the purposes of vision, it was enucleated in order if possible to eradicate the disease. It seemed as if this last operation was to be successful, but after an interval of about six years a solid black nodule made its appearance at the bottom of the

orbit, and increased steadily in size. It was, together with the orbital tissues, freely excised. As far as could be made out there were no enlarged glands. The subsequent history of the case, which is of interest from its long duration and the purely local character of the recurrent growth, can, unfortunately, not be given, as the patient was lost sight of.

Fig. 1. Keratoconus.

(κέρας, a horn, and κώνος, a cone.)

An alteration in the curvature of the cornea so that it resembles a cone.

Synonyms: Conical cornea; Staphyloma pellucidum; Hyperkeratosis.

French, *Keratocone*. German, *Keratoconus*. Italian, *Cheratoconus*.

CONICAL CORNEA often appears for the first time about the age of puberty, and is seen most frequently in young women who are in delicate health. The first symptom complained of is short-sight, but ordinary concave spherical glasses do not afford much relief. As the disease increases, the disturbance to vision becomes very great, everything is surrounded by a halo, polyopia is often very troublesome, and, as both eyes are usually affected, the patient may be unable to read, and quite incapable of distinguishing objects only a few feet distant. The development of keratoconus is unaccompanied by any symptom of inflammation, but at the outset those who suffer from it complain occasionally of head-pain, and of a full uncomfortable feeling in the eyes themselves, which are often unnaturally brilliant, and present a peculiar lustrous appearance. At this early stage it may not be easy to detect the conicity of the cornea by simple inspection of the surface; but if the patient be placed opposite a window a few feet away, the image will appear misshapen, or, if the fundus be examined by the ophthalmoscope, its details will be seen to be distorted. In cases so advanced as the one chosen for illustration, the prominence of the cornea is very evident, whether looked at from the front or from the side; while in nearly every instance where the disease has existed for many years, oblique illumination reveals a minute nebulous opacity

on the apex of the cone, and small irregularities in the curvature around its summit. These changes are all due to a progressive thinning of the substantia propria of the cornea, whereby it becomes so weakened as to be unable to resist the normal intra-ocular tension.

Fig. 2. Arcus Senilis, or Gerontoxon.

(γέρων, an old man, and τόξον, a bow.)

The opaque ring, due to fatty degeneration of the margin of the cornea, often seen in the eyes of old people.

Synonyms: Marasmus senilis cornea; Macula arcuata; the Arcus senilis adiposus of Canton.

French, *Arc sénile*. German, *Arcus senilis*. Italian, *Arco senile*.

AFTER middle life is reached a bluish-white opaque ring is often seen encircling the cornea, a narrow transparent strip of which separates it from the limbus. At first it is of semilunar shape, and is situated beneath the upper eyelid, but by and by a similar opacity appears beneath the lower, and the two crescents continue to grow until their horns meet. The arcus thus formed presents a perfectly true surface, and its outer edge, towards the limbus, is dense and sharply defined, while the inner is concave, and gradually shades off into the transparent central area. There is no inflammation, the appearance being due to fatty degeneration of the substantia propria at the periphery of the cornea. It is of no practical importance, and does not in any way interfere with the healing of a wound carried through it, *e.g.* for the extraction of a cataract. Its presence, however, is often coincident with the occurrence of other changes indicative of the approach of old age, such as grey hair, ossification of cartilage, degeneration of blood-vessels, etc., and although by no means pathognomonic of, yet it is frequently associated with, fatty degeneration of the heart, and other senile changes in the cardio-vascular system.

DISEASES OF THE CORNEA.

Fig. 1. Keratoconus.
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Fig. 2. Arcus Senilis.
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Fig. 3. Fascicular Keratitis.
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Fig. 4. Chronic Keratitis.
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Fig. 5. Xanthelasma Corneae.
page 86.

Fig. 6. Abscess of the Cornea.
page 87.



Figs. 3 and 4. Keratitis.

(*képas*, a horn, cornea; and termination *-itis*, inflammation.)

Inflammation of the cornea.

Synonym: Corneitis.

French, *Kératite*. German, *Hornhautentzündung*. Italian, *Cheratitis*.

NOTWITHSTANDING that the cornea, in its normal condition, is a non-vascular structure, it suffers frequently and severely from inflammation, which always runs a protracted course, occupying weeks, months, or years. Keratitis, which may be primary, or secondary to injury or conjunctivitis, is therefore one of the most important of all the affections of the eye, and though it may pass off without leaving any injurious results, it produces in many instances permanent impairment of sight by causing incurable opacities, or alterations in curvature—irregular astigmatism—or by inducing serious complications in the iris and ciliary body.

All inflammations of the cornea may be divided into the suppurative and the non-suppurative. The former group—ulcerations—is considered in connection with Plates XXV. and XXVI., while a typical example of the latter is illustrated and described in connection with Plates XXVII. and XXVIII. Some cases are due to direct traumatic infection, many arise as complications in the course of conjunctival affections, and others must be regarded as due to defective general nutrition—an attack being determined by exposure to cold—more particularly when there is interference with the trophic nerve supply, as is seen in neuro-paralytic keratitis, after excision of the Gasserian ganglion, or in old-standing cases of chronic glaucoma.

The symptoms and signs of all forms of keratitis may be briefly summarised as follows (Plate XXIX., Fig. 5). At the onset there are lachrymation and intolerance of light, and frequently pain in and around

the eye. There is injection of the blood-vessels round the cornea, which soon loses its transparency, while from the injected limbus new-formed vessels traverse its surface, and also invade the substantia propria. Vision is seriously impaired, and the sight may be further injured by the development of iritis and cyclitis, or by the breaking down of the infiltration to cause abscess and ulceration.

Fig. 3 illustrates the appearances presented by a case of fascicular keratitis. The disease usually occurs in young adults, and is accompanied by intense pain. It is characterised by the presence of an ulcer, which, forming originally at the margin of the cornea, creeps across its surface followed by a leash of distended blood-vessels.

Fig. 4 represents a circumscribed keratitis. The illustration was taken from a woman about thirty years of age, in whom the disease appeared while she was nursing a baby. Although the cloudiness at the lower aspect of the cornea was considerable, the symptoms of acute inflammation were slight, and the patient's chief complaint was of dimness of vision.

Fig. 5. Xanthelasma Corneae.

(ξανθός, yellow, and ἔλασμα, a plate.)

A degeneration of the cornea characterised by its yellow colour.

French, *Xanthelasma de la cornée*. German, *Xanthelasma der Hornhaut*.

Italian, *Xanthelasma della cornea*.

THIS figure depicts a somewhat rare form of degeneration of the cornea. The eye had been injured many years before the drawing was made, and although never acutely painful, it was liable every now and then to slight attacks of inflammation. The cornea was flattened, and in its lower two-thirds was occupied by an opacity of yellowish brown colour, slightly raised, with uneven surface, and impregnated here and there with what appeared to be a calcareous deposit.

Fig. 6. Abscess of the Cornea.

A collection of pus in the substance of the cornea.

Synonym: Onyx (ὄνυξ, a nail).

French, *Abcès de la cornée*. German, *Hornhaut abscess*: *Eitergeschwülst*.

Italian, *Ascesso della cornea*.

ALL inflammatory infiltrations of the cornea either become absorbed and disappear, or else break down into pus. If the purulent infiltration bursts externally, an ulcer forms, but if it remains surrounded by undestroyed layers of the cornea, it is an abscess. The eye shown in the illustration was that of a woman about fifty years of age, who, after exposure to cold, was suddenly seized with severe pain accompanied by photophobia and lachrymation. There were intense injection of the ciliary region, and congestion and oedema of the borders of the eyelids. In the cornea were six minute abscesses, which, however, soon disappeared under treatment by atropine and fomentations, and the administration of quinine. Some cases are much more severe and persistent. When the pain is very violent it is usually accompanied by the formation of pus in the anterior chamber, and by the implication of the iris and the ciliary body. This complication ought never to be overlooked, as the irido-cyclitis may destroy the sight even although the cornea itself recovers so much that useful vision is possible.

PLATES XXV., XXVI.

Ulcer of the Cornea.

(*ulcus*, ἔλκος, an abscess.)

A breach of corneal surface.

French, *Ulcère de la cornée*. German, *Hornhautgeschwür*.

Italian, *Ulcera della cornea*.

ANY ulceration of the cornea not due to direct injury is the result of the breaking down of a localised inflammatory infiltration which reaches the surface by causing the destruction of the epithelium in front of it. Corneal ulcers therefore if not traumatic are always secondary to disease previously existing in the eye, and most of them are complications of conjunctival affections. For clinical purposes they may be divided into these which occur in (1) conjunctival affections; (2) abnormal exposure of the eyeball; (3) diseases characterised by interference with the nerve supply; (4) the breaking down of a cicatrix; (5) the improper use of a lead-lotion—Saturnine ulcer.

1. *Conjunctival Affections.*

(a) Catarrhal ophthalmia.—In this, more particularly in adult cases, there are found, for the most part on the margin of the cornea, small grey crescent-shaped ulcers, which by their coalescence occasionally produce a breach of surface of considerable size. (b) Purulent ophthalmia.—In this, whether in adults or in newly born children, there occur sloughy ulcers which may be either central or marginal, the latter being sometimes concealed by the chemosed conjunctiva overlapping the

ULCER OF CORNEA.

Fig. 1. Ulcer of the Cornea.
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Fig. 2. Healing Ulcer of the Cornea.
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Fig. 3. Serpiginous Ulcer of the Cornea.
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Fig. 4. Leucoma of the Cornea.
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Fig. 5. Necrosis of the Cornea.
page 91.

Fig. 6. Iridectomy for Optical purposes.
page 94.

ULCER OF CORNEA.

Fig. 1. Ulcer of the Cornea.
page 90.

Fig. 2. Healing Ulcer of the Cornea.
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Fig. 3. Serpiginous Ulcer of the Cornea.
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Fig. 4. Leucoma of the Cornea.
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surface of the cornea. They are rapidly progressive and lead to perforation. (c) Strumous ophthalmia.—In the conjunctivitis of strumous children many different forms of ulceration are seen. Sometimes there is only a tiny abrasion of the corneal epithelium, which, from the intense photophobia and blepharospasm to which it gives rise, can with difficulty be detected without staining by fluoresceine. In other cases there is a transparent faceted ulcer which looks as if a little bit had been chipped out of the surface of the cornea. Indolent, and always very difficult to heal, this may become vascular and persist for many weeks as a red speck. In this form it rarely perforates. Should a pustule situated in the corneo-scleral margin suppurate and ulcerate, it may rapidly cause perforation of the cornea with prolapse of the iris (Plate XXVI., Fig. 2). At times, especially in unhealthy children, an abscess forms in the centre of the cornea and, bursting externally, gives rise to a purulent ulcer. Pus forms within the layers of the cornea—onyx—and, accumulating in the anterior chamber, gives rise to hypopyon. (d) Ulceration may also occur in trachoma, where it is always to some extent present along with pannus; in trichiasis, where misdirected eyelashes irritate the cornea; and in lithiasis, where an exposed chalky particle in either the upper or lower lid scratches the front of the globe.

2. Abnormal Exposure of the Eyeball.

When the eye is not properly protected by the lids, as in ectropion, lagophthalmos, or proptosis, the cornea suffers and ulceration takes place, as a rule, at its lower part.

3. Diseases characterised by Interference with Nerve Supply.

More especially is the complication noticed in the last paragraph apt to occur when, in addition to the unnatural exposure, there is also interference with the function of the fifth cranial nerve. This is seen

in its most pronounced form in neuro-paralytic keratitis, which may follow excision of the Gasserian ganglion, or paralysis of the trigeminus through disease. Ulceration is not uncommonly found in absolute glaucoma, where, as the result of the increased intra-ocular tension, there is want of sensation in the cornea. In old and debilitated people it is often said to arise from exposure to cold; but here also the special vulnerability and rapid destruction are more probably due to defective nerve supply, and may consequently be considered in the same category as kerato-malacia in either badly nourished infants or in the last stages of exophthalmic goitre.

4. *The Breaking-down of a Cicatrix.*

This is seen in cases, whether due to traumatism or to disease, in which the scar that has been left breaks down from time to time and the ulceration begins afresh.

5. *The Improper Use of a Lead-lotion—Saturnine Ulcer.*

If, in ignorance, a lead-lotion has been applied in a case of corneal ulceration, a deposit of white-lead will form upon the raw surface and give rise to a staring white opacity which is permanent (Plate XXVI., Fig. 1).

In diseases of the eye in which severe ulceration of the cornea occurs, the complication is so serious as for the time being to overshadow the original disorder. Hence the necessity for careful examination in all such cases, so that the treatment may be directed to prevent, if possible, the cornea from becoming involved, or to limit the area of destruction if ulceration has already taken place. It must be remembered also that a simple abrasion of the cornea (Plate XXV., Fig. 1) may be changed, by infection from diseased eyelids, and more

particularly from discharge in cases of blennorrhoea of the tear sac, into a sloughy ulcer which may destroy the eye completely (Plate XXV., Figs. 3 and 5).

Corneal ulcers may be classified into superficial and deep, central and marginal, progressive and healing; but two forms require special notice—the serpiginous and the rodent. The former (Plate XXV., Figs. 3 and 5) is in almost every instance the result of some injury—probably trivial in itself—where the raw surface has been infected, either at the time, or afterwards by discharge from the tear passages. It receives its name from the tendency it has to creep over the surface of the cornea, and it is in about seventy-five per cent. of cases complicated by hypopyon. It is specially characterised by a crescentic undermined suppurating margin in the direction in which ulceration spreads, whilst healing goes on along the opposite border. This peculiarity may be explained by the fact that the micro-organism specially associated with this form of ulcer—pneumococcus—is unable to live in a tissue after its products have reached a certain stage of concentration. Unless a very extensive area of the cornea has become involved, typical serpiginous ulcer does not tend to perforate, differing in this respect very markedly from some other purulent forms in which the streptococcus has been found, and where the tendency is to rapid destruction of corneal tissue and early perforation. Rodent ulcer usually occurs in elderly people, and often develops on the arcus senilis. It travels slowly round the cornea, leaving a trail due to cicatricial opacities. Though slow to heal, it rarely causes perforation.

The subjective phenomena associated with ulcers of the cornea are much more pronounced in the superficial, than in the deep, forms. In the former the nerves are exposed and irritated, in the latter they have been destroyed. As a rule photophobia is always worse in children, more especially in those who are strumous, than in adults. Pain, often very severe, in and around the eye is a sure sign that the ulcer is progressive. It reaches its maximum immediately before perforation

but sudden relief is experienced as soon as the cornea gives way. Pericorneal injection, always present but varying in intensity, is usually most pronounced in adults, and, when severe, indicates clearly that active mischief is in progress. Should there be inflammation of the iris and ciliary body, the injection is concealed by chemotic swelling of the ocular conjunctiva. When an ulcer is progressive, its surface is uneven and greyish or yellowish in colour, and its edges are ragged, steep, swollen, undermined, and wholly or in part infiltrated with pus. Both pericorneal injection and subjective phenomena are acute. If, on the other hand, an ulcer be healing (Plate XXV., Fig. 2), its surface is clean and smooth; its edges are even and rounded, and the cloudiness beyond tends steadily to clear up. The pericorneal injection and the subjective phenomena gradually disappear.

A further stage in the healing process is marked by the development of "vessels of repair" running towards the ulcer from the limbus and preventing extension of the sore; but it must be remembered, that although an ulcer which has become vascular does not grow larger, it may increase in depth and ultimately perforate. Immediately after all the necrosed tissue has been removed there is a rapid development of epithelial cells to cover the surface, and of connective tissue to fill up the cavity. As a rule these two processes go on simultaneously, so that by the time the surface of the ulcer has become protected by epithelium the depression has been raised to the level of the surrounding cornea. Sometimes, however, the surface is completely covered long before the lost substance has been replaced by new tissue, *e.g.* in "indolent," "transparent," or "corneal-facet" forms.

Complications.

In severe ulceration, as for example after the eye has been burned, the whole substance of the cornea is destroyed and melts away with the exception of Descemet's membrane. This, denuded of the other

ULCER OF CORNEA.

Fig. 1. Saturnine Ulcer of Cornea.
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Fig. 2. Ulcer of Cornea with prolapse of Iris.
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Fig. 3. Leucoma Adherens.
page 94.

Fig. 4. Myocephalon.
page 94.

Fig. 5. Partial Staphyloma.
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Fig. 6. Anterior Staphyloma of the
Cornea and Iris.
page 95.

ULCER OF CORNEA.

Plate 28.

Fig. 1. Saturated Ulcer of Cornea.
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Fig. 2. Ulcer of Cornea with prolapse of iris.
page 93.

Fig. 3. Leucoma Adhens.
page 94.

Fig. 4. Myocephalon.
page 94.

Fig. 5. Partial Staphyloma.
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Fig. 6. Anterior Staphyloma of the
Cornea and Iris.
page 95.



layers of the cornea, escapes for the time being the general destruction, and presents a smooth shining surface, which must on no account be taken for a sign of the healing of the ulcer. Such an error ought never to arise, because all the other signs and symptoms point to rapid progression; and probably within twenty-four hours Descemet's membrane also will have given way, and the iris will be seen lying exposed and prolapsed. In some cases, however, simple perforation is to be regarded as a favourable occurrence, because after the aqueous has escaped, and all pressure has in consequence been removed, the disease is arrested and healing begins. If the perforation be in the centre, the anterior capsule of the lens will come forward against the posterior surface of the cornea immediately after the aqueous chamber is emptied; but if the rupture takes place at any other part, it is the iris that comes forward and the intra-ocular pressure is sufficient, on the escape of the aqueous humour, to force it into the gap, and as a rule to cause it to prolapse beyond the cornea (Plate XXVI., Fig. 2). In cases where ulceration is extensive and rupture of the cornea occurs, the damage to the eye is so great that the lens becomes dislocated, and sometimes escapes from the globe followed by a gush of vitreous humour. Such a complication is occasionally accompanied by intra-ocular haemorrhage, and may be followed by panophthalmitis.

Hypopyon is present, as has been already noted, in about seventy-five per cent. of all serpiginous ulcers, and in many cases there is also the additional complication of irido-cyclitis. The pus in the anterior chamber is derived partly from the ulcer through a perforation in Descemet's membrane, and partly from the inflamed iris and ciliary body. In the absence of iritis and cyclitis a comparatively large hypopyon can become rapidly absorbed, but when the ulcer is complicated by irido-cyclitis, the collection of pus in the anterior chamber tends to persist, and usually varies in amount from day to day. There is great accentuation of all the subjective phenomena, and pain, often markedly nocturnal in character, radiates from the eyeball along the branches of

the fifth nerve. The pupil dilates irregularly to atropine, the anterior chamber is deep, and the ocular conjunctiva is raised above the level of the cornea as a fleshy chemosis, the colour of which varies from a bright to a livid red, according to the degree of implication of the uveal tract. It is a wise rule, therefore, before giving a prognosis in a case of hypopyon-ulcer to instil atropine and watch its effect upon the pupil. The more quickly the iris responds to the influence of the mydriatic, the more favourable will be the course of the disease.

Sequelae.

An ulcer which has involved the substantia propria of the cornea always leaves a cicatrix, which is dense and permanent in proportion to the severity of the previous inflammation and the loss of corneal substance. A scar of this kind receives different names according to its density, being called a nebula when it is but faintly visible, a macula when it is more pronounced, and a leucoma when it is prominent and milky white (Plate XXV., Figs. 4 and 6). The permanence of this cicatrix is largely dependent upon age—the younger the patient the more chance there is of the opacity clearing. Time also may work in its favour, but, as a general rule, no change is likely to take place after the lapse of two years. Even a very slight nebula in the cornea interferes greatly with sight, hindering the entrance of light and producing astigmatism. When vision has been thus disturbed in early life, squinting and nystagmus are apt to develop as the child grows older.

Where an ulcer goes on to perforation, it is always followed by a leucoma, and in this case the iris is adherent to the posterior surface of the cornea—leucoma adherens (Plate XXVI., Figs. 3 and 4). With the rupture of the cornea there is apt to be dislocation of the parts within the eyeball, and the apposition of the iris to the cornea will probably in time bring about obliteration of the corneo-iridic angle and blocking of the anterior filtration spaces. When this occurs, the damaged eyeball

becomes hard and painful, intra-ocular haemorrhage and panophthalmitis may supervene, and in addition there is a great tendency for the corneal cicatrix to break down, and for ulceration to begin afresh. It occasionally happens that, after perforation, the opening of the cornea does not close properly, and a fistula remains from which the aqueous drains away constantly. If the opening does not close within a short time, the nutrition of the eyeball suffers severely, and the globe softens and shrivels, and undergoes those degenerative changes which are grouped under the term phthisis bulbi. When the destruction of the cornea has been great, the newly-formed connective tissue covering the prolapsed iris, unable to resist the force of the intra-ocular pressure, bulges and gives rise to a partial or a complete staphyloma (Plate XXVI., Figs. 5 and 6).

PLATES XXVII., XXVIII.

Interstitial Keratitis.

(κέρας, anything made of horn.)

Inflammation of the substantia propria of the cornea.

French, *Kératite interstitielle*. German, *Hornhautentzündung diffuse*.

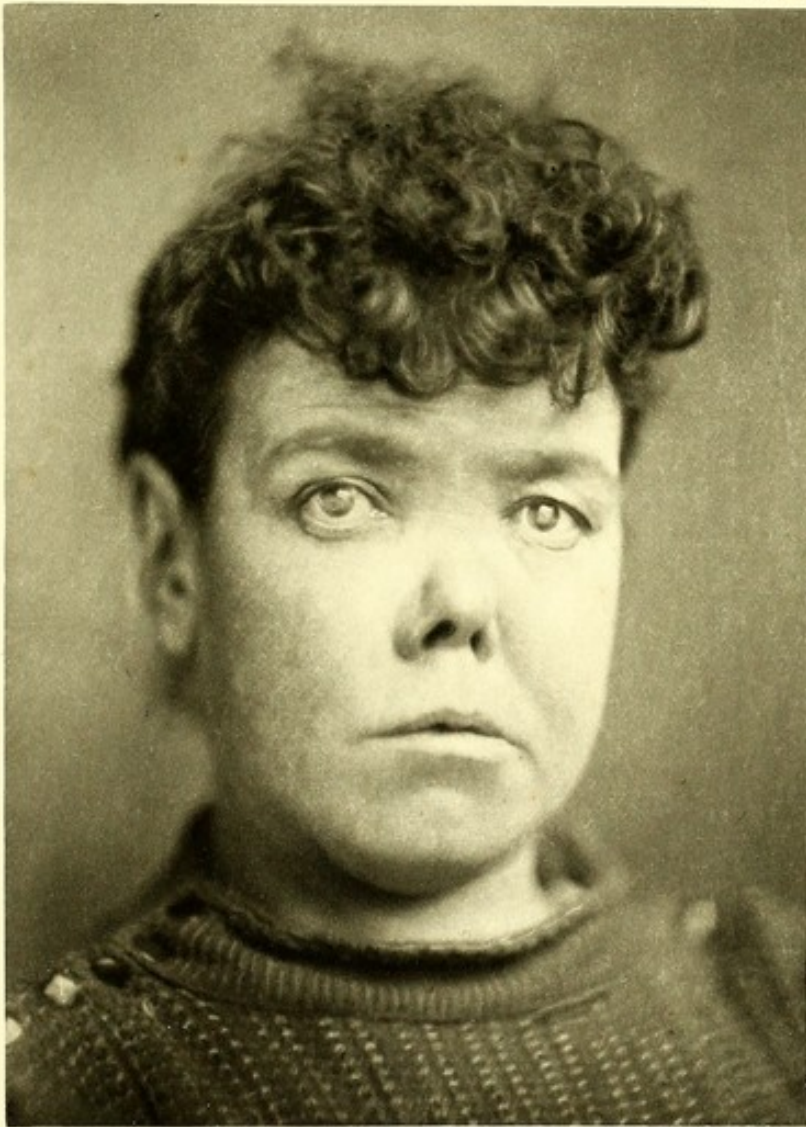
Italian, *Cheratitis*.

INTERSTITIAL KERATITIS is by far the most important eye-symptom of inherited syphilis. It usually attacks those predisposed to it between five years of age and twenty, though it is sometimes present during intra-uterine life. It is seen oftener in girls than in boys, and a very trivial exciting cause is sufficient to determine the onset. The prominent symptoms may be described as follows: At first the patient has difficulty in facing the light, and when the eye is examined a few small greasy-looking spots are to be seen in the substance of the cornea, the surface of which is rough, but not as a rule abraded. The inflammation starting from these foci spreads rapidly until the cornea loses its transparency, and comes to resemble a piece of ground glass. The blood-vessels of the limbus are congested, and the amount of this pericorneal injection, taken along with the degree of photophobia and lachrymation, affords a good indication of the severity of an attack. Fringes of minute blood-vessels not only traverse the surface of the cornea, but also invade its substance, with the result that the ground-glass appearance is lost, and the cornea takes on a rusty colour, or even, so great is the vascularity in some cases, becomes like a piece of red cloth. Since these newly-formed blood-vessels encroach from the margin, there is generally in the

INTERSTITIAL KERATITIS.

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PLATE XXVII



INTERSTITIAL KERATITIS

centre a non-vascular area of a yellowish-white colour, somewhat resembling an abscess; but the formation of pus or the occurrence of ulceration is exceedingly rare.

When the appearances have reached the stage just described, the intolerance of light is so extreme that, for the most part, the eyes are kept firmly closed, and the blepharospasm and lachrymation contribute to form a fissure at the outer canthus, the presence of which causes intense pain whenever the eyelids are forcibly separated. In a time varying from a few weeks to several months, the vascularity lessens, and, with the disappearance of the blood-vessels, the cornea begins to clear up, after which it will, in a mild case, regain its transparency in a comparatively short time. It may be here stated, however, that when a mother is infected at conception or during the early months of pregnancy, the child will suffer acutely, and, should keratitis ensue, it will always be severe, and may take years to run its course.

Eyes that have been affected by interstitial keratitis (Fig. 2) are easily recognised by a peculiar lack-lustre appearance of the iris, and the increased depth of the anterior chamber; and sometimes ophthalmoscopic examination will detect the scars of a pre-existing choroido-retinitis. The disease is almost always symmetrical, but it is rare for both eyes to be attacked simultaneously, and generally just as the one is recovering the other begins to suffer. Mild cases last on an average from three to nine or twelve months, but many run a much more protracted course, and that, too, in spite of careful medicinal and hygienic treatment. The more severe the attack the denser is the infiltration of the corneal substance, and the less likely it is that there will be a perfect recovery. Permanent nebulous opacities are apt to remain, and these, although so slight as to be visible only on careful examination of the eye, always interfere greatly with the normal acuity of vision. Moreover, the curvature of the cornea is so much altered that a high degree of astigmatism is produced. In all severe cases the iris becomes implicated, and the inflammation, travelling backwards, involves the choroid and

retina. These complications are all the more likely to occur if during the course of the keratitis any acute illness supervenes. Synovitis of the elbow and knee joints, periosteal swellings on the long bones, etc., etc., most frequently also occur in those cases where implication of any portion of the uveal tract has taken place.

Interstitial keratitis, when due to hereditary syphilis, is always associated with certain peculiarities of physiognomy (Plate XXVII. and Plate XXVIII., Figs. 1, 3, and 4), and although all these appearances are rarely to be seen in any one patient, yet when even a few of them are found in combination they constitute most trustworthy evidence of the existence of hereditary taint. The conformation of the face is somewhat angular, the features are contracted and drawn, the skin is coarse, and the complexion is pale and earthy. The forehead is prominent, and the skin covering it is thrown into wrinkles through the frowning incidental to the long suffering from fear of light. The bridge of the nose is depressed, and may be completely sunken, through loss of the bones from syphilitic ulceration: from a similar cause affecting the skin, the angles of the mouth and the alae nasi are scarred and fissured by white cicatrices. The teeth are often stunted in their growth, peg-shaped, and irregularly placed, and most characteristic of all is the notching of the upper central incisors of the permanent set.

Some of the patients are abnormally precocious, while others are dull and stupid. In a certain proportion of cases there is suffering not only from defective sight but also from deafness. This last is sometimes due to disease of the middle ear, connected with ulceration of the throat and perforation of the palate, and then the power of hearing may to a certain extent return as the otitis media improves. When, however, there is inflammation of the auditory nerve the hearing is lost rapidly, and the patient remains stone deaf for the remainder of life.

PHYSIOGNOMY IN SYPHILITIC KERATITIS.

Fig. 2. Eyes which have recovered from Keratitis interstitial.
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Fig. 1. Shows depressed bridge of nose.
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Fig. 3. Notched Teeth.
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Fig. 4. Fissures at angle of mouth.
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PHYSIOGNOMY IN SYPHILITIC KERATITIS.

Fig. 2. Eyes which have recovered from Keratitis interstitial.
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Fig. 1. Shows depressed bridge of nose.
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PLATE XXIX.

Figs. 1 and 2. Scleritis.

(σκληρός, hard, and termination, -ιτις, an inflammation.)

Inflammation of the Sclerotic.

French, *Sclérite*. German, *Skleritis*. Italian, *Scleritide*.

THIS disease which is sometimes designated Episcleritis occurs most frequently in young adults, especially among those of a rheumatic or gouty constitution. It is characterised by the appearance on the sclerotic, close to the margin of the cornea, of a circumscribed elevation, of dark-red or bluish-red colour. This might at first sight be mistaken for a phlycten, but careful examination will show that the infiltration is not in, but beneath, the conjunctiva. Moreover, the inflamed patch is always tender to touch, and there is usually more or less aching pain in the brow. The iris is rarely inflamed, but is often somewhat discoloured, the pupil reacts sluggishly to the stimulus of light, and occasionally the cornea is implicated at the point nearest to the elevation, and then the disease becomes complicated by symptoms of interstitial keratitis. After a few weeks the general congestion diminishes and the swelling, now more bluish than red, and traversed by a few enlarged and varicose veins, gradually disappears; but usually for some time longer the underlying sclerotic presents a slate-blue discolouration.

Episcleritis is often very troublesome, as it always shows a marked tendency to recur either at the same spot or at some other part of the eyeball, and it may continue to attack point after point, and only pass off after it has travelled all round the circumference of the cornea.

Relapses, too, may occur after several years, and sometimes the eyes are affected alternately. In spite of its protracted course, however, the disease rarely causes any permanent damage to the eyeball.

Fig. 2 illustrates a form of scleritis supposed to be due to tertiary syphilis—gummatous scleritis. I am indebted to Dr. Argyll Robertson for the drawing from which the illustration has been taken.

Figs. 3 and 4. Sclerotico-Choroiditis Anterior.

Inflammation of the sclerotic and the anterior portion of the uveal tract.

Synonyms: Scrofulous scleritis; Anterior choroiditis; Sclero-keratitis; Sclero-iritis; and Cirsophthalmia (κίρσός, a varicose vein, and ὀφθαλμός, an eye).

French, *Scléro-choroïdite antérieure*. German, *Sklerochorioiditis*. Italian, *Sclero-choroiditide*.

THIS is a very dangerous disease, for although in its early stages its signs are slight yet its progress is most insidious, and as it proceeds it is likely to involve all the tissues of the eyeball. Its consequences are all the more distressing from the fact that it very frequently attacks young adults. The figures represent the right and left eyes of a boy, twelve years of age, who exhibited many symptoms of a tubercular constitution. The eyes had been affected for two years, and the disease had commenced in the left. At the outset a few enlarged and varicose blood-vessels appeared over the surface of the sclerotic in its temporal aspect, and in this region the "white of the eye" quickly became bluish, with here and there a thickened patch of porcelain-like appearance. Later several milky white opacities formed on the cornea, which at points around its circumference seemed to be overlapped by the sclerotic. Up to this stage there had been no pain, but now the child's sufferings became acute, he shrank from the light, and his left eye watered constantly. The tension of the eyeball was found to be

DISEASES OF THE SCLEROTIC.

Fig. 1. Episcleritis.
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Fig. 2. Gummatous Scleritis.
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Fig. 3. Sclerotico-choroiditis Anterior.
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Fig. 4. Sclerotico-choroiditis Anterior.
page 100.

Fig. 5. Interstitial Keratitis.
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Fig. 6. Serous Irido-cyclitis.
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DISEASES OF THE SCLEROTIC.

Plate 29.

Fig. 1. Epischleritis.
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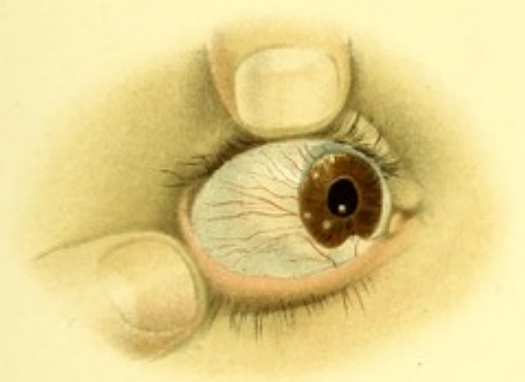
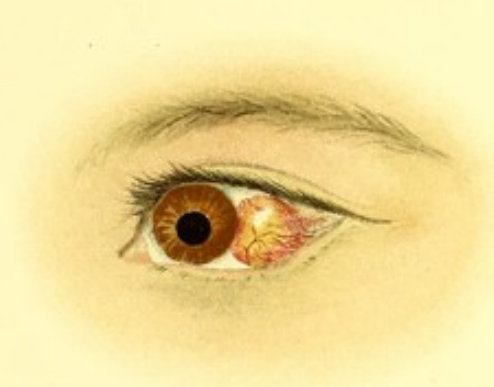
Fig. 2. Gummatus Scleritis.
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Fig. 3. Sclerotic-choroiditis Anterior.
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Fig. 4. Sclerotic-choroiditis Anterior.
page 100.

Fig. 5. Interstitial Keratitis.
pages 82 and 101.

Fig. 6. Serous Irido-cyclitis.
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increased, and the conjunctiva was markedly congested; but it was not until the redness had passed away, that it was seen that a considerable change had taken place in the appearance of the sclerotic. Patches of a dark slate-blue colour were now visible around the cornea, and these yielding to the natural force of the intra-ocular pressure by and by protruded in the form of staphylomata situated over the ciliary region, above and to the outer side. The left pupil became contracted and displaced downwards, but in neither eye was the iris acutely inflamed.

A further stage in the progress of this disease is marked by the occurrence of an increased secretion of fluid into the vitreous. This gives rise to an increase of tension, which the already weakened parietes of the globe are unable to withstand, and consequently the eyeball becomes distended in all its diameters, and a certain amount of exophthalmos is produced. The cornea is usually opaque and enlarged, and its curvature so altered that it seems almost continuous with the attenuated sclerotic (Plate XVII., Fig. 1).

Sclerotico-choroiditis may extend over many years, but on the whole the progress is steadily downward, for, although under favourable conditions a remission in the symptoms may be obtained, the improvement is rarely permanent, a very slight cause serving in predisposed subjects to determine a relapse. After each recurrence, vision deteriorates more and more, and the sufferings of the patient are, especially in the later periods, very severe, owing to the development of acute attacks of secondary glaucoma.

Fig. 5. Acute Keratitis.

THIS figure is referred to in the description appended to Plate XXIV.

Fig. 6. Serous Irido-Cyclitis.

An inflammation of the glands of the ciliary body.

Synonyms: Serous cyclitis; Serous iritis; Keratitis punctata; Aquo-capsulitis; Descemetitis.

French, *Iritis séreuse*. German, *Iritis serosa*. Italian, *Irite sieroso*.

THIS disease is much more frequent in women than in men, and occurs chiefly in ill-nourished and anaemic persons who have over-exerted their eyes by long-continued reading or needlework, especially by artificial light. The figure does not afford a typical illustration of the affection, because it is somewhat unusual to find the symptoms of inflammation so acute as they are here depicted. On the contrary, the irritation produced is often so slight, that the first discomfort of which the patient complains is dimness in vision, and the most striking objective feature is the presence, on Descemet's membrane, of a number of greasy-looking spots collected for the most part at the lower half of the cornea, and arranged in the form of a triangle with the base downward. These punctate deposits may be very numerous, but are often so minute that it is necessary to employ a lens for their detection. The aqueous becomes turbid, and the anterior chamber is often markedly deepened. The alteration in the composition of the aqueous humour causes blocking of the filtration spaces, thus interfering with the natural balance between the processes of secretion and excretion of the fluids of the eyeball, and so produces increase in the intra-ocular tension. When this occurs, the pupil, unless previous inflammation has caused the iris to become tagged to the lens capsule, dilates, the white of the eye is congested, and the patient usually complains of a feeling of dull aching in the globe and forehead, and cannot expose the eye to a strong light. If it be possible to illuminate the fundus by means of the ophthalmoscope, flocculi are

seen in the anterior part of the vitreous, and, in cases of long duration, patches of choroiditis may be detected.

Many patients make a perfectly good recovery, but there is always a danger of relapse, and occasionally chronic glaucoma is established and the disease terminates in cataract and shrinking of the globe.

PLATE XXX.

Figs. 1 and 3. Coloboma of the Iris.

(κολοβόειν, to mutilate.)

A deficiency in the tissues of the iris of either congenital or traumatic origin.

French, *Colobome*. German, *Verstümmelung*. Italian, *Coloboma*.

COLOBOMA of the iris is a very frequent congenital defect. The cleft usually occurs at the lower aspect, and is directed downwards and somewhat inwards. It varies from a slight notching of the pupillary border (Fig. 3)—pyriform pupil—to the entire absence of a portion of the iris extending from the pupil to the ciliary body. One or both eyes may be affected, but the deformity rarely interferes with vision, unless there co-exist the further complication of coloboma of the choroid and optic nerve entrance. Sometimes, however, there is defective development of the whole eyeball (microphthalmos, Plate XXXIX.), and, at other times, the defect in the iris is found associated with such congenital abnormalities as hare-lip, cleft-palate, or coloboma of the eyelid.

Now and then cases occur in which the development of the uveal tract has been arrested at the corneo-iridic angle, and although a rudimentary iris is always present, yet, when the eye is looked at, the natural colour is wanting, and the pupil is similar to one completely dilated by atropine. If no trace of the iris be visible the condition is termed irideremia (*ἰρις*, a coloured circle, an iris, and *ἐρημία*, a deficiency), and on ophthalmoscopic examination the ciliary processes can be seen all round, and within these the circular black line, which demarcates the

CONGENITAL ANOMALIES OF THE IRIS.

Fig. 2. Piebald Iris.
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Fig. 3. Coloboma of the Iris.
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Fig. 1. Coloboma of the Iris.
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Fig. 4. Persistent Pupillary Membrane.
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Fig. 5. Idiopathic Iritis.
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outline of the lens. Both eyes are affected, and patients complain that they are dazzled by light. Many also suffer from amblyopia and nystagmus.

Fig. 2. Variations in the Colour of the Iris.

VARIATIONS in colour are always due to irregularities in the amount and distribution of the pigment, which, when it gets massed together, as shown in Fig. 2, into little heaps in the stroma, gives rise to a number of brown spots upon a blue iris—the piebald iris—or is deposited as a black patch on the surface, resembling the coloboma after a badly performed iridectomy. On the other hand, all pigmentation may be absent from the iris, which then presents a pink appearance, while a red reflex is visible from the pupil in ordinary daylight. This is the condition in albinos (*albus*, white) in whom pigmentation is absent from the hair, skin, and other structures where it is normally found; who suffer so much from bright light that they go about with their eyes half closed; and in whom sight is defective, and nystagmus frequent.

Fig. 4. Persistent Pupillary Membrane.

THE figure affords an illustration of this interesting congenital abnormality. I am indebted to Dr. Argyll Robertson for the drawing. Very fine threads arising at different points in the smaller circle of the iris stretch across the pupil to form a delicate network in front of it. These ought not to be mistaken for posterior synechiae (*συνέχειν*, to keep together), for they spring from the anterior surface of the iris, do not interfere with the movements of the pupil, and are unaccompanied by inflammation.

Fig. 5 is described in connection with Plate XXXI.

PLATES XXXI., XXXII.

Iritis.

(*iris*, a coloured circle, an iris; and termination *-itis*, inflammation.)

Inflammation of the iris.

Synonyms: Iriditis; Uveitis.

French, *Iritis*. German, *Regenbogenhautentzündung*: *Iritis*. Italian, *Iride*.

IN some cases inflammation of the iris is due to direct injury, and hence it occurs frequently after a blow, a penetrating wound, or an operation upon the eye, more particularly if the iris has been much bruised, and the lens capsule has been ruptured. At other times it results from exposure to cold, which will cause an attack all the more readily if the patient be suffering from rheumatism, gout, syphilis, or tubercle. It may also occur as a complication in diseases of the conjunctiva, the sclerotic, and the cornea, and may come on during the course of both retinal and choroidal affections. The following symptoms are common to every case of iritis, no matter how it may have been caused—viz. pain, impairment of sight, intolerance of light, pericorneal injection, discolouration of the iris, turbidity of the aqueous, irregularity of the pupil, alteration in tension, lachrymation, and general malaise. These symptoms vary much in severity, being very pronounced when the disease is acute, and but slightly marked when it is chronic. They differ also in the rapidity of their progress, and the length of time they persist. Plate XXX., Fig. 5, depicts an eye suffering from subacute idiopathic iritis, and the following is a brief description of a case. The patient complains that whenever he looks at the light the eye feels tender and waters, and that the sight is blurred. He may also complain that he feels out of sorts, suffers from headache and loss of appetite, and is feverish and

DISEASES OF THE IRIS.

Fig. 1. Rheumatic Iritis.
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Fig. 2. Haemorrhagic Iritis.
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Fig. 3. Syphilitic Iritis.
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Fig. 4. Syphilitic Iritis.
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Fig. 5. Tubercular Iritis.
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Fig. 6. Chronic Iritis.
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Fig. 1. Rheumatic Iritis.
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Fig. 2. Haemorrhagic Iritis.
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Fig. 3. Syphilitic Iritis.
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Fig. 4. Syphilitic Iritis.
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Fig. 5. Tubercular Iritis.
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Fig. 6. Chronic Iritis.
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restless. The pulse may be quick, the tongue foul, the bowels constipated, and the urine high-coloured and scanty. There is also pain of a neuralgic character, not so much in the eyeball itself as in the forehead, the cheek, and the side of the nose. It is usually more severe at night than during the day, and is often markedly periodic, coming on in paroxysms always about the same hour, and very frequently waking the patient from sleep. At first a faint pink blush appears round about the cornea, but soon inflammatory oedema of the conjunctiva becomes super-added, giving rise to a livid red injection, which may completely conceal the sclerotic. The iris loses its brilliancy, and all details of its structure become invisible. The pupil is contracted, not quite circular, and sluggish in its response to the stimulus of light. If it yields at all to the action of atropine, the dilatation is irregular, as the iris has become firmly attached to the capsule of the lens by inflammatory exudation—posterior synechiae. If the irregular pupil be carefully examined, the lens capsule is seen spotted with pigment at those points where the inflamed iris has been in contact, but where the adhesion was not sufficiently strong to resist the action of the mydriatic. There is always more or less fibrinous effusion, the aqueous is turbid, and in some cases the exudation collects in spots over the posterior surface of the cornea, or may, when the disease is very acute, more especially if it be of traumatic origin, form a purulent deposit at the bottom of the anterior chamber—hypopyon iritis.

An ordinary attack of iritis lasts from four to six weeks, but whenever complications occur its duration is very much longer, as the whole uveal tract may become implicated, and involve the sclerotic on the one hand and the retina and the vitreous on the other.

The following are the more important complications:

1. *Increase of Tension.*

In acute iritis the tension of the eyeball is usually unaltered, but it sometimes becomes considerably increased. This is all the more apt to

occur if the patient be elderly, and the ciliary body and choroid be acutely implicated. It is always accompanied by most intense pain, which is usually aggravated, rather than relieved, by the use of atropine.

2. *Implication of the Uveal Tract.*

As the iris is simply a continuation of the ciliary body and choroid, it is hardly possible for it to be inflamed without a simultaneous hyperaemia of the whole uveal tract. It is often accompanied by scleritis (Plate XXXII., Fig. 1), and sight always deteriorates and is in some cases rapidly lost.

3. *Occlusion of the Pupil.*

In every case of iritis there is more or less exudation, which seals the iris to the capsule of the lens and interferes with the natural action of the pupil. Instead of being limited to points around the pupillary margin—posterior synechiae—the adhesion may be so complete as to preclude the possibility of any circulation of fluids between the posterior and the anterior aqueous chambers—exclusion of the pupil—and, when such a condition exists, there is generally also exudation occupying the area of the pupil—occlusion of the pupil (Plate XXXII., Fig. 2)—and the amount of exudation on the surface of the lens may be so great as to resemble cataract (Fig. 5).

4. *Iris bombé or Iridoncosis.*

(*ἰρις*, an iris, and *ὄγκος*, *ὄγκωσις*, a puffing out.)

When the pupil is “excluded” or “occluded,” cyclitis followed by secondary glaucoma occurs, the iris becomes bulged forward from the pressure of the aqueous behind, and the depth of the anterior chamber is diminished except at its central portion. In such cases the iris is always discoloured and atrophied, and at one or more points its fibres

CHOROIDO-IRITIS.

Fig. 1. Subacute Choroido-iritis.
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Fig. 2. Chronic Choroido-iritis.
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Fig. 3. Acute Choroiditis.
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Fig. 4. Choroido-iritis with haemorrhage.
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Fig. 5. Choroido-iritis after Rheumatic Fever.
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Fig. 6. Choroido-iritis after Measles.
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Fig. 1. Subacute Choroïdo-iritis.
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Fig. 2. Chronic Choroïdo-iritis.
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Fig. 3. Acute Choroïditis.
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Fig. 4. Choroïdo-iritis with hæmorrhage.
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Fig. 5. Choroïdo-iritis after Rheumatic Fever.
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Fig. 6. Choroïdo-iritis after Measles.
page 114.



are so thinned that the uveal pigment shines through as black spots or stripes. The iris stroma proper becomes quite rotten, the blood-vessels degenerate, and intra-ocular haemorrhage is of frequent occurrence (Plate XXXII., Figs. 2 and 4). By and by the constant dragging upon the ciliary body sets up a chronic irido-choroiditis, whereby the nutrition of the globe is seriously impaired, cataract forms, the tension diminishes, the vitreous shrinks, the retina separates, and the eyeball gradually shrivels—phthisis bulbi.

An inflammation of the iris may be primary, or secondary to some local or constitutional disease. It may occur in three forms, the plastic, the serous, and the purulent, and this classification has the great advantage of being founded upon a pathological basis; but in practice it is more convenient to divide the cases into clinical types, which differ from each other in their course, prognosis, and treatment.

1. *Traumatic Iritis.*

This form depends altogether upon the nature of the injury which has given rise to it, and is always serious when the lens has been wounded (Plates XXXIII. and XXXIV., and the description appended to them).

2. *Rheumatic and Gouty Iritis.*

Plate XXX., Fig. 5; Plate XXXI., Figs. 1 and 6; and Plate XXXII., Fig. 5. The last-mentioned figure represents the left eye of a boy who suffered severely from rheumatic fever. During the course of his illness acute irido-cyclitis supervened, and the illustration shows the appearance of the eye twelve months after all rheumatic symptoms had disappeared. As a rule, the disease attacks adults in whom there is a history of general rheumatism, or who suffer from digestive disturbances, often indicated by the presence of lithiasis or oxaluria. It may, however, also occur in those who have never suffered before from

any symptom of rheumatism in other parts of the body. It prevails for the most part during the early spring or the 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 froth—arthritic foam—collects along the edges of the eyelids and at either canthus. The discolouration of the iris is not so pronounced, and the amount of exudation is not so great, as in some other forms of iritis, but the pupil becomes gradually closed, and may be contracted to a mere pin point from posterior synechiae. In the gouty forms, more especially, haemorrhage into the anterior chamber (Plate XXXI., Fig. 2) is not unfrequent. The worst feature of this form of iritis is its tendency to recur. It relapses again and again, and hence it has received the name "recurrent iritis." A patient, a man aged thirty-six, who was recently under my care, told me he had suffered from twenty attacks within six years.

Under this heading ought also to be included:

(1) A large number of cases of chronic iritis (Plate XXXI., Fig. 6) in which there has been neither pain nor any redness of the eye, but the sight has steadily failed. Examination reveals extensive posterior synechiae, and it is probably the retinal portion of the iris that is primarily affected.

(2) A peculiarly insidious and very destructive form of iritis which attacks young adults of gouty parentage. The whole uveal tract is gradually involved, floating bodies form in the vitreous, the lens becomes cataractous, and the extinction of vision is hastened by the occurrence of secondary glaucoma.

(3) Gonorrhoeal iritis, which is a somewhat rare complication of gonorrhoeal arthritis.

3. *Syphilitic Iritis.*

Plate XXXI., Figs. 3 and 4. The syphilitic virus attacks the uveal tract with great frequency, and often with peculiar virulence; and this

is not to be wondered at when it is remembered how prone syphilis is to implicate the smaller blood-vessels—arteritis syphilitica—and this, too, even in those cases in which the secondary symptoms have not been severe. Of all the causes of iritis, syphilis is admitted to be one of the most frequent, and although it is difficult in the early stages to be sure of the diagnosis from the eye appearances alone, yet, as the inflammation of the iris proceeds, there often develop signs and symptoms so characteristic that all doubts are removed. When the iritis accompanies the sore throat and the cutaneous eruptions of secondary syphilis its cause is perfectly clear, and it is then merely one of the manifestations of the general disease; but it must be admitted that many cases occur where, in the absence of a syphilitic history, it is no easy matter to distinguish the syphilitic from the non-syphilitic form. Though every ophthalmic surgeon has formed in his own mind a clinical picture of the appearance presented by inflammation of the iris when it is the result of syphilis, yet of all the so-called characteristic signs—turbidity of the aqueous, greasy spots on the posterior surface of the cornea, opacities in the vitreous, a degree of dusky red pericorneal congestion out of all proportion to the severity of the pain which is for the most part circumorbital and nocturnal—none can be considered pathognomonic except the formation in the iris of gummatous nodules situated for the most part close to the margin of the pupil. These nodules vary in size, and may not be visible until the pupil is dilated by atropine, when they are detected on the parts which are adherent to the anterior capsule of the lens. Syphilitic iritis, moreover, oftener than any other form, involves both eyes, and though the one is as a rule affected after the other, it is by no means unusual to find both inflamed at the same time. Relapses in the form of frequently recurring attacks are not common, but iritis when due to syphilis is liable to be complicated with, or to be followed by, inflammation of the choroid and the retina.

The patient, whose case is illustrated in Plate XXXI., Fig. 4, was a woman aged twenty-eight, whom I first saw on the 25th of March, 1895.

Four months previously, shortly after the birth of a child, her right eye became inflamed. There was a clear history of syphilis, and this was confirmed by the statement of her usual medical attendant. When she was first seen, a greyish-pink vascular growth occupied the lower portion of the iris. This was, however, partially obscured by the great turbidity of the aqueous, which was almost milky in appearance in the lower two-thirds of the anterior chamber. There was an intense deeply-livid pericorneal injection; but pain was remarkably slight, and, although the eye watered a great deal, there was very little intolerance of light. Perchloride of mercury was prescribed and atropine instilled, and after a week the turbid aqueous had become so transparent that the outline of the gumma in the iris was distinctly visible. It was now seen to be composed of a cluster of orange-red nodules, varying in size, and extending from the pupillary border into the substance of the iris for a considerable distance towards the periphery. Numerous roundish greasy-looking spots also showed themselves on the posterior surface of the cornea.

Under the steady continuance of the treatment indicated, the pericorneal injection gradually diminished, and the gumma quickly disappeared. So rapid, indeed, was the progress of the case that in a few weeks the patient, considering that she was well, ceased to attend. There is usually, however, considerable atrophy of the iris after the absorption of a gumma so large as was here present; but, as a rule, uncomplicated cases end in resolution, with more or less perfect recovery of eyesight.

When, however, the gumma extends backwards, and involves the ciliary region, the prognosis is by no means so favourable. Severe pain and photophobia are then constant symptoms, and in virulent cases the eye may be destroyed completely in spite of even the most energetic antisyphilitic treatment. One of the worst cases which has ever come under my own observation was that of a man who, at the time his eyes became affected, was suffering from a very profuse eruption on the skin,

and from ulceration of the throat so severe as to be almost phagedaenic. The left eye passed through the ordinary stages of acute syphilitic iritis, and recovered, leaving some points of adhesion between the iris and the capsule of the lens. When the left eye was almost well, the right became acutely inflamed; the pain was very severe, and was circumorbital and markedly nocturnal in character; there was intense pericorneal injection with great tenderness over the ciliary region. In spite of the most energetic antiphlogistic and antisiphilitic treatment the disease continued to progress. At different points round the cornea the sclerotic became inflamed, and raised the overlying conjunctiva in circumscribed patches, violet-red in colour, and intensely tender to touch. Thereafter the cornea began to lose its transparency, and to bulge forward. These very acute symptoms lasted for nearly a fortnight, and then gradually subsided; but the sclerotic, thinned as a result of the previous inflammation, allowed the choroid to shine through, and showed a slate-blue discolouration. By and by, yielding to the force of the intra-ocular pressure, it first formed staphylomatous projections over the ciliary region, and ultimately became distended in its entire circumference, so that the eyeball was completely disorganised.

4. *Tubercular Iritis.*

Plate XXXI., Fig. 5. This is a rare form of iritis, and the disease may appear in one eye or in both. It might be confounded with the syphilitic form, but tubercular iritis usually occurs at an age when gummata are very rarely observed. It often co-exists with tubercular manifestations in other parts of the body, and the eye symptoms sometimes appear suddenly, after surgical operations upon bones and joints affected with strumous disease. It may run its course with but little pain and end in recovery, but, on the other hand, and more especially when the ciliary body is involved, there may be great suffering, and in the metastatic cases just referred to the disease may appear in such an

acute and virulent form as to completely destroy the eye within a few days. The figure was taken from a child, eight years of age, whom I saw in the summer of 1897. It had been under the care of a surgeon for strumous dactylitis, and the condition of the eye was noticed very shortly after an operation upon one of its fingers. The child did not complain of pain, but the eye watered when it was exposed to the light, and there was a pinkish blush surrounding the cornea. There were a few posterior synechiae, but when atropine was instilled the pupil dilated moderately. On the surface of the iris were a number of nodules of yellowish-grey colour. These were all of minute size, except one situated on the ciliary attachment of the iris at its outer aspect. There were never any acute symptoms and the tubercles slowly disappeared, all that remained of them by the spring of 1898 being a tiny speck which marked the site of the largest. It seemed as if the eye was going to make a perfect recovery, but before sufficient time had elapsed to permit of the disappearance of this little spot, tubercular meningitis set in and resulted in death.

Fig. 6, Plate XXXII., shows the eye of a child, four years of age, who, during an attack of measles, suffered from irido-cyclitis so severely that it seemed at first as if the eye was to be completely destroyed. The acute symptoms gradually subsided, but it was many months before the fundus could be illuminated. Sight, however, slowly returned, and, as far as could be judged in a child so young, was, by the end of twelve months, almost as good in the one eye as in the other. There remained, however, at the lower part of the pupil, a firm posterior synechia, opposite to which there was an atrophied patch in the iris.

5. *Sympathetic Iritis.*

This is described in connection with Plate XXXV.

PLATES XXXIII., XXXIV.

Injuries of the Eyeball.

French, *Blessures de l'œil: Traumatismes de l'œil.* German, *Verletzungen des Auges.* Italian, *Ferite dell' occhio.*

It is as a rule to the family doctor that patients first resort for aid after an injury to the eyeball, and few cases of accident give greater cause for concern, inasmuch as, no matter how trivial an eye-injury may seem, there is always the risk of disastrous results. The fate of the damaged eye depends indeed, in many cases, on the treatment first adopted, and at all times the sense of responsibility is intensified by the knowledge that an injury to one eye may be followed by sympathetic inflammation of its fellow, and that this may be so severe as to cause complete loss of vision.

It is convenient to divide injuries of the eyeball into those which are the result of a blow (concussion injuries, Plate XXXIII.), and those which are due to a wound (penetrating injuries, Plate XXXIV.).

1. Concussion Injuries.

Figs. 1 and 2. *A Blow on the Eye.*

Plate XXXIII. The superciliary ridge and the projecting malar eminence serve the purpose of natural bulwarks, and safeguard the ball from injury. The full force of a blow in many instances, therefore, falls upon those outlying buttresses, and the globe itself frequently escapes in a wonderful manner. Owing to the circumorbital tissues

being so lax, a blow upon the eye at once induces rapid swelling of the lids and the surrounding parts, all of which speedily become discoloured from effusion of blood. The appearances presented are those commonly designated as a "black eye." In the majority of cases there is also subconjunctival ecchymosis, which varies in degree according to the severity of the injury (Fig. 1). It may be limited to the spot where the eyeball was struck, or, as sometimes happens, may completely cover the sclerotic, and then the conjunctiva projects, and appears like a red collar encircling the cornea. The effused blood forms a clot, visible through the transparent conjunctiva, and bounded in front by the corneal limbus. Now and then, however, these limits are overstepped, and blood finds its way for a short distance into the substance of the cornea. It always more or less completely hides the sclerotic, and this changed appearance of the eyeball is at once noticed by the patient, and usually causes him much anxiety. When subconjunctival ecchymosis occurs immediately after an accident, it is of very little significance, but should it, on the other hand, make its appearance after a lapse of several days, the prognosis is very serious, because it is then one of the most trustworthy indications of fracture through the anterior fossa of the skull. This sign is therefore of great value as indicating a grave condition, which may be followed by death; so that it is always very important in every case of injury to the head to note whether subconjunctival ecchymosis be present, and to enquire whether it appeared immediately after the accident, or not for several days.

Gradually the clot becomes absorbed, passing through varying shades of brown and green and yellow until the sclerotic again becomes visible. The time required for the disappearance of the blood varies from a few days to several weeks, but in all cases in which the haemorrhage has been extensive a yellowish staining of the white of the eye remains for a much longer time. After a slight blow the patient does not as a rule complain of anything except the disfigure-

CONTUSION INJURIES OF THE EYEBALL.

Fig. 1. Subconjunctival Ecchymosis.
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Fig. 2. Haemorrhage into Anterior Chamber.
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Fig. 3. Rupture of Iris at Pupillary border.
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Fig. 4. Rupture of Iris at Ciliary attachment.
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Fig. 5. Dislocation of the Lens.
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Fig. 6. Rupture of the Eyeball.
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Fig. 1. Subconjunctival Echyymosis.

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Fig. 2. Haemorrhage into Anterior Chamber.

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Fig. 3. Rupture of Iris at Pupillary border.

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Fig. 4. Rupture of Iris at Ciliary apparatus.

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Fig. 5. Dislocation of the Lens.

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Fig. 6. Rupture of the Eyeball.

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ment produced by the ecchymosis, but when the contusion has been severe there is always more or less dimness of vision, and the pupil, which at first is somewhat contracted, does not readily dilate under the influence of atropine. This drug may have to be instilled several times before full dilatation is produced, and the pupil often expands irregularly, assuming an oval shape before becoming round. The dimness of sight is, unless the eyeball has received some structural damage, always transitory, and often of very short duration, and is supposed to be due to shock sustained by the retina at the time of the accident. The lowered visual acuity is sometimes due to a temporary astigmatism, and there may be no change visible on ophthalmoscopic examination, though occasionally the optic disc is seen to be congested, and there is a hazy clouded appearance over the fundus oculi, especially round the macular region. When the injury has been so severe as to produce fracture of the bones at the inner side of the orbit, communication is opened up with the frontal and ethmoidal sinuses, and air is thereby allowed to escape into the surrounding cellular tissue. This is known as emphysema of the eyelid. It is usually accompanied by epistaxis, and the soft swelling is readily distinguished by crackling to the touch and increasing rapidly in size when the patient blows his nose.

When the globe itself has been struck the consequences are often most serious, for an injury seemingly very trivial at the time of its occurrence may be followed by rapid loss of sight, and by inflammation so severe and persistent as to terminate in atrophy of the ball. The delicate and sensitive tissues of the eye are peculiarly intolerant of sharp sudden blows, and many eyes have been lost after such an apparently simple injury as that caused by the rebound of a twig of a tree, the flapping of a sail, or a stroke from a whip-lash. These injuries are often indeed more fatal to vision than others which at the time of their occurrence seemed of a graver nature. A blow may be so severe as to produce temporary alteration in the shape of the globe, and yet vision be retained.

Intra-ocular haemorrhage is of frequent occurrence after contusions of the eyeball, even in cases where there is no evidence of rupture of any portion of the uveal tract (Fig. 2). The effused blood may appear in either the aqueous or the vitreous chamber, and always interferes with sight and produces a peculiar discolouration of the iris.

Figs. 3 and 4. *Rupture of the Iris.*

A blow which has not been severe enough to rupture the cornea or sclerotic may yet produce considerable internal damage. The iris frequently suffers. Its pupillary border may be ruptured, or it may be torn from its ciliary attachment—iridodialysis (*ἰρις*, an iris, and *διάλυσις*, a separation). The lens also may be dislocated, and after all blood has become absorbed the iris will be observed to tremble with every movement of the eye—iridodonesis (*ἰρις*, an iris, and *δύνησις*, an agitation). Deeper structural damage may also be caused, *e.g.*, rupture of the choroid and separation of the retina.

Fig. 3 was drawn from the eye of a woman forty-eight years of age, who, nine years before I saw her, was about to open a lemonade bottle when the cork sprang out and struck her right eye. The pupil was dilated and irresponsive to light, there was a distinct rupture of its margin at the outer aspect on a level with the palpebral fissure, the iris was tremulous, and the lens was dislocated and cataractous.

Fig. 4 represents the eye of a girl fourteen years of age. She also was opening a lemonade bottle when she was struck upon her right eye by the cork. For a few minutes she was quite stunned by the force of the blow. The pain was very severe, and the bleeding into the anterior chamber was so profuse that at first the exact nature and extent of the injury could not be ascertained. The patient was kept in bed, and in a few days the blood became absorbed. It was then seen that the pupil was oval-shaped and displaced inwards, and that the iris was torn from its ciliary attachment at its upper and

outer aspect. The tension of the eyeball was normal and the lens was not dislocated, but there was complaint of "dazzling," and sight was much impaired. A year after the accident the eye presented the appearances shown in the illustration. By that time the aperture at the ciliary margin of the iris had become much less, but was still distinctly visible, and when light was transmitted to the eye by the ophthalmoscope, a red reflex was obtained through the rupture as well as from the pupil. Sight was then quite restored to the normal standard.

Fig. 5. *Dislocation of the Lens.*

This accident is not unfrequent when the eye is struck directly, *e.g.*, by a blow from a fist, a tennis ball, a racquet, etc.; and it is still more likely to occur when the blow comes from the side, whence it happens that, in a fight, the peacemaker suffers oftener than the combatants themselves. The displacement may be partial or complete. In the former case the lens remains in the posterior chamber, its black outline being readily visible on ophthalmoscopic examination. If the vitreous be fluid, it is seen to swing up and down with the movements of the eye. In complete dislocation the lens may be forced into the vitreous, when it lies quite removed from the line of sight at the bottom of the chamber. In other cases, more especially if the lens be small, it escapes through the pupil, and falls into the aqueous. In this situation it may give rise to much trouble, and excite secondary glaucoma. When the injury is more severe, the tissues of the eyeball are ruptured, and the lens escapes beneath the conjunctiva. The sclerotic usually gives way at its upper or inner aspect, just beyond the corneo-scleral border, and it is easy to distinguish the lens lying covered by conjunctiva. These cases are always accompanied by much laceration of the iris and profuse haemorrhage, and occasionally by considerable inflammatory reaction. After dislocation, the lens may remain transparent, but more usually it becomes cataractous, and in old-standing cases undergoes calcareous degeneration, when its bulk is so

much reduced that it slips backwards and forwards through the pupil without any difficulty. In the case represented in the figure the lens had been dislocated for more than a year, and was found, when an attempt was made to extract it, to have been converted into a thick liquid somewhat of the colour and consistency of cream, which ran out readily when the conjunctiva was cut.

Occasionally the lens is dislocated idiopathically, and congenital dislocation—ectopia lentis—also occurs.

Fig. 6. *Rupture of the Eyeball.*

The drawing was taken from a young man who told me that, the night before, when he was going to his home, he was attacked and robbed by a gang of ruffians, and received a kick upon the right eye. The pain was so excruciating, and the loss of blood so great, that he fainted, and was found in an unconscious state by a policeman some time afterwards. There was a wide rent in the sclerotic, through which it was evident that the clear structures of the eye had escaped, and through which a large prolapse of the choroid and retina had taken place. The ball was filled with blood, which had also infiltrated the substance of the cornea, and formed a thin layer in front of the iris, giving rise to the appearance of a pupil though no pupil was there. The conjunctiva was chemosed, and the lids were swollen and discoloured. When the globe was enucleated, it was found occupied by a large blood-clot, all the proper structures having escaped except some remains of the uvea and the retina.

2. Penetrating Injuries.

Fig. 1. *A Wound of the Cornea with Prolapse of the Iris.*

Plate XXXIV. This form of injury is of frequent occurrence not only among adults, but also among children, who readily injure their eyes with

PENETRATING INJURIES OF THE EYEBALL.

Fig. 1. Wound of Cornea with Prolapse of the Iris.
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Fig. 2. Prolapse of the Iris with Traumatic Cataract.
page 121.

Fig. 3. Traumatic Cataract with Iritis.
page 121.

Fig. 4. Purulent Cyclitis.
page 122.

Fig. 5. Distension of the Eyeball.
page 121.

Fig. 6. Phthisis Bulbi.
page 123.



sharp pointed instruments, *e.g.*, a knife, a fork-prong, scissors, a pen, a piece of stone, a slate, etc. Whenever the cornea is penetrated, the aqueous escapes, and the iris prolapses. The pupil loses its circular shape, becoming drawn and pointed towards the prolapsus, which gets caught firmly between the lips of the corneal wound, while the part which projects soon becomes bleached and shrivelled.

Figs. 2, 3, and 5. *Traumatic Cataract.*

A wound of the cornea accompanied by prolapse of the iris usually, under appropriate treatment, heals up without much trouble; but the condition is very much more serious when the lens has been injured. This complication is more likely to occur in punctured or lacerated wounds, and is much more serious in adults than in children, in whom the cataractous lens soon undergoes solution, and in favourable cases disappears, leaving the eye as it would be after a successful needling operation for soft cataract. In adults, on the contrary, the masses of cataractous lens do not undergo solution readily, but, swelling up, act as a foreign body, and thus set up an irido-cyclitis (Fig. 3) which may be so severe as to end in destruction of the eye—phthisis bulbi. These changes are all the more liable to occur if a foreign body remains embedded in the ball. In punctured wounds, when the iris has been injured, the globe, instead of shrivelling, occasionally enlarges (Fig. 5). The patient from whom the drawing was made was fourteen years of age, and had, when a mere child, been wounded on the right eye with a pair of scissors. The cornea was much enlarged, and near its centre was a cicatrix to which the iris and the capsule of the lens were adherent. The sclerotic was thin and bluish, and the whole globe was much distended and very prominent. Sight was gone, but the eye never caused any discomfort.

Figs. 4 and 6. *Suppurative Cyclitis.*

If traumatic infection occur, suppuration is sure to follow, and in this respect punctures are more fatal than incised wounds. Within twenty-four, or at most forty-eight, hours after the injury the patient complains of sharp stinging pain in the eye. There is slight mucopurulent discharge on the dressings, and a copious gush of tears occurs when the eyelids are opened: the edges of the lids are red and somewhat swollen. In rare instances the advent of the mischief is not heralded by pain, while in others the onset is marked by great suffering not only in the eye but also in the head, and by persistent sickness and vomiting. The pain, at first transitory, becomes more constant, and in character more deep-seated and throbbing. The aqueous becomes turbid, and the iris discoloured. There is exudation into the pupil, well-marked pericorneal injection, increase in the purulence of the conjunctival secretion, infiltration of the lips of the wound, and chemosis of the ocular conjunctiva. In favourable cases the symptoms may at this stage begin to subside, and the inflammation to pass off, leaving a closed pupil. It often happens, however, that the disease progresses still further, and more and more exudation is poured out into the pupil, which by reflected light appears red from the new development of blood-vessels and extravasation of blood. Small abscesses occur in the cornea, and pus forms in the anterior chamber, either constituting an ordinary hypopyon, or collecting as a ring abscess all round the ciliary attachment of the iris. The pain is more acute than ever, and, although it may moderate during the day, is always very severe at night. The suppuration may limit itself to the anterior part of the eyeball, and by its pressure on the sclerotic form staphylomatous bulgings round the cornea, or it may travel backward involving the whole uveal tract. The globe is now a bag of pus which will burst externally whenever the cornea gives way—panophthalmitis. There is great chemosis of the ocular conjunctiva, which projects as a fleshy mass between the lids;

the orbital tissues become implicated; and the eyeball, distended and prominent, becomes fixed and immovable owing to orbital cellulitis. Even in comparatively mild cases the inflammation takes from five to eight weeks to run its course. The cornea, if it has not been destroyed by the suppuration, gradually becomes small and flattened, and blood-vessels enter the substantia propria. The cicatrix of the wound becomes puckered, the intra-ocular tension diminishes, and the globe begins to shrink. For long, however, it remains irritable, tender on pressure, and liable to attacks of pain. The cornea becomes smaller and flatter until the anterior chamber is obliterated, and the eyeball, changed in shape owing to compression by the recti muscles (Fig. 6), may shrivel into a little nodule at the apex of the orbit—phthisis bulbi.

PLATE XXXV

Sympathetic Ophthalmia.

A destructive irido-cyclitis of one eye, the result of injury to the other.

Synonyms: Reflex Ophthalmia; Iritis sympathetica; Irido-cyclitis sympathetica; Ophthalmia migratoria.

French, *Ophthalmie sympathique.* German, *Sympathische Ophthalmie.*
Italian, *Oftalmia simpatica.*

THE true nature of this disease, the most dangerous to which the eye is exposed, is still somewhat obscure. It was formerly believed that it was transmitted from the one eye to the other along the ciliary nerves and the blood-vessels, but recent investigations have gone far to prove that it results from the presence of micro-organisms, which, travelling from the injured eye, reach the other by the lymphatics in the neighbourhood of the optic nerves and chiasma. It is usual to speak of the injured eye as the "exciter," while the one secondarily affected is called the "sympathizer."

The morbid changes in the exciting eye which are likely to give rise to sympathetic inflammation may be classified as follows:

1. Penetrating wounds of the ciliary region, accompanied by prolapse of the iris and ciliary body (Fig. 2), are above all others the most liable to cause sympathetic disturbance, which will follow all the more readily if the wound be lacerated, and if the instrument with which it was inflicted was not clean.

2. Foreign bodies lodged within the eyeball, more particularly if they lie near the ciliary processes, are a constant source of danger, as they tend to keep up inflammatory reaction in the whole uveal tract.

SYMPATHETIC OPTHALMITIS.

Fig. 2. Section of the Eyeball, shewing
Prolapse of Iris and Ciliary-body.

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Fig. 3. Early stage of Sympathetic Irido-Cyclitis.

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Fig. 1. Sympathetic Irido-Cyclitis.

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Fig. 4. Later stage—pupil filled with Exudation.

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Fig. 5. Complete posterior Synechia and
Degeneration of the Iris.

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3. Degenerative changes in an eye previously injured are always accompanied by a certain amount of irido-cyclitis, and consequently an atrophied globe, tender and irritable through calcification of the lens and ossification of the choroid, is invariably a menace to the sound eye.

4. Corneal ulcers which have perforated may form the starting-point for a sympathetic ophthalmitis, but it is interesting to remember that an eye which has burst from within is not nearly so dangerous as one in which perforation has occurred from without. Moreover, all clinical experience goes to prove that after panophthalmitis the danger of a transference of infection from one side to the other is very slight.

5. Sarcoma of the choroid, or dislocation of the lens, accompanied by plastic irido-cyclitis may also induce sympathetic inflammation, but these are probably the only instances in which the disease arises apart from the existence of a perforating lesion of the "exciter."

The kind of eye which most frequently endangers the safety of the other is one which, in consequence of perforation by injury or ulceration, has been attacked by plastic irido-cyclitis, and has become soft and tender to touch. The length of time which may intervene between the injury and the onset of sympathetic inflammation is very variable, for while it probably never occurs earlier than three weeks, there is practically no limit after that to the interval which may elapse before it declares itself. On an average it develops most frequently five or six weeks after the accident, and, if the second eye escape until the one injured has healed, it is not likely to suffer unless fresh inflammation or degenerative changes occur in the exciting eye. In the latter case the onset may not take place for many years. The following is an example: W. G., aged sixty-four, was under my care in October 1891. Thirty-seven years before, he had been struck on the right eye by a piece of glass. The injury, a very severe one, took many weeks to heal, and sight was totally lost, but the eye had caused no inconvenience until September 1891, when it became tender and irritable. The left eye had never given him the slightest trouble, except for a few weeks

during the time the right was being treated, and he had been regularly at work as a weaver until four days before I saw him, when sight had suddenly failed to such an extent as to render it impossible for him to follow his occupation. The injured eye was much shrunk, the cornea was small and flat, and a cicatrix marked the site of the original wound, which had extended right across the globe involving the ciliary region on either side. The stump was tender to pressure and the conjunctiva covering it was injected. The left eye was evidently suffering through sympathy. There was no pain, but sight was so dim that objects round about could be distinguished only with difficulty. The patient shrank from the light, the eye watered readily, there was a faint pink blush round the cornea, the iris had lost its natural lustre, and the pupil was contracted but dilated regularly after atropine was instilled. The ophthalmoscope disclosed an indistinctness in the details of the fundus, but that may have been due to haziness of the media. The injured eye was enucleated with as little delay as possible, and when it was afterwards examined the remains of the choroid were found transformed into a mass of bone, which almost filled the cavity of the sclerotic and involved all that was left of the ciliary body. The operation was followed by speedy relief to the "sympathiser." Four weeks afterwards the patient was able to make out small print quite easily.

This case also illustrates the insidious nature of the onset of sympathetic ophthalmia, which, although occasionally ushered in by severe pain and other symptoms of acute inflammation, usually develops in a manner so treacherous that serious results are not anticipated until the disease is thoroughly established. It may come on at any age, but is more frequent in the young than in the old, and particularly in children who are naturally delicate and of a highly neurotic temperament. When once it has started it is most difficult to arrest. Even under the most favourable conditions it runs a protracted course, and, though recovery occasionally takes place, the result is very frequently total blindness. The destruction of the sympathising eye is, indeed, often more complete than that of the

one which received the injury, and the knowledge of this fact adds greatly to the responsibilities of the surgeon, when he is called upon to treat a case in which sympathetic inflammation has fully developed, and where the exciting eye still retains a fair amount of sight.

It is always necessary to draw a distinction between sympathetic irritation and sympathetic inflammation; for the former is simply a neurosis, and passes off without leaving any organic changes, but the latter is plastic, and in the long run involves the whole of the internal structures of the ball.

1. *Sympathetic Irritation.*

This is characterised by the following symptoms: The patient feels that his eye gets soon tired; has difficulty in reading small print; and after prolonged work suffers from transitory attacks of dimness of vision when he looks at distant objects, or it may be from momentary total blindness. He feels uncomfortable in a bright light, which may cause neuralgic pains to dart through his head, and induce injection of the conjunctiva, accompanied by copious lachrymation.

2. *Sympathetic Inflammation.*

This may or may not be preceded by the symptoms just described, and usually failing sight is the first warning that the patient receives of the development of the disease. When the eye is examined a zone of pink hair-like vessels is seen surrounding the cornea; the iris is dull (Fig. 3); and the pupil is small and sluggish, and dilates irregularly after the instillation of atropine. Even at this early stage there may be neuro-retinitis and floating bodies in the vitreous, but more frequently there is difficulty in seeing the details of the fundus owing to haziness of the media incidental to inflammation of the uveal tract. The cornea also becomes inflamed, spots form in its posterior surface—keratitis

punctata—the aqueous is turbid, and the anterior chamber deep. The corneal signs are all the more marked when the inflammation assumes the serous type—serous irido-cyclitis (Plate XXIX., Fig. 6)—but the plastic form is by far the more frequent. Blood-vessels now develop upon the surface of the iris whose substance thickens and bulges into the anterior chamber, the exudation filling up the pupil (Fig. 4), and later on gluing the whole posterior surface of the iris to the capsule of the lens—complete posterior synechia—matting the ciliary processes together, and implicating the choroid so extensively that the nutrition of the eye is seriously affected. As a result the tension diminishes, the lens becomes cataractous, and the shrinking vitreous causes detachment of the retina. Up to this time there has been perception of light, but now blindness becomes total. The eye is liable to recurrent attacks of irido-cyclitis (Fig. 5); its blood-vessels degenerate, and, rupturing, give rise to intra-ocular haemorrhage; it steadily shrivels, and the final result is phthisis bulbi.

The principal points relating to the origin, progress, and termination of sympathetic ophthalmia were shown in the case illustrated by Fig. 1. M. K. was a pale, delicate-looking child of ten years of age. Her sight had always been defective, but as she was able to run about with other children, the full extent of her visual difficulties was not appreciated until she was seven years of age and was sent to school, when it was discovered that she was suffering from cataract in both eyes. An operation performed on the right eye in 1892 was followed by inflammation, and though she was detained in hospital for many weeks the right eye was still red and tender-looking when she returned to her home. Shortly afterwards, the left eye also became inflamed, and its sight began to fail. From that time both eyes were tender, intolerant of bright light, and subject to recurrent attacks of inflammation. There had at no time been much pain, and the redness of the eyeballs had never been great, but vision had steadily grown worse until she became blind in both eyes.

When I first saw her on the 2nd of December, 1895, she presented a typical example of chronic inflammation involving the whole uveal tract. Both eyeballs were soft, and the right globe was shrunk and misshapen from the pressure of the ocular muscles. There was no pain, but there was slight tenderness on palpation over the right ciliary region. For a short time after each examination of the eye, a faint pink blush surrounded the cornea, but at no other time was there any injection of the conjunctiva. The right cornea was clear, but the left presented a few dirty greasy-looking spots on its posterior surface. Both irides were discoloured, and there was a coloboma upwards—the result of an iridectomy—in the right. They had a dull greyish-green appearance, and scattered over their surface were several brownish-black spots due to exposure of the uveal pigment from stretching and wasting of the overlying iris stroma. This peculiar colouration and these atrophic changes caused the irides to look rotten. The pupils were fixed owing to complete posterior synechiae, and there was slight bulging of the iris into the anterior chamber. The right pupil was occupied by inflammatory exudation, which was white and clear in its central portion, and bound to the iris by bands of fibrin. The left pupil was also occluded by a membranous opacity to which the iris was firmly attached. It was impossible to illuminate either eye by means of the ophthalmoscope.

For more than a year there was little change in the appearances just described, but after that time the "sympathiser" began to shrink rapidly. There was no pain, but the sclerotic was covered by a pink injection, blood appeared in the anterior chamber, and the iris became green in colour from staining by the blood. In the right eye there was still a perception of light, but the left was totally blind, probably owing to detachment of the retina.

PLATES XXXVI., XXXVII.

Glaucoma.

(γλαυκός, blue-green.)

A disease of the eye characterised by increase in the intra-ocular tension, and receiving its name from the greenish appearance presented by the pupil.

Synonym: Cat's eye.

French, *Glaucome*. German, *Grüner Staar*: *Glaukom*. Italian, *Glaucoma*.

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 extreme liability of females, more particularly to the inflammatory forms, is in many cases intimately connected with the cessation of the menses. Both eyes are usually affected; but, as a rule, the second months, perhaps years, after the first. Generally the more acute the attack is in the one first involved, the shorter will be the interval before the other suffers; while, on the other hand, if the disease in the first be non-inflammatory, the longer is the second likely to escape.

Glaucoma shows a special predisposition to attack certain races. It is more common in England than in Scotland, and seems to be particularly frequent among the Egyptians and the Jews. It is often hereditary, and, when it is so, generally appears at an abnormally early age. Some years ago I operated on a woman in whom the first symptoms appeared when she was thirty-four years of age, and whose mother, brother, and four cousins on the maternal side all suffered from the same cause—every one of them, except the brother, having been

CHRONIC GLAUCOMA.

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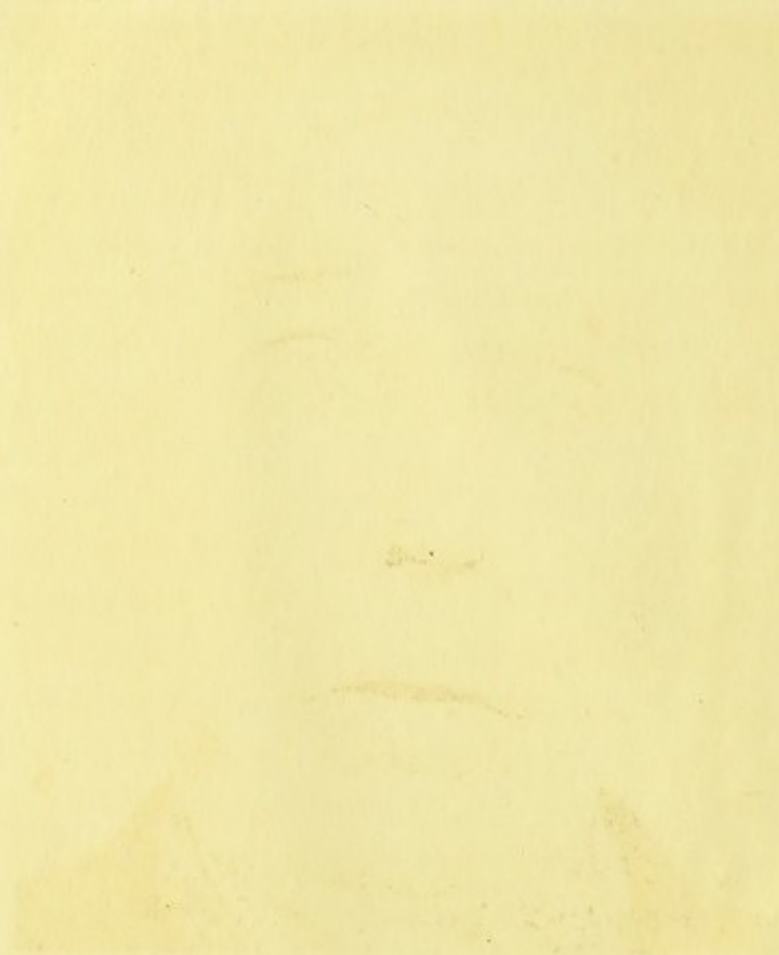
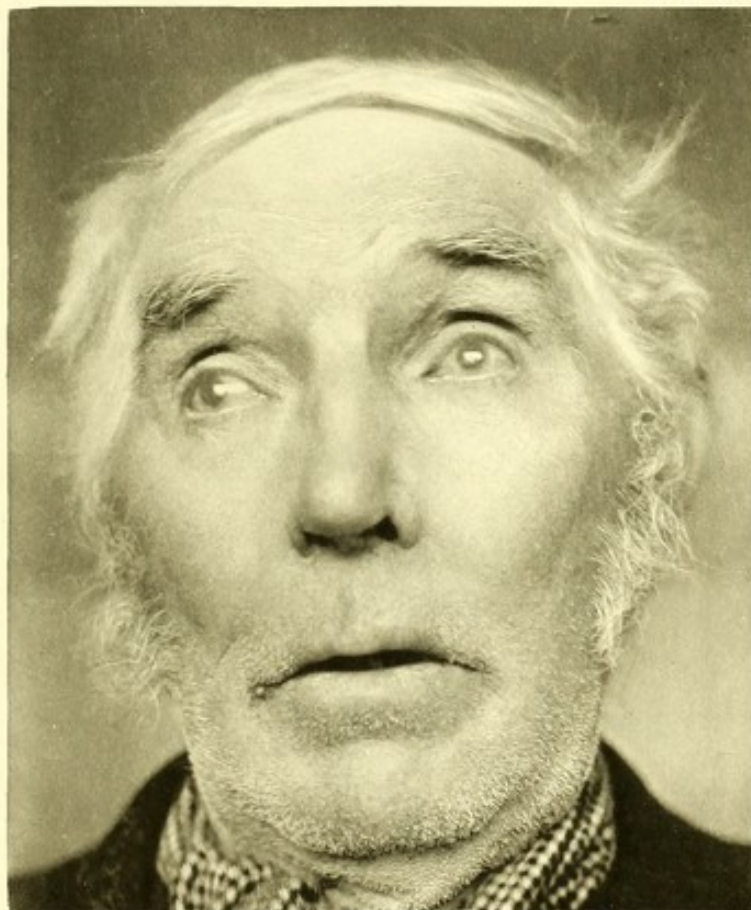


PLATE XXXVI



CHRONIC GLAUCOMA.

blind for years. I have since had to operate on this woman's daughter, who, at the early age of twenty-seven, exhibited all the signs and symptoms of increased intra-ocular tension. The long-sighted suffer more frequently than the short-sighted; but in this connection it must be borne in mind, that just about the period of life at which glaucoma is most apt to occur, acquired hypermetropia is very common. Patients frequently attribute the onset of glaucomatous symptoms to some injury, but there is rarely any 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. Of much more importance, from an aetiological point of view, are certain constitutional states, more particularly the rheumatic and the gouty. It is well known that 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; to fatigue, the result of worry or of sleeplessness; or there may be associated anaemia, lithiasis, bronchitis, constipation, or the suppression of some habitual discharge.

In eyes predisposed to the disease there is probably always an abnormal rigidity of the walls of the blood-vessels, and consequently alterations in the intra-ocular circulation will be all the more readily produced. A familiar example is seen in the glaucomatous attack not unfrequent after atropine or other mydriatic has been instilled into the eye of an elderly person. But whatever the determining cause, a disturbance in the equilibrium between the processes of secretion and excretion within the eyeball is at once followed by a rise in the intra-ocular pressure; which increase of tension is the essence of the disease, 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 nothing is so satisfactory as 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.

Glaucoma may be primary or secondary. In the former, the increase of tension is not due to any disease previously existing, so far as can be discovered, in the eye; whereas, in the latter, it is manifestly to be accounted for by pathological changes present before the glaucomatous symptoms appeared. Primary glaucoma may be inflammatory or non-inflammatory, and, of these forms, the following typical cases may be described.

In the first, the patient was an old woman blind in both eyes, whom I saw in consultation in 1888. Three weeks before, she had gone to bed apparently quite well, but had, about midnight, been awakened by very severe pain in the forehead and left eye. Almost immediately after the onset the eyeball became acutely inflamed, and felt as if it were too large for the socket; the eyelids were very much swollen; there was profuse lachrymation; and the sight of the eye became very dim. The pain, accompanied by feverishness and persistent retching and vomiting, increased; in the course of two hours the right eye became similarly affected; and within twelve hours the vision in both was completely gone. By the time I saw her the suffering had considerably abated, and the swelling had disappeared from the lids, but the eyeballs were of stony hardness. There was extreme congestion and oedema of the ocular conjunctiva, which presented a dusky red colour; the surface of the cornea was rough and nebulous, and quite insensitive to touch; the irides were discoloured; the pupils were dilated, oval-shaped, and irresponsive to light; the anterior chambers were very shallow; and vision was gone beyond the possibility of restoration by operation or any therapeutic procedure. Here we have a clinical picture of glaucoma in its most terrible aspect—the seizure, course, and termination of the disease being the incidents of a few hours: after a single inflammatory attack, appearing with overwhelming suddenness, vision is totally and irrevocably lost.

Such cases are, however, fortunately rare, and the more usual form is well shown in the case to be next described (Plate XXXVII., Fig. 1). The patient was a lady of between fifty and sixty years of age, who had been seized during the night with what was thought to be a severe bilious attack, accompanied by very acute pain in the left eye, and radiating from the eye along the branches of the fifth nerve of the same side. The doctor in charge of the case had, on the supposition that he was dealing with iritis, used atropine; but after each instillation the pain increased, the inflammatory symptoms became more severe, and the vision of the eye was so much affected that by the end of two days there was only a bare perception of light. The suffering was most intense; there was deep livid injection of the ocular conjunctiva, and the cornea, besides showing a smoky cloudiness, was so insensitive that it could be touched with a feather without the patient's knowing; the pupil was widely dilated, the anterior chamber shallow, and the tension of the eyeball very markedly increased. Eserin was freely applied, and as soon as the pupil was sufficiently contracted a large piece of the iris was excised, with the pleasing result that the pain subsided almost at once, and vision slowly returned until, with a glass adjusted to correct the long sight of the patient, it reached one-third of the normal standard of acuteness. Ophthalmoscopic examination now showed the optic disc to be of fairly normal appearance, with no pathological "cupping"; but there were distinct pulsation and marked congestion of the retinal veins. The right eye was, so far as could be made out, normal in every respect, except that there was a high degree of hypermetropia.

Of the non-inflammatory form—simple chronic glaucoma—the case of Mrs. J., a frail woman of sixty years of age, may be taken as an example (Plate XXXVII., Fig. 2). Two years before I saw her she had received a blow upon her right eye from a piece of wood, and from that time she dated the onset of her defective vision. She practically suffered no pain in either eye, nor had there ever been any symptoms of inflammation, but sight had slowly and steadily diminished till she

could not distinguish light from darkness. Subjective sensations of light, however, caused much annoyance, and often, during the night, proved so troublesome as to disturb the patient's rest, and so vivid as to make her afraid. Both eyeballs were hard to the touch; congestion and tortuosity of the episcleral veins were markedly present, though otherwise the conjunctiva retained its transparency, and the sclerotic its pearly whiteness; the cornea was smooth and clear, but insensitive to touch; the iris was discoloured, and at parts atrophied; the pupil was irregular in its outline, and partially dilated, and presented the usual characteristic greenish reflex; and the anterior chamber was shallow. On ophthalmoscopic examination, it was seen that the lens in each eye was becoming cataractous; the optic discs were of a greenish-white colour, and deeply cupped; there was pulsation in the retinal arteries, and the veins were large and tortuous.

These, then, are examples illustrating clearly three fully developed types of glaucoma—the acute inflammatory or glaucoma fulminans, the subacute or chronic inflammatory, and the simple non-inflammatory (Plate XXXVI.)—as it occurs as a primary disease. 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.

These in the premonitory stage, whether that be of long or short duration, are transient, and may unfortunately be disregarded; and, 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, it is always necessary to be heedful—(1) if a patient states that he every now and then suffers from 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 the normal; (2) if the patient requires to use spectacles, it is very suspicious if he says he has had to change them frequently, and he 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. 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 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. Ophthalmoscopic examination will reveal 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 last from a few minutes to several hours; but the periods between them get gradually shorter and 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.

Once established, and allowed to run its course unchecked by treatment, the disease tends naturally to take on one of the forms already 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 the eyeball is removed. These degenerative changes affect every tissue of the globe, and not till complete atrophy takes place will the patient be free from discomfort.

It is characteristic of many cases that the increase of tension is intermittent; but whenever it has existed for any length of time there follow :

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 characterised by the fact that it passes off almost immediately after the excessive tension has been relieved. This appearance has been shown to be due to oedema, and to it must be attributed the occurrence of the iridescent vision. As the anatomical seat of the fluid which causes the oedema is in the nerve channels in Bowman's membrane, the corneal nerves get pressed upon and paralysed; and this explains the more or less anaesthetic 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 when staphylomatous projections occasionally form at any part where the sclera has been weakened by injury, and in the equatorial region of the ball. When, as a 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 may become enormously distended. From the large bulging cornea—in some cases clear, in others opaque—this disease has received the special name of buphthalmos, or ox-eye: in reality it is simply the glaucomatous process occurring in very early life (Plate XXXVIII.).

2. *Alterations in the Uveal Tract.*

Sudden congestion of the choroidal and ciliary blood-vessels leads to excess of pressure in the vitreous, with the result that the lens and

GLAUCOMA.

Fig. 1. Subacute Glaucoma.
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Fig. 2. Chronic Glaucoma.
page 133.

Fig. 3. Chronic Glaucoma with Haemorrhage,
and degenerative changes.
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Fig. 4. Secondary Glaucoma due to Dislocation of
the Lens into the Anterior Chamber.
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Fig. 5. Cysticercus in the Eyeball.
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Fig. 6. Cysticercus in the Eyeball.
page 143.

GLAUCOMA.

Plate 87.

Fig. 1. Subacute Glaucoma.
Page 132

Fig. 2. Chronic Glaucoma.
Page 132

Fig. 3. Chronic Glaucoma with Haemorrhage
and degenerative changes.
Page 132

Fig. 4. Secondary Glaucoma due to Dislocation of
the Lens into the Anterior Chamber.
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Fig. 5. Cysticercus in the Eyeball.
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Fig. 6. Cysticercus in the Eyeball.
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iris are pushed forward at the expense of the depth of the anterior chamber. The blood-vessels on the outside of the eyeball become dilated and tortuous, and the conjunctiva may become oedematous; while in very acute cases there may be serous effusion between the choroid and retina, leading to rapid extinction of vision. In advanced cases the choroid may become thinned, and this atrophic process is usually most marked at the posterior pole of the eye, and the 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 blood-vessels, 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 eserine 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 arteries are incompletely filled and the retinal veins congested; indeed, when advanced degenerative changes have taken place in the walls of the blood-vessels, haemorrhages are not uncommon. By the ophthalmoscope, one may see pulsation in the arteries, as well as in the veins, as they pass over the optic disc, and as this is never the case in the arteries of 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. As the disease progresses, and the increased tension is maintained, the lamina cribrosa recedes farther and farther, and the excavation of the disc becomes deeper and deeper, and can, if the case be kept under observation, be measured by means of the ophthalmoscope. A glaucomatous cup requires time for its formation, and is only developed after the increased tension has persisted for a considerable period; consequently it is not seen after a single inflammatory 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, which 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, tells sooner or later on their nutrition, and atrophy sets in, with the commencement of which, alteration in the colour of the disc takes place and, coincidently, sight begins to fail—the failure in visual acuity, however, depending not so much on the actual depth of the

cup as upon the degree of atrophy of the nerve fibres that has been reached, the amount of which is indicated by the pallor of the disc. It is consequently clear that observation of the degree of this pallor, and of the calibre of the retinal vessels, is 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 significance than one with a deeper cup of a more natural colour.

Along with defects in the visual acuity there is always associated restriction of the visual field, at first confined for the most part to the nasal portion, and as a rule not involving the temporal region till the disease has made considerable progress, but still steadily becoming greater and greater until vision is totally annihilated. It is interesting here to note that colour-vision, which is lost so early in primary atrophy of the optic nerve, is retained in glaucoma for a comparatively long period, and consequently, in a doubtful case, the results of the examination of the colour-sense may be of very considerable value.

Intra-ocular haemorrhage is a frequent accompaniment of glaucoma. Vascular degeneration is always present (Plate XXXVII., Fig. 3), and when microscopic sections of glaucomatous eyes are examined, endarteritis and aneurismal dilatation of the blood-vessels may be detected. Arteriosclerosis is especially common in the short ciliary arteries in the neighbourhood of the optic nerve, and also in those of the ciliary circle, and this affords an anatomical explanation of the occasional occurrence of haemorrhages into the optic cup as well as into the anterior chamber. Indeed the whole phenomena of inflammatory glaucoma are similar to those seen in thrombosis of blood-vessels, the sudden blocking of the vascular supply being indicated by acute pain, and followed by congestion, oedema, and infiltration of the tissues.

In the eye, thrombosis is followed by haemorrhages which may invade the vitreous, and when the choroidal vessels are affected, blood-clots are found lying between the choroid and the retina. In this connection, however, it ought to be remembered that when vascular

degeneration has proceeded so far as to give rise to haemorrhagic retinitis, the patient's blood-vessels, as a whole, are in such an unsatisfactory condition that he may within a comparatively short time die from cerebral apoplexy, renal cirrhosis, or some other disease arising from the same cause.

Glaucoma may complicate cataract, or it may exist in eyes with high degrees of myopia, and either case demands special consideration.

1. *Glaucoma and Cataract.*

It is not often that increase of tension is present in eyes suffering from ordinary senile cataract, but in a glaucomatous eye the lens may become opaque early—*i.e.* before the increase of tension has produced great diminution of the eyesight—and cataract always forms during the course of glaucomatous degeneration. In the latter case, vision is lost, and consequently extraction of the cataract is useless, but in the former case the removal of the opaque lens will, in all likelihood, improve the vision very considerably. In such cases, however, a large iridectomy ought to be performed preliminary to the extraction, in order, if possible, to reduce the tension to the normal, as any attempt to remove the lens while the intra-ocular tension remains high is apt to be followed by haemorrhage. Several years ago I had to operate on a woman, aged sixty-two, for traumatic cataract. The accident that had injured the lens capsule had occurred two months before. The patient had been suffering from pain in her eye and head for weeks, and at the time of the operation the eyeball was exceedingly hard; the lens was swollen, and had pressed the iris so far forward that the anterior chamber was nearly obliterated; and there was a deep livid congestion of the ocular conjunctiva. A very small corneal incision was made, as carefully as possible, with a narrow linear knife, but immediately on the escape of the aqueous, blood flowed from the choroid, the lens and vitreous were extruded *en masse* upon the patient's cheek, and the haemorrhage was so profuse that it

was controlled only with great difficulty. The eyeball had to be enucleated.

It sometimes happens that the greyish-green reflex from the pupil of a patient suffering from chronic glaucoma is mistaken for senile cataract, and such an error in diagnosis is fraught with the most disastrous consequences. Quite recently, I saw an old woman who had come from a country district in the north of Scotland. Her vision had been gradually getting weaker for a number of years, but being advised that this was due to cataract she waited patiently till the proper time for operating should arrive. In one eye the loss of vision was complete, and in the other there was not sufficient sight left to enable her to find her way about her house. 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. No operation was of any avail—the case was one of simple chronic glaucoma, which had been allowed to run its course until the vision was all but totally annihilated, and there was not the slightest hope of recovery. Such instances, unfortunately, are not uncommon, and until the ophthalmoscope is more generally used in medical practice they will continue to occur. 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 most variable, and probably at no time very high, so that, unless the ophthalmoscope be employed, accurate diagnosis is impossible. Glaucoma may follow the extraction of a cataract with or without iridectomy, but if we exclude the increase of tension liable to follow upon a needling operation, such a complication is by no means common.

2. *Glaucoma and Myopia.*

Short-sighted persons are, as a rule, immune from inflammatory attacks of glaucoma, but a moderate increase of tension sometimes

occurs in eyes in which the myopia is progressive, and as the optic disc suffers from the increase in the intra-ocular pressure, the deterioration in the visual acuity becomes very markedly accentuated. Although considered here specially, on account of the importance of their occasional association, there can be no doubt that the glaucomatous symptoms are superadded to the choroidal changes which characterise malignant myopia; and this leads me to state that increase of tension may occur in the course of many eye affections, and when it does occur, so modifies the primary disease that the high tension becomes the serious feature in the case. Hence we speak of secondary glaucoma in contra-distinction to those cases with which I have just been dealing in which the disease is primary—*i.e.* cannot be accounted for by any discoverable disease previously existing in the eye. The clinical picture presented by it, therefore, is a well recognised and a fairly constant one, whereas, in secondary glaucoma, the appearances presented are, in all cases, modified by the antecedent disease from which the eye has been suffering, and upon which the glaucomatous process has been, as it were, grafted. It is unnecessary to do more than simply enumerate some of the principal diseases which it may so complicate. It may arise as a result of injury, *e.g.* in burns at the corneo-scleral margin; in wounds of the cornea, with prolapse of the iris and injury to the lens, especially in a patient advanced in years; or symptoms, of which high tension is the most important, may arise from the dislocation of the lens into the anterior chamber (Plate XXXVII., Fig. 4). Again, it may arise in the course of, or form the sequel to, disease in any part of the eyeball—in perforating ulcer and staphyloma of the cornea; in serous iritis, from the abnormal secretion and altered character of the aqueous; and in plastic iritis when the pupillary margin becomes sealed completely to the lens capsule, and fluid accumulates behind the iris. Increase of tension at once occurs whenever a sarcoma of the choroid involves the ciliary region, or even before that if, as a result of the irritation due to its pressure, complete separation of the retina has been produced. Increase

of tension is not, as a rule, common in retinal affections, and when it occurs along with separation of the retina, usually indicates the presence of an intra-ocular growth. It sometimes, however, does occur in the advanced stages of pigmentary retinitis, and, as has already been mentioned, an apoplexy of the retina is the forerunner of haemorrhagic glaucoma.

Figs. 5 and 6 depict the appearance presented by a cysticercus in the anterior chamber. For these illustrations, which are of historic interest, I am indebted to Dr. Argyll Robertson. The original drawings were made for Dr. Robertson's father, and were by him communicated to Mackenzie, who reproduced them and recorded the case in full—see p. 1090 of the fourth edition of the *Treatise on Diseases of the Eye*.

PLATE XXXVIII.

Buphthalmos.

(βούς, an ox, and ὀφθαλμός, an eye.)

A condition in which the eyeball becomes so much enlarged that it resembles the eye of an ox.

Synonyms: General hydrophthalmia; megalo-cornea; keratoglobus.

French, *Buphtalmie*. German, *Ochsenauge*. Italian, *Buftalmia*.

BUPHTHALMOS may be looked upon as a congenital form of glaucoma, the enlargement of the whole eyeball being due to the fact that the infant's sclerotic is too weak to resist the intra-ocular pressure. The disease develops during the first years of life, but its very earliest stages probably always occur *in utero*, the large size of the eyes being apparent when the child is born. In the illustration only the left eye was affected, but both may suffer, and become totally blind. Occasionally the disease comes to a standstill, and then a certain amount of sight remains, but in other instances the enlargement continues long after all sense of light has been lost, and the globes attain enormous dimensions.

The cornea is unnaturally large and bulging, and may be perfectly transparent or clouded by opacities. The sclerotic is greatly distended, very thin, and of a dark slate-blue colour. The anterior chamber is abnormally large and deep, and the iris trembles with every movement of the eye. If the increased tension be maintained, atrophy of the optic nerve and cupping of the disc will ensue, and when the disease has reached an advanced stage intra-ocular haemorrhage is prone to occur.

BUPHTHALMOS.

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BUPHTHALMOS.

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PLATE XXXVIII



BUPHTHALMOS

Children affected with buphthalmos always seem to suffer acutely. When very young they frequently weep, and scream, and rub their eyes, and when old enough to describe their sensations they complain of severe pain when the tension is high, more especially in those cases where there is bleeding into either the aqueous or the vitreous chamber.

PLATE XXXIX.

Microphthalmos.

(μικρός, small, and ὀφθαλμός, an eye.)

Abnormal smallness of the eyeball.

French, *Microphthalmie*. German, *Mikrophthalmus*. Italian, *Microoftalmia*.

THE accompanying illustration was taken from a man who affirmed that immediately after he was born it was noticed that the left eye was much smaller than the right, but that he was quite sure his sight was equally good with either until a few months before he came to consult me. When I first saw him the left globe appeared sunk in its socket (enophthalmos—ἐν, in, and ὀφθαλμός, an eye), and resembled the eye of an infant; but all its different parts—cornea, iris, pupil, optic disc, etc.—though small, were perfectly symmetrical. The media were quite transparent, and naturally the refraction was highly hypermetropic. The patient complained that he could not see any object when he looked directly at it, and this central defect in the visual field was found on ophthalmoscopic examination to be due to choroidal changes so extensive that they had destroyed the whole macular region. The choroiditis increased rapidly, and in less than two years the man had with this eye merely light perception. So far as could be made out the right eye was normal.

In this case of microphthalmos there was at the beginning, if the patient's statement is to be accepted, nothing abnormal except the smallness of the globe, but many cases are complicated by coloboma of iris and choroid, defects in the retina and optic nerve, cataract, squinting,

MICROPHTHALMOS.

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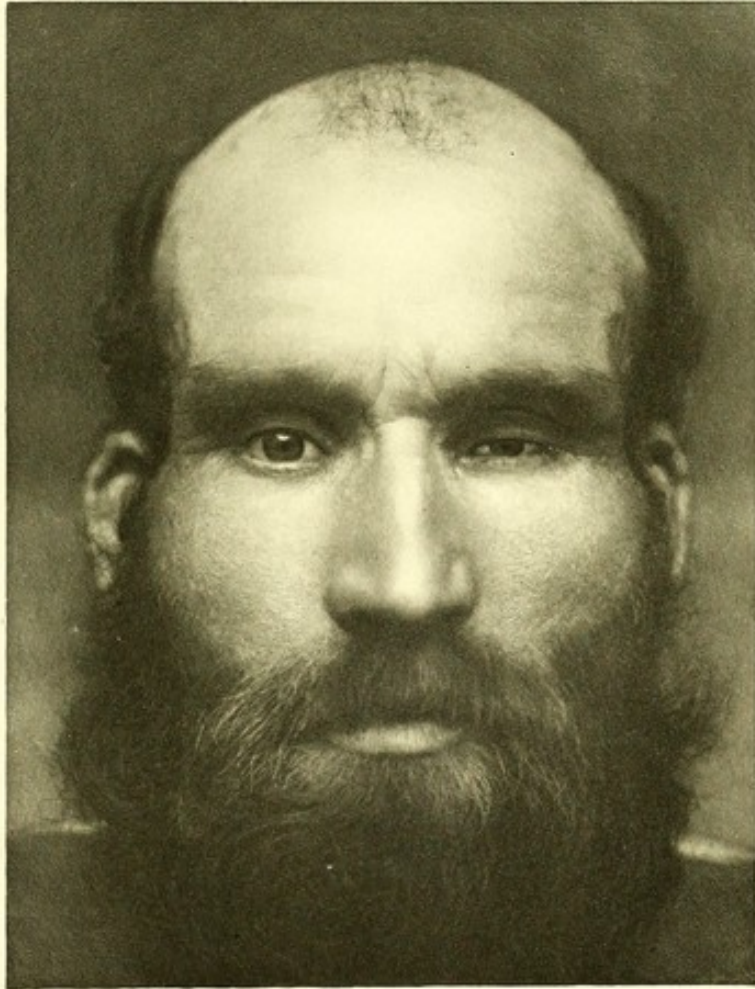
MICROPHYLLOID

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PLATE XXXIX



MICROPHTHALMOS

or nystagmus, and some are associated with abnormal smallness of the head and brain, and defective mental development.

Sometimes microphthalmic eyes are accompanied by cystic swellings in the lower part of the orbit, so large as to conceal the rudimentary eyes : at other times the eyes seem to be altogether absent (anophthalmos—*ἀν*, privative, and *ὀφθαλμός*, an eye).

PLATE XL.

Cataract.

(Cataracta; καταρρηγνύναι, to rush down.)

An opacity of the crystalline lens or its capsule.

Synonyms: Gutta opaca; Suffusio.

French, *Cataracte*. German, *Staar*. Italian, *Cateratta*.

CASES of cataract may be divided into nuclear, cortical, or capsular; into hard, soft, fluid, or mixed; into complete or partial; into mature or immature; into primary or secondary. Except when it results from injury the disease is slow, occupying months or years in its progress. It is due to defective nutrition of the lens, the cause of which is in most cases very difficult to determine. It is sometimes congenital; may occur at any period of life, though it is most common in the aged; and heredity seems to play a prominent part in its aetiology, as it is not uncommon for several members of the same family to be affected. Certain occupations also act as predisposing causes, glass-blowers, blacksmiths, and all mechanics who work near large fires, being more liable to suffer than others. Senile cataract is not, as a rule, dependent on any disordered state of the general health; but in a large percentage of cases albumen is found in the urine, and in diabetes mellitus opacity of the lens is of such frequent occurrence that diabetic cataract is well recognised.

In senile cases the progress of the disease is slow, in those of early life more rapid, and in those that are congenital it may be *nil*. Where it advances, however, there is uninterrupted increase of opacity

CATARACT.

Fig. 1. Senile Cataract.
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Fig. 2. Amber Cataract.
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Fig. 3. Pyramidal Anterior Polar Cataract.
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Fig. 4. Pyramidal Anterior Polar Cataract.
page 152.

Fig. 5. Zonular or Lamellar Cataract.
page 151.

Fig. 6. Capsular Cataract after Operation.
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CATARACT.

Fig. 1. Senile Cataract.
Page 150.

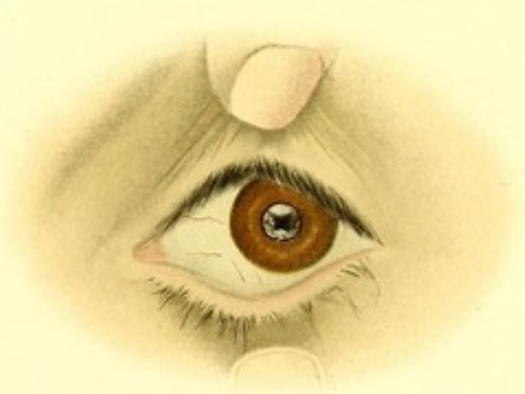
Fig. 2. Amber Cataract.
Page 150.

Fig. 3. Pyramidal Anterior Polar Cataract.
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Fig. 4. Pyramidal Anterior Polar Cataract.
Page 152.

Fig. 5. Zonular or Lamellar Cataract.
Page 151.

Fig. 6. Capsular Cataract after Operation.
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and decrease of vision, till perception of light and darkness is all that is left. From the time the patient is first seen until the cataract is ripe for operation, there may be a lapse of anywhere from one to twelve years. It is always better to delay till maturity be reached, *i.e.* till, the whole cortex being opaque, there are no glittering sectors present, nor is there any clear interval between the iris and the cataractous parts. In cases which ripen slowly, it may, however, be necessary to extract the lens before this period, if the vision has become so dim as to seriously interfere with the patient's work.

Symptoms.

The chief symptoms are :

1. Sight so defective that objects appear as if seen through a cloud, a mist, or a cobweb. Vision is usually worst when the eyes are exposed to bright light, and best when they are in the shade and the object looked at is strongly illuminated. This feature gives rise to the characteristic gait associated with the disease. The patient on entering a room is dazzled, bends his head forward on his breast, often puts up his hand to shade his eyes, and seems to feel his way. In all these points there is great contrast with a case of amblyopia from atrophy of the optic nerve, where the carriage is upright with the head well thrown back, and the eyes wide open to receive every ray of light that can be got.

2. There is sometimes multiple vision, any object giving out a bright light—*e.g.* a lamp, a star, the moon, etc.—showing itself doubled, trebled, or even quadrupled.

3. Owing to increase in the refractive power of the lens, myopia in many cases shows itself as the cataract advances, and the patient, though his vision is not nearly so good for distant objects, can read type of moderate size, and throws his spectacles aside under the impression that he is regaining his sight. The existence of cataract

should always be suspected when a person advanced in life says he has become able to read without spectacles, while vision for distant objects has become worse.

4. The one objective symptom of the disease is opacity of the lens, which becomes, according to circumstances, light-grey, yellowish-grey, amber-yellow, yellowish-white, or dark reddish-brown in hue, the last being, however, very uncommon. In the early stage, especially in senile cases, there is a dull greyish-yellow reflection from the pupil, particularly where the colour is amber-yellow; but while this is so, every greyish-yellow reflection of this sort, especially in elderly people with dark complexions, must not be set down as due to cataract, because as age advances a hardening process takes place in the lens without affecting its transparency. Before a definite opinion is given, the tension of the ball should be carefully ascertained, in case incipient glaucoma be present. If the intra-ocular pressure be normal, the pupil should be dilated with homatropine and the eye examined in a dark room by oblique illumination (when the opaque portions look yellowish, greyish, yellowish-white, or greyish-white), and by the ophthalmoscope (when the red reflex is obscured either by a series of dark streaks radiating from a central point, or by a dull shaded part in the centre of the lens). The only conditions with which any confusion is likely to arise are (*a*) opaque deposit on the capsule resulting from iritis; and (*b*) ulceration of the cornea, which has perforated, and where some of the fibrin has remained adherent to the lens. These may, however, be distinguished by the superficial position of the opacities with reference to the plane of the iris, and by irregularity of the pupil due to old inflammatory adhesions.

Varieties.

Hard or Nuclear Cataract (Figs. 1 and 2).—In senile cases, where the patients are usually from sixty to eighty years of age, cataract

commences in the centre of the lens as a yellowish-grey spot, not sharply defined but merging gradually into the clear periphery. This opacity increases slowly, and gradually involves the circumference. It is generally amber-yellow in hue, but is sometimes so dark as to be known as "black cataract," though it is in reality not black but dark reddish-brown.

Soft or Cortical Cataract.—This is found in persons under thirty years of age, and assumes many different forms. (*a*) It may show itself as a number of minute circular or oval light-grey spots scattered throughout the lens, and these will extend till the whole structure is involved. (*b*) More common is the stellate form where streaks radiate from a common centre like spokes in a wheel. Just as happens in (*a*) the whole structure ultimately becomes almost uniform, though spots and streaks can alike be distinguished. (*c*) Of the many congenital varieties the most common is the lamellar or zonular (Fig. 5), in which, while the centre of the lens is affected by cataract, the periphery retains its transparency. The opaque central circular portion has generally a sharply defined margin bounded by a dense ring, and there are often several concentric rings. The clear periphery may be readily seen by the ophthalmoscope after the pupil has been dilated. The opacities are generally symmetrical, and it is characteristic of this congenital variety that some of the spots are more opaque than others. Many of them remain stationary, the transparent part persisting all through life. This particular form is often unsuspected till the child goes to school, when it is observed to hold its book very close to its eyes. Obviously, therefore, all cases of short-sight occurring in young children should be examined very carefully in order to distinguish those due to cataract from those due to myopia.

Fluid Cataract.—This is an uncommon form in which there is fluid in the opaque lens. It may be recognised, first, by the lens surface having a uniform yellowish-grey colour without trace of striae or circular spots; and second, by the unnaturally globular appearance of the cataract

as seen through the pupil. This is a disintegrating stage of either the hard or the soft variety, and is found only in cases that have lasted for many years, and are over-mature.

Hard and Soft Cataract.—This, by far the commonest form, occurs in persons between the ages of fifty and sixty, and has a hard yellow nucleus with a striated and soft circumference. It may be diagnosed by the yellow reflection from the centre shown by oblique illumination and by its stellate appearance—the true stellate form never being found in persons over fifty years of age.

Hard and Fluid (Morgagnian) Cataract.—In this variety there is a hard amber-yellow nucleus floating in the fluid, this being a phase of the disease in passing from the hard to the fluid stage. The upper part shows all the characters of the fluid form, while in the lower part is a rounded yellowish body—the nucleus which has sunk. If the head be bent back, the nucleus disappears and only the homogeneous structureless fluid is seen, if it be bent forward the nucleus reappears.

Diabetic Cataract.—This, which is generally of large size, looks otherwise, in young individuals, like the soft form, and, in old persons, like the hard and soft; but associated with it are the dry skin, thirst, and other symptoms of diabetes. It attacks both eyes, and its growth is usually very rapid; but sometimes the opacity clears considerably if the general condition improves.

Anterior Polar Cataract (Fig. 3).—This is referred to under Ophthalmia Neonatorum at page 63 (Plate XVII., Figs. 1 and 3). Sometimes the little chalky pyramid breaks away from the capsule and falls forward through the pupil into the anterior chamber (Fig. 4).

Posterior Polar Cataract.—This is an opacity at the centre of the posterior capsule. It begins as a little circular or stellate spot which gradually extends, and may eventually become general. In the majority of instances it is associated with diseased conditions of the internal structures of the eye, particularly of the choroid.

Glaucomatous Cataract.—This, which generally shows a greenish tint,

occurs in the later stage of glaucoma, and is, therefore, associated with stony hardness of the ball, distension of the sub-conjunctival veins, dilatation of the pupil and the other signs symptomatic of the latter disease. Sight, as a rule, is totally lost, and where this is the case obviously cannot be restored by the removal of the cataract (Plate XXXVI. and Plate XXXVII., Fig. 3).

Traumatic Cataract.—Here there is a history of injury—*e.g.* from a blow or a perforating wound—the colour is light-grey; and in most cases a flocculent mass of opaque lens-substance protrudes through a wound in the capsule into the anterior chamber. In a young person the lens-substance will slowly dissolve, leaving a thin capsular opacity such as remains after a needling operation (Fig. 6); but in an elderly patient the condition is much more serious, as the lens, hardened by age, does not readily undergo solution, and, acting as a foreign body, is apt to cause destruction of the eye from irido-cyclitis, accompanied by increased tension (Plate XXXIV., Fig. 3).

Dislocated Cataract.—When the vitreous is unduly fluid, or there is laxity of the suspensory ligament, there is a slight trembling of the lens as the eyeball moves in different directions. Under such circumstances a very trivial injury will produce dislocation of the lens. The displacement is generally downwards, or to one side, and the round light-grey body, swaying about in the vitreous with the movements of the globe, may be easily recognised. Should it pass, as sometimes happens, through the pupil into the anterior chamber, it is very apt to induce secondary glaucoma (Plate XXXVII., Fig. 4).

PLATE XLI.

Abscess of the Orbit.

French, *Phlegmon de l'orbite*. German, *Orbitale Phlegmone*.

Italian, *Ascesso dell' orbita*.

ABSCCESS of the orbit is a very severe and dangerous affection arising from many different causes. It is most frequently due to contusions or to penetrating wounds, and especially to the lodgment of foreign bodies. It may follow exposure to cold and wet, erysipelas spreading from the face, tonsillitis, or alveolar abscess; but in all these cases the orbital suppuration is apt to be complicated by thrombosis of the cavernous sinus; or the disease may result from acute periostitis and necrosis of the bones of the orbit, and this is all the more likely to occur in persons of syphilitic or tubercular constitution.

The disease may be acute or chronic. In acute cases panophthalmitis may be set up, or the pus may pass from the orbit to the cranium and give rise to severe cerebral symptoms. In chronic cases there may be simulation of an orbital tumour, and then it may be necessary to make an exploratory incision in order to complete the diagnosis.

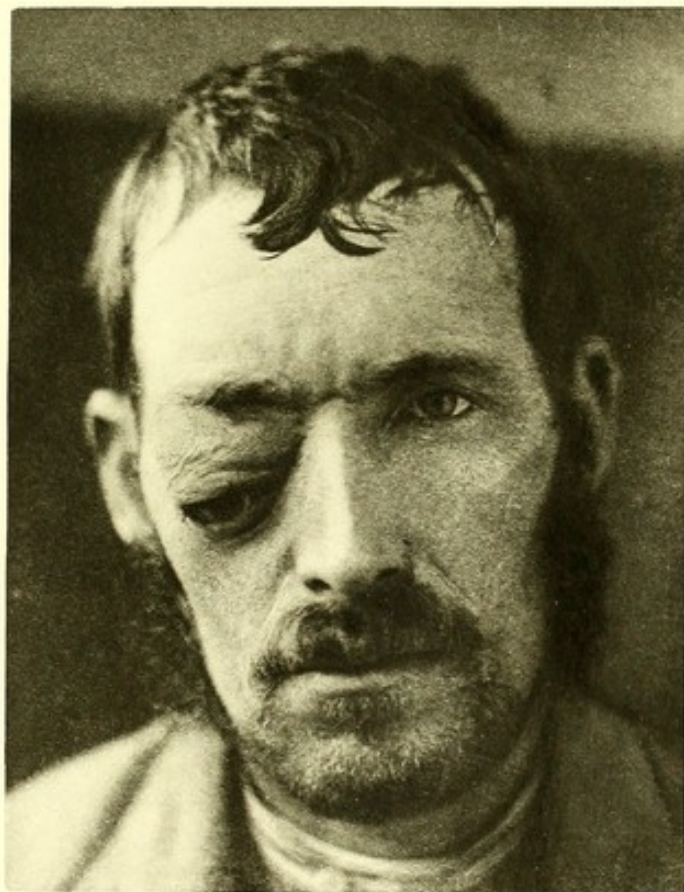
The man from whom the photograph was taken was unfortunately lost sight of, and so his history is imperfect and cannot be given in detail; but the following is an account of a typical case that was under my care in 1893:

Charles G., aged six years, was brought to me in September 1893,

ABSCCESS OF THE ORBIT.

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PLATE XLI



ORBITAL ABSCESS

by his mother, who stated that he had, a month before, received a severe blow on the right side of the head, but that no importance had been attached to the occurrence for a fortnight, at the end of which time he began to suffer from severe head-pain, occasional vomiting, and frequent attacks of shivering. It was also noticed at the same time that the right eyeball was more prominent than the left, and the child complained of not being able to see so well with that eye. These symptoms steadily increased; and when the boy was brought to me the right globe was very prominent, being pushed forward, outward, and downward. The patient seemed also unable to move it in any direction. The eyelids were red and swollen, the upper being so tensely stretched over the prominent eyeball that it presented a glazed appearance, while the chemosed conjunctiva projected beyond the palpebral opening, and overhung the lower lid. The pupil was dilated and sluggish, but the iris remained of natural colour. Ophthalmoscopic examination disclosed very acute neuro-retinitis, with numerous haemorrhages and much exudation in the neighbourhood of the optic disc, as well as enlarged, tortuous, and congested veins. The boy had, with this eye, no perception of light. No pulsation could be felt, but there was pain when the globe was pressed backward into its socket, and this tenderness on pressure was very acute over the inner canthus. The veins of the right cheek were greatly distended. The patient's temperature was found to be 101.8° F.

A free incision was made through the swollen conjunctiva into the orbit, below and to the inside of the eyeball, and a large quantity of thick greenish-yellow pus escaped. The wound was gently probed, but no dead bone was felt. The abscess cavity was carefully washed out with warm saturated solution of boracic acid, and a drainage tube was passed deeply into the orbit. Almost immediately after the escape of the pus the exophthalmos became less pronounced and the divergence less marked, while it was also noted that the boy could now move his eye slightly inwards. The acute symptoms subsided from the time the abscess was opened, and though it was nearly two months before the

wound was perfectly closed, yet, in less than a fortnight, the swelling of the lids and conjunctiva had practically disappeared, the eyeball was gradually coming back into its natural position, and the boy was eating and sleeping well. The right pupil, however, still remained dilated, and sluggish in its response to light, and although the ophthalmoscope showed that the signs of inflammation were passing rapidly away from the fundus oculi, yet there was no improvement in vision. At the end of two months the discharge from the abscess had quite ceased; the eyeball, though still prominent and slightly divergent, could be moved in every direction, and the general health had been greatly improved by good feeding and the helpful influence of cod-liver oil and syrup of the iodide of iron.

This patient was last seen on the 10th of February, 1897, when it was found that although he had had occasional attacks of headache there was no pain in his eye. He looked strong and well, and his appearance contrasted most favourably with the puny delicate aspect he presented when he was first brought to me nearly four years before. The right eyeball was still prominent and slightly divergent, but it could be moved freely in every direction. The right pupil was a little larger than the left, but both responded to the stimulus of light and contracted in the act of convergence; the left pupillary reflex being, however, much more active when the right eye was exposed to the light—consensual reflex. There was no power to distinguish light from darkness with the right eye, the ophthalmoscope revealed advanced atrophy of the optic nerve, and the whole fundus was stippled over with pigment in such a way as to appear as if it had been dusted with coarse black pepper. The veins were normal in size, but the calibre of the arteries was somewhat reduced.

In giving a prognosis in a case of abscess of the orbit not only must its probable effect upon the patient's eyesight be taken into consideration, but it must also be remembered that occasionally the disease may give rise to meningeal complications and terminate fatally. Danger

in both of these directions is best avoided by early evacuation of the pus and free drainage; so that whenever suppuration is suspected an exploratory puncture ought to be made with as little delay as possible, because the optic nerve suffers early from the pressure, and sight may thereby be permanently lost. The cornea may lose sensation, and ulcerate, owing to pressure on the ciliary nerves behind the globe.

PLATE XLII.

Aneurism of the Orbit.

(ἀνεύρυσμα, a widening.)

Synonyms: Pulsating exophthalmos; aneurism by anastomosis.

French, *Angiomes caverneux de l'orbite*. German, *Pulsirender Exophthalmus*.

Italian, *Aneurisma dell' orbita*.

IN the description appended to Plate VI. a case is referred to in which a naevus of the lower lid extended into the orbit, and gave rise to some of the symptoms of aneurism from anastomosis, but the disease which is now to be described differs from that in so far that it arises deep in the orbital cavity, or even within the skull. I am indebted to Dr. Argyll Robertson for the photograph which illustrates this subject.

Aneurism of the orbit is as a rule unilateral, but a few cases are on record where the disease affected both sides. When idiopathic, it may occur very early in life, and women seem to be affected more frequently than men. More usually, however, the disease is the result of injury, and is due either to aneurism of the ophthalmic artery, or to traumatic rupture of the internal carotid in the cavernous sinus. After a severe blow on the head or neck, or a penetrating wound of the orbit, the patient is conscious of a peculiar sensation, which is usually compared to a sudden snap like the cracking of a whip. This is followed by pain, often very severe, which is referred chiefly to the bottom of the orbit, and is accompanied by a whizzing noise in the head. This tinnitus is often compared to the rippling of water, and is always greatly aggravated if the head falls below a certain level. After a time, longer or shorter according to the severity of the original injury, the eyeball begins to

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bulge forward in its socket and is seen to pulsate, the movements being synchronous with those of the heart. A distinct thrill is felt on palpation, and a blowing murmur heard when a stethoscope is applied to the forehead. If, however, the common carotid artery on the same side be compressed, the pulsation ceases, and the murmur is no longer heard. As the disease progresses the exophthalmos becomes more pronounced, the lids swollen and red, and the conjunctival vessels large and tortuous. By pressure the proptosis can be made to disappear, but the eye returns to its former position whenever the pressure is removed. By and by the movements of the globe are interfered with, and between the eye and the orbit a soft elastic swelling can be distinctly felt. Ophthalmoscopic examination at an early stage of the disease reveals distension and pulsation of the retinal veins, and afterwards neuro-retinitis supervenes. The eyesight is soon affected, and blindness almost certainly ensues if the aneurism is not relieved by treatment.

PLATE XLIII.

Exophthalmic Goitre.

A disease characterised by a group of symptoms, of which the chief are protrusion of the eyeballs, enlargement of the thyroid gland, palpitation of the heart, and accelerated pulse-rate.

Synonyms: Graves' Disease; Exophthalmus anaemicus; Exophthalmic bronchocele.

French, *Maladie de Graves: Ataxie cardiovasculaire: Dyscrasie exophthalmique.*
German, *Die Basedow'sche Krankheit: Glotzaugencachexie: Cardiognus strumosus: Tachycordia strumosa exophthalmica.* Italian, *Malattia del Graves.*

CASES of exophthalmos, probably of the nature of exophthalmic goitre, were referred to by Saint-Yves as far back as 1722, by Louis in 1724, and by Gilibert in 1791; but Flajani was the first to notice, in 1802, the coincidence of goitre with lasting palpitation of the heart. He quoted three cases, all occurring in males, but in none of them did he make any reference to the condition of the eyes. The disease was undoubtedly recognised by Parry, a physician practising in Bath at the end of the eighteenth century, who described, under the designation of "enlargement of the thyroid gland in connection with enlargement or palpitation of the heart," at least eight cases, in one of which he distinctly noted the prominence of the eyeballs. As the point is of historic interest a brief summary of his account may be given. The patient was a married woman, thirty-seven years of age, who had, after confinement, been attacked by rheumatic fever, followed by violent palpitation of the heart, with symptoms resembling cardiac asthma. She also suffered from haemoptysis, with severe pains over the lower portion of the sternum. When Parry first saw her the pulse

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was 156, irregular and intermittent, and the palpitation was so violent that the whole chest was shaken with each beat of the heart. "About three months after her lying-in," says Dr. Parry, "while she was suckling her child, a lump about the size of a walnut was perceived about the right side of the neck. This continued to enlarge until the period of my attendance, when it occupied both sides of her neck, so as to have reached an enormous size, projecting forwards before the margin of the lower jaw. The part swelled was the thyroid gland. The carotid arteries on each side were greatly distended, the eyes were protruded from their sockets, and the countenance exhibited an appearance of agitation and distress which I have rarely seen equalled."

Demours in his *Traité des Maladies des Yeux*, published in 1818, describes the case of a girl, eleven years of age, who suffered from prominence of the left eyeball, with enlargement of the thyroid gland; but though he notes that the mother had developed a goitre after her first confinement, he makes no mention of any heart disturbance. Between 1805 and 1835 Wardrop, Wenzel and Ware, and Middlemore referred to cases of goitre with palpitation, or of exophthalmos with palpitation; and in 1828 Adelman carefully recorded the clinical history as well as the post-mortem appearances in two patients in whom there had been considerable goitre along with enlargement of the heart, continued violent palpitation, great dyspnoea, and abdominal pain; and in one of whom "the staring look of the large eyes caused a very remarkable aspect."

Not, however, till 1835 were the three characteristic symptoms—exophthalmos, enlargement of the thyroid, and palpitation of the heart—clearly associated, and their co-existence recognised as a specific disease. Even then it is of interest to note that Graves, who made the discovery, speaks only incidentally of the prominence of the eyeballs, and draws attention more particularly to goitre with palpitation. Alluding to this subject in his clinical lectures, he says: "I have lately seen three cases of violent and long-continued palpitation in females, in each of which the same peculiarity presented itself, viz. enlargement of the thyroid

gland. The size of this gland, at all times considerably greater than natural, was subject to remarkable variations in every one of these patients." Only in connection with one of these cases, however, does Graves make any mention of exophthalmos, and this was one which was communicated to him by Stokes "after hearing his clinical lecture on the combination of palpitation of the heart with enlargement of the thyroid gland." In that communication Stokes thus refers to the eyes: "The eyeballs were now observed to enlarge gradually, until at length their condition imparted to the countenance an unearthly expression. The tumefaction continued to increase until the globes of the eyes appeared to protrude from the orbits, looking downwards and forwards, and exhibiting a zone of the white sclerotic round the entire [circumference] of the cornea of at least two lines in breadth. The lids could only be half closed; and the appearance of this lady during sleep, with these great brilliant eyes yet open, can never be effaced from my memory. It was remarkable that the conjunctiva was never vascular, nor were any symptoms of ophthalmia developed, such as we see occurring in the open eye which attends in the facial paralysis described by Sir Charles Bell. Notwithstanding the unnatural enlargement of the organs, there was no alteration in the power of vision." To Stokes, therefore, must be given the credit of being the first of the Dublin physicians to draw attention to exophthalmos in connection with goitre and palpitation.

By the time Graves' *Clinical Lectures* were published in 1848, the disease had attracted considerable attention, and in Germany Basedow, who was practising in the little town of Merseburg, published in detail an accurate clinical description of several cases. But if Graves in his lectures laid special stress upon the condition of the heart and the enlargement of the thyroid, and only referred to the eye symptoms in an incidental way, Basedow certainly gave an undue prominence to the last, and failed to emphasise the importance of the associated palpitation and the enlargement of the thyroid. Hirsch and others have claimed for Basedow a priority of observation, and, looking upon him as the true

founder of our knowledge of exophthalmic goitre, have identified his name with the disease; but as Wickham Legg points out, "Basedow never seems to have grasped the threefold character of the symptoms; he dwells on the exophthalmos to the exclusion of the other two." The Dublin physicians, on the contrary, while recognising the exophthalmos, did not forget the others, and to the names of Graves and Stokes must be added that of Sir Henry Marsh, who, in an address before the Pathological Society of Dublin in 1841, said that "it would be perhaps in the recollection of many of the members that he had last year [*i.e.* 1840] described a singular variety of disease," characterised by "rapid, violent, and irregular action of the heart, co-existing with enlargement and swelling of the thyroid gland. He had mentioned, also, that in the majority of these cases there was a remarkable prominence and protrusion of the eyeballs, so as to give to the group of symptoms by which this disease was characterised a very striking feature." These observers, then, ought at least to share with Basedow the honour of having laid the foundation of our knowledge of this subject. In Scotland, Begbie was the first to recognise the intimate association of the three symptoms—his observations having been made as early as the year 1839—and, in a memoir presented to the Medico-Chirurgical Society of Edinburgh, he asserted the entity of the disease, and advanced a theory of its causation—namely, its dependence on anaemia. Since then writers of all countries have recorded their observations of cases, and have added much to our knowledge of this peculiar affection; and, in reviewing the recent literature connected with the subject, it is interesting to note how symptoms at first looked upon as rare and abnormal have come to be regarded as constant features in the clinical picture of the disease as we know it at the present day.

Exophthalmic goitre is more frequent among women than among men, and in males the cases are often "incomplete," *i.e.* some of the great characteristic symptoms may be wanting. The disease is most frequently met with in women between the ages of fifteen and thirty, and

in men between thirty and forty-five; but cases are recorded of girls of two and a half, seven, eight, and fourteen, years of age; in women of fifty-eight and sixty; and in a man of sixty-eight. Though it is seldom that any near relative of the patient has been affected in a similar way, there are records of occasional marked family tendency. There are accounts of a woman who had ten children, eight of whom suffered from exophthalmic goitre, while of the others one was hysterical and the other epileptic; of an aunt and three nieces; of a mother and three children (girls); and of three sisters; but if direct inheritance be rare, a family predisposition towards nervous diseases is by no means unfrequent. Other relatives have been noted as suffering from epilepsy, hysteria, chorea, diabetes, and insanity. Among my own cases is a patient whose mother, a sister, and an aunt were all inmates of a lunatic asylum.

Although persons in apparently good health may be attacked, there is generally a neurotic predisposition (especially if the patient be anaemic, chlorotic, or exhausted by acute illness); and, where this exists, the onset may follow injury to the head, exposure to cold, rheumatic arthritis, some depressing emotion, prolonged mental anxiety, or sudden fright—the last three being the most frequent exciting causes. With reference to the final one Mackenzie has drawn attention to the close resemblance presented by a well-marked case of exophthalmic goitre to the appearances described by Darwin, as characteristic of man in intense fear. "We have only," he says, "to imagine the condition to become prolonged by a failure of the nervous system to recover its balance and to right itself, and we have a more or less complete clinical picture of Graves' disease"; and again, "the existence of a certain abnormal condition of the nervous system having been once established, we know how in time it becomes dissociated from its exciting cause, rises to independence as a disease in its own right, and may require only a minimal excitement to set it off. In many cases the disease is started anew by severe mental shock; probably in a good many more it is the expression of the unconscious memory of the individual of some such shock in an ancestor."

Though the onset is in most cases very gradual, it sometimes rapidly follows profound emotional disturbance. Trousseau instances a woman who, after a night of weeping on account of the death of her father, "whom she had attended at the cost of great fatigue, suddenly felt her eyes swell and lift up her eyelids"; while at the same time she suffered from bleeding at the nose, unusual throbbing and increase in size of the thyroid gland, and violent palpitation of the heart. In another case a girl developed palpitation (pulse 140), exophthalmos, and enlargement of the thyroid, immediately after hearing of the death of her brother; but the symptoms all disappeared within forty-eight hours. Exophthalmic goitre rarely appears during pregnancy, and the conditions incident to the maternal state often cause the entire disappearance of even well-marked symptoms. From the beneficial influence of marriage, and the fact that the disease often shows itself in girls about the time of puberty, some have endeavoured to associate it with derangement of the sexual functions, but the condition of blood-poverty that always co-exists is a sufficient explanation of menstrual irregularities; and the occurrence of cases among very young children, and among women who have passed their climacteric, as well as in men, seems to point to the conditions as merely coincident, and not as having the relations of cause and effect.

In "incomplete" cases there may be secondary features differing widely in their nature, but the great characteristics in every instance are (1) rapid action of the heart, (2) enlargement of the thyroid gland accompanied by "pulsation of the whole neck, especially in its lateral portions," and (3) protrusion of the eyeballs

Symptoms Referable to the Heart and Circulation.

The symptom most usually found, and generally the first to show itself, is increased frequency of the action of the heart, accompanied by greater pulsation in the larger blood-vessels. The least emotion, or the

slightest physical exertion, tends to aggravate this excited condition, and the palpitation, at first paroxysmal, gradually becomes more and more constant. The patient is often painfully conscious of the thumping of the heart, the beating of which can sometimes be heard several feet away from the chest wall. Inspection reveals a tumultuous heaving over the cardiac area, and the absence of punctuation in the apex beat, which has become diffuse and widespread. Unless changes due to dilatation, or hypertrophy, have set in, there is not usually any increase in the area of cardiac dulness; and, though the sounds are loud, auscultation reveals as a rule no murmur except where, from general anaemia and consequent dilatation of the ventricular wall, a systolic murmur follows the first sound. The pulse is rapid, usually from 90 to 150, but rises under excitement, and is frequently so small, irregular, and intermittent, as to be almost uncountable. During severe paroxysms there may be dyspnoea, approaching cardiac asthma in severity, and, when this is so, it is characteristic that the remedies usually employed for such conditions do not alleviate the symptoms. Although the pulse at the wrist is often remarkably feeble, the largest blood-vessels dilate and pulsate forcibly, and this increased pulsation is always well marked in the vessels of the neck (over which a systolic murmur can almost invariably be heard), and is probably general all over the body, for it has been observed even in the retinal blood-vessels. The veins of the neck are sometimes dilated, and an anaemic souffle along their course can frequently be detected, while symptoms of general circulatory disturbance—blushing, flushing, sudden perspirations, etc.—are nearly always present even where the primary symptoms are not pronounced.

Symptoms Referable to the Thyroid Gland.

As a rule, complaint of swelling of the neck is made shortly after the disturbances of circulation have set in; but, though this is the usual order of development, the goitre may appear at any time, and there have

been cases where no trace of enlargement of the thyroid was ever detected. The tumour is very seldom as large as in cases of ordinary endemic goitre, and, except for the frequent presence of a choking sensation and difficulty in adjusting a collar, the patient suffers but little inconvenience. A lobe of the enlarged gland may, however, extend down into the chest and alter the shape of the trachea, and death may even take place from dyspnoea, brought on by the pressure of the goitre upon the windpipe and the surrounding parts. The enlargement varies from time to time, and is always greater when the attacks of palpitation are most violent, which would of itself suggest that the goitre is at least in part the result of vascular turgescence; and the dilatation of the superficial veins over the tumour, together with the increased arterial pulsation, the peculiar thrill felt on palpation, and the blowing murmurs heard on auscultation, go a long way to confirm the theory. The increase in size is often greater on the right side than on the left, as might be expected, seeing that under normal conditions the right lobe of the thyroid is almost always the larger. After a time the gland becomes firmer in its consistency, a change brought about probably by an increased development of connective-tissue elements.

Symptoms Referable to the Eyes.

Though the prominence of the eyeballs occasionally precedes the other two by a considerable time, it is usually the last of the three cardinal symptoms to make its appearance; but whether it comes soon or late it holds in the symptomatology of the disease a very important place. It generally develops equally and simultaneously in the two eyes, although cases have been recorded in which the exophthalmos came on earlier in one eye than in the other. Though the prominence has been known to implicate the left eye while the right side of the thyroid was enlarged, and *vice versa*, this crossing is by no means common, the rule being that the enlargement is most marked on the same side as the

exophthalmos. The prominence of the globes may be altogether absent, and is the least constant of the three great characteristic symptoms. It varies much in degree in different cases, and in the same case from time to time; and increases or diminishes, not only in proportion to the severity of the palpitation, but also with the menstrual period. It may even disappear altogether, leaving the goitre and the heart affection as bad as before; may be so slight as to be scarcely noticeable; or may be so extreme as to prevent the closure of the lids, or to dislodge the ball from the socket. In acute and long-continued cases it may be reduced by pressing the eyes back into the orbit, but returns at once on the pressure being removed. After death the prominence is hardly visible. Unlike exophthalmos of orbital origin it rarely impairs the mobility of the eyes, and strabismus has hardly ever been noticed; but the complications of ophthalmoplegia externa, and other paralyzes of ocular muscles, and of fatty degeneration of the recti and obliqui muscles, have been found. In addition to the proptosis there is occasionally actual increase in the size of the ball, which explains the occurrence of myopia during the course of the disease. Except as a result of such complications vision is very seldom affected, and in the great majority of cases pupillary symptoms are entirely absent.

There is seldom pain in the eyeballs but often increased lachrymation, which may be explained by the close connection between the fibres of the sympathetic and the fifth cranial nerve; and this is all the more likely as other affections of the trigeminus have been observed. Anaesthesia of the cornea and acute pain in the globes, accompanied by profuse scalding lachrymation, with increased sensibility on pressure over both supra-orbital foramina, and diminution of ordinary sensibility over the distribution of the right supra-orbital nerve, have also been noticed. These neuropathic symptoms are of great interest where, from undue exposure of the eyeball, disturbances of its nutrition occur. Where the prominence is so great as to prevent the eyelids from closing perfectly, the eye suffers from exposure, and a moderate amount of conjunctivitis

is met with ; but mere want of protection of the eyeball is hardly sufficient to account for the very rapid destruction of the cornea which occasionally occurs, and as a result of which the patient's vision is placed in the greatest danger. Such cases seem analogous to those of neuro-paralytic ophthalmia, which follow in paralysis of the fifth nerve, and in the rapidity of the destructive process contrast strongly with inflammatory mischief resulting simply from undue exposure—*e.g.* in lagophthalmos caused by paralysis of the facial nerve. Happily such acute symptoms are not frequently met with ; but, when they do occur, the prognosis is serious, not only for the vision, but also for the life, of the patient.

A young woman of twenty-one years of age, who came under my notice in 1888, may be taken as an example. The early history of the case was incomplete, but for at least three years she had suffered from palpitation, enlargement of the thyroid, and exophthalmos. Very shortly after the onset of the illness she began to suffer from lachrymation and inflammation of the conjunctiva whenever she exposed herself to the slightest cold. In April the eyes had become so bad that she had to give up work, but her medical attendant stated that corneal ulceration was observed for the first time only about the end of June, when the left cornea became implicated and sloughed very rapidly. A few days afterwards the right cornea also became affected. By the 4th of July both eyeballs were so prominent that the lids could not be closed over them ; there was considerable chemosis of the ocular conjunctiva ; the left cornea was ulcerated throughout its whole extent ; and there was a large prolapse of the iris. A sloughy ulcer occupied the greater portion of the right cornea, which seemed almost wholly devoid of the epithelial layer. There was no paralytic affection of the limbs, but the patient was unable to walk, and was very much excited. Her sister stated that she was quite worn out by travelling, but that she had been highly excitable ever since vision had become affected. The pulse was very irregular, and beating 120 per minute. The heart had a thumping action, with a diffuse apex beat, but no murmur could be detected. In

spite of all treatment the eyes got rapidly worse, and by the 13th of July the lens had escaped from the left, and the cornea of the right had given way. The general condition was one of gradually increasing weakness. Narcotics had little or no influence in procuring sleep, so that day and night the patient continued restless and delirious. At times she was wildly maniacal, and it was with the greatest difficulty she could be kept in bed. Her face was much flushed, and she perspired very freely. She had a particularly bad night on the 18th of July, and next morning the temperature was 104° F., the respirations 26, and the pulse so rapid and irregular as to be almost uncountable. On examining the chest, slight dulness was found on percussion at the extreme right base, but none of the auscultatory signs of consolidation could be detected. The patient got steadily worse, and died somewhat suddenly on the afternoon of the same day. Unfortunately the relatives would not permit a post-mortem examination to be made.

The exophthalmos has been attributed to turgescence of the blood-vessels of the orbit; to swelling of the orbital fat—which is certainly in some cases quite normal; and to the contraction of the layer of unstriated muscular fibre bridging over the spheno-maxillary fissure. This muscle is also found in the upper and lower eyelids, and although, from its scanty development in man as compared with some other animals, it cannot play a very important part in the causation of the proptosis, yet it is generally admitted that another sign—retraction of the upper eyelid—is due to the contraction of these unstriated muscular fibres of Müller. This undue retraction of the upper eyelid is usually described as Stellwag's sign, and, along with the protrusion of the globes, gives to the face an aspect of the wildest terror. Associated with the undue retraction is a diminished frequency in the act of involuntary winking, and to this cause Stellwag, who drew attention to it, attributed the occurrence of the lachrymation, which is so frequently met with. As Stellwag's sign, when present, is usually one of the earliest symptoms of exophthalmic goitre, and is not met with in other forms of exoph-

thalmos, it is of considerable value in the diagnosis of unilateral and incomplete cases. Retraction of the lower lid has been noticed, but it is very uncommon.

Another eye symptom of considerable interest, first described by Von Graefe, consists of a disturbance in the voluntary movements of co-ordination, and may be described as a dissociation of the movement of the eyeball and eyelid, when the glance is directed upwards or downwards. This sign is probably due to a central lesion, and is certainly not a paralysis produced by the prominence of the eyeball, because in the act of closing the eyes the lids descend perfectly; and, while it may be entirely absent in cases where the exophthalmos is very pronounced, it may be very well marked in others where the prominence of the eyeballs is hardly noticeable. Like Stellwag's sign it often occurs very early, and both may be quite distinct where no other symptoms are present; but, though this is so, Von Graefe's sign cannot be considered as pathognomonic of exophthalmic goitre. A modified form was shown in a case that came under my notice in 1890. The patient, a woman thirty-nine years of age, had well-marked exophthalmos in both eyes, the right being much more prominent than the left. The thyroid gland was enlarged, but the swelling was for the most part confined to its right lobe. The patient suffered very much from palpitation, the pulse was irregular and rapid, the thumping action of the heart was visible over a large extent of the cardiac area, the sounds were loud, and a distinct ventricular-systolic murmur was audible over the mitral area. Stellwag's symptom was well marked, and Von Graefe's sign was present, but modified in so far that, although the upper lid seemed at first to follow the downward glance, yet when the gaze was directed further downwards it lagged behind, and after a few seconds was spasmodically retracted so as to leave a large surface of the sclerotic exposed. The pupils responded to the stimulus of light, and in the act of convergence; they were somewhat dilated, but as the patient was highly myopic not much importance could be attached to the significance of this symptom.

Ophthalmoscopic examination revealed some atrophic patches in the choroid, but there was no undue tortuosity or pulsation of the retinal blood-vessels. The patient was very emotional and inclined to be melancholic. She stated that her symptoms had been coming on gradually for several months, but she could assign no cause for the appearance of the disease. There was no disturbance in menstruation.

The results of ophthalmoscopic examination in exophthalmic goitre are generally negative. There is occasionally pulsation in the retinal arteries, but not so often as might be expected where the heart and the vessels of the head and neck are so much affected. Pulsation in the retinal veins is frequently seen, but this phenomenon is met with in so many different conditions of the fundus that it has no diagnostic value. I have, in only one case of exophthalmic goitre, seen slight oedema of the optic disc, and that was in a gentleman rather over sixty years of age. He consulted me on account of an attack of conjunctivitis in his left eye, but a well-marked exophthalmos at once attracted attention, and enquiry elicited the following facts:—More than a year before, he had been under medical treatment for very distressing palpitation, accompanied by dropsical swelling of the extremities. He was confined to bed for several weeks, but at the end of that time had recovered sufficiently to permit of his resuming business duties. Shortly afterwards, however, it was observed that both eyeballs were, without any assignable cause, becoming very prominent. The exophthalmos had varied in degree, having been much worse than it was at the time of my examination. There was no increase in the palpitation at the time of the onset of the eye symptoms, nor had there been any return of the dropsical swelling. Both eyeballs were markedly prominent, but the exophthalmos was rather more pronounced on the left side than it was on the right. There was increased lachrymation in both eyes, and a subacute conjunctivitis in the left. The eyeballs were perfectly covered and protected when the eyelids were closed. The Stellwag and Von Graefe symptoms were both absent. By means of gentle pressure the exophthalmos could

be reduced, but it immediately returned whenever the pressure was removed, and the operation was attended by slight pain. Vision was absolutely normal. Ophthalmoscopic examination revealed slight oedema of both the optic discs, with increased tortuosity and pulsation of the retinal veins.

Tremor.

The body is often in a state of constant tremor, with such fine vibrations that it may be necessary to take hold of the patient's hand before the agitation is noticed. It thus differs from paralysis agitans where the tremors may be seen at a glance, and it may be distinguished from the trembling movements present in other diseases such as alcoholic tremor, etc., by its not affecting the individual digits. It is always aggravated by muscular fatigue or mental excitement, and may become so strong as to amount to spasmodic movement, and so persistent as to resemble tetany. It acquires its chief importance from the fact that it is an early manifestation—sometimes the very first—and is therefore helpful in the diagnosis of incomplete cases. Other complications of a similar nature present in aggravated cases are painful cramps, muscular weakness, a tendency of the legs to give way at the knees, hemiplegia, paraplegia, contracture of the paralysed limb, and altered cutaneous sensibility.

Symptoms Referable to the Skin.

There may be pigmentation of the skin resembling in many respects the Addisonian bronzing, and consisting of a general diffuse yellowish discolouration, or of patches which, when they occur on the face, are most commonly seen on the eyelids and round the orbits. Vitiligo, urticaria, and a greasy cutaneous condition have also been seen; and in this connection may be mentioned, too, local congestions of the skin, *tache cérébrale*, premature greyness of the hair and baldness, loss of eyebrows and eyelashes, oedema of the legs and of the eyelids, and

atrophy of the mammae, all of which have been noted as accompaniments of Graves' disease.

Diminution of the Electrical Resistance.

When the body of a presumably healthy individual is placed in the circuit derived from a constant current battery, its electrical resistance has been estimated to range from four thousand to five thousand ohms; but in exophthalmic goitre the opposition which the skin offers to the passage of the current is remarkably diminished, sometimes falling as low as two hundred ohms. Why this should be so is not very clear, unless it be that on account of the dilatation of the capillaries due to vaso-motor disturbances the skin becomes saturated with fluid, and thus the resistance of the non-conducting epidermis is reduced to a minimum. The symptom, though not pathognomonic, is of importance as, being "at once objective and measurable," it may be of value in the diagnosis of obscure cases, though it must be remembered that notable diminution of resistance may arise from other causes, *e.g.* chronic alcoholic excess.

Sympathetic Disturbances.

One of these is a rise in temperature, probably the result of nervous disturbances, and quite independent of any inflammatory complications. Apart from actual pyrexia, as indicated by thermometric observation, patients frequently complain of sensations of burning heat attended by flushings and profuse perspirations. Uncontrollable diarrhoea is often present, differing from ordinary diarrhoea in so far that it comes on suddenly in paroxysms, and does not appear to be in any way related to digestive derangements in the stomach or bowels, as the tongue may remain clean and the appetite be unaffected. It is not amenable to treatment by the ordinary remedies, and passes off as suddenly as it came on. It has been supposed by some that it is analogous to the

gastric crises in locomotor ataxia, but it differs from these in the fact that the attacks are as a rule perfectly painless. The motions are profuse and watery—a kind of intestinal sweating it has been called. When the diarrhoea is persistent and accompanied by rise of temperature, intestinal mischief must be thought of, as tubercular complications are not uncommon. In any case the long continuance or the repeated occurrence of attacks of diarrhoea has a most injurious effect upon the patient's nutrition, and added to the anaemia, which is a nearly constant feature of the disease, may precipitate a fatal result with great rapidity. Vomiting not related to the taking of food, and following any emotional excitement, is a not unfrequent symptom. The appetite varies in different cases, and is often capricious. Pulmonary symptoms characterised by irritating cough and profuse expectoration may also, in the absence of any more definite lung complication, be regarded as the result of vaso-motor paralysis, and comparable with the profuse perspirations and the paroxysmal diarrhoea. Polyuria, glycosuria, and diabetes have also been observed, and may be mentioned under this heading, because, from the fact that they vary with the condition generally, and disappear in many cases altogether when this improves, they seem to be due to some mysterious alteration in function rather than to any organic disease. Transient albuminuria, sometimes limited to the period of digestion, is not uncommon. It is intermittent, and usually lessens as the other symptoms abate. The albumen may be large in amount, but is not associated with tube casts or other evidence of renal degeneration.

Psychical Symptoms.

A change in the manner and character of all patients is almost invariably met with. They are nervous, restless, excitable, easily put about, irritable, and of uncertain temper. They are usually called wilful and hysterical, and as they are often capricious and difficult to get along with, they may be gravely misunderstood by their relatives and friends.

In many cases the memory is impaired, and the patient, becoming low-spirited and emotional, feels quite unfit for work. There is mental depression and even melancholy. The feelings are easily excited, and there may be a maniacal tendency. These symptoms may culminate in actual insanity, which may take the form of mania, melancholia, or general paralysis.

General Health.

In some cases the general health of the patient is not much affected, but where the disease is active and the stage acute there is always striking emaciation. Besides the almost constant accompaniments of anaemia, chlorosis, and disorders of the menstrual function, already noted, there is often enlargement of the lymphatic glands, somewhat resembling lymphadenoma, though it is not easy to understand what relation enlargement of the lymphatic, the tracheal, and the bronchial glands, or of the spleen, bears to the primary disease.

Exophthalmic goitre is, as a rule, slow and insidious in its onset, and has a tendency to remissions and intermissions, the latter sometimes so complete that the patient may be said to suffer from several separate attacks. Cases seem indeed to be divisible into two classes, one where the course is chronic and extends over several years, and another where it is exceedingly rapid and acute. Whether the progress be fast or slow does not seem to affect the termination, which may be recovery more or less complete, or death. An account has been given of a girl in whom the symptoms passed off entirely at the end of two days (probably the quickest recovery on record); and I know of no instance, on the other hand, where there has been a fatal issue in less than six weeks from the beginning of the attack, and rarely, indeed, before the end of a year. Many cases which begin with very acute symptoms gradually pass into a chronic stage, and sometimes one or other of the cardinal symptoms may subside entirely while the others remain much as before.

For example, cases are known in which the exophthalmos disappeared while the tachycardia and the goitre persisted. When the eye symptoms and those referable to the thyroid gland are strongly developed, the pulse rate very rapid, the tremor well marked, and emaciation actively progressing, the prognosis is necessarily unfavourable, but even in the most unpromising cases, if the patient can be properly cared for, good therapeutic results may be obtained. The following instance, which came under my notice in 1889, is an example: The patient was a machinist, about twenty-four years of age, who, nine years before I first saw her, began, as a result of domestic troubles, somewhat suddenly to develop all the characteristic symptoms of exophthalmic goitre. Her eyes were very prominent, and could only with difficulty be covered by the closed eyelids, but both the Stellwag and Von Graefe symptoms were absent. The thyroid gland was much enlarged, with the swelling most pronounced on the right side. The palpitation was very distressing, and the pulse so rapid and irregular that it could not be accurately counted; but as far as could be made out there was no organic heart affection. When she came into my consulting room she was literally trembling all over, and was so nervously excited that she could scarcely tell me about her symptoms. She was steadily losing flesh, and described herself as feeling very ill. The menstrual function was in abeyance. Treatment by means of rest, nourishing food, and general blood tonics, was carried on for more than a year, and when I had an opportunity of seeing her again at the beginning of June 1891, her condition was as follows: The exophthalmos, though distinctly noticeable, had become very much less, and the swelling of the thyroid was greatly reduced in size and felt firmer on palpation, the right lobe being still the larger. The pulse was steady and regular, and beating below 100 per minute; the tremor had practically disappeared; and there had been a considerable gain in weight. There was still nervousness and a tendency to excitement, but the patient was able to be regularly at her employment, and stated that she felt quite well. She still suffered from amenorrhoea.

In many instances death takes place from intercurrent disease, and in a few instances has occurred without warning—a result due in the more chronic cases to cerebral haemorrhage, some heart affection, or some form of tuberculosis.

The plate, taken from a patient under the care of Dr. Middleton in the wards of the Glasgow Royal Infirmary, shows a characteristic example.

Proptosis.

(*πρό*, forward, and *πτῶσις*, falling.)

Protrusion of the eyeball.

Synonym: Exophthalmos.

French, *Proptose*. German, *Vorfall*. Italian, *Proptosi*.

EXOPHTHALMOS is a symptom common to, and often the earliest sign of, many dissimilar affections of the orbit. One or both eyes may be affected, and in some cases the protrusion is so extreme that the eyeball cannot be covered by the lids, and becomes inflamed from exposure—exophthalmia. When the onset is acute the cause is frequently inflammatory, and the disease begins either as a periostitis or as a cellulitis. The inflammation may be idiopathic, and spread to the orbit from the skin as in erysipelas, carbuncle, or abscess; or it may originate during the course of the exanthemata, puerperal fever, syphilis, tubercle, or rheumatism. Both orbital periostitis and orbital cellulitis are accompanied by chemosis of the conjunctiva, swelling and redness of the lids, and impairment of sight, the result of optic neuritis; but in the former the proptosis occurs more rapidly, and seldom takes place directly forward, deviating to one side or to the other, while the movements of the eyeball are restricted, but not equally so in all directions. In periostitis, too, the pain is acute instead of dull, and is often strikingly nocturnal, while there is always tenderness on pressure over the bone.

At other times the inflammation is traumatic. Such cases are common, and follow a blow, a penetrating wound, the lodgment of a

foreign body in the orbit, or a wound of the eyeball which has led to suppurative choroiditis. Emphysema of the orbit, haemorrhage into Tenon's capsule, the oedema which occasionally comes on suddenly after an operation for strabismus, and panophthalmitis are all examples of traumatic exophthalmos.

When, on the other hand, the protrusion of the eyeball develops gradually, it is usually due to the presence of a morbid growth, which may either originate within the orbit or extend to it from adjacent parts. Of the intra-orbital causes tumours are the most frequent. They may be simple or malignant, and may originate in the lachrymal gland, the bony wall of the orbit, the connective tissue, the blood-vessels, or the optic nerve. If the seat of the neoplasm be deep in the orbit, the eyeball will be pushed forward early, and the exophthalmos may be great long before the growth can be detected by palpation. Extra-orbital causes are sometimes difficult to determine, as the socket may be encroached upon from every side. Exostoses have been found in all the regions round the eye, and like other tumours of the ethmoid, the sphenoid, and superior maxilla, they may spread to the orbit. I have seen nasal polypi extend from the nose into the socket and induce protrusion of the globe, and among other causes may be mentioned encephalocele, thrombosis of the cavernous sinus, and orbital aneurism.

Proptosis is an occasional accompaniment of cerebral tumour, and is always present more or less in paralysis of the extra-ocular muscles—exophthalmos paralyticus.

In some instances the origin of the disease is very obscure. The vision is good, the pupil is active, and there is no imperfection in the movements of the globe. The onset may be sudden, and both eyes are often affected. This subject is considered in the description appended to Plate XLIII.

A somewhat unusual case, attended by pronounced exophthalmos, was for some time under my care. The patient was a woman twenty-three years of age. A year before I saw her the right eye was enucleated

PROPTOSIS.

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PLATE XLIV



PROPTOSIS

for the relief of the pain attendant upon relapsing irido-cyclitis, and within a few weeks after this operation the left eye became painful, and the vision dim. The patient, who presented slight notching of the central incisors, and who had a younger sister who suffered from interstitial keratitis, was highly myopic and astigmatic, and the choroid was extensively atrophied. The attacks, the origin of which it was difficult to explain, came on at irregular intervals, but often during the night, and were so severe as to interfere with sleep. Pain was felt in the orbit, brow, and temple, of the left side, the globe projected from the socket, there were slight injection round the cornea, dilatation of the pupil, increased intra-ocular tension, and great dimness of vision, but there was no loss of transparency of the cornea, lens, or vitreous humour. In this instance pain was always the very first indication that an attack was coming on, and as it was at times very severe, and the recurrence frequent, I performed an iridectomy operation in December 1897. For three months the patient remained perfectly free from suffering, and there was no protrusion of the globe, but after a period of hard work accompanied by domestic worry all the old symptoms recurred, and the exophthalmos became again during an attack as pronounced as before.

PLATE XLV.

Intra-ocular Tumours.

Synonyms : Sarcoma ; Glioma ; Melanosis.

French, *Tumeurs intra-oculaires*. German, *Intraoculäre Geschwülste*.

Italian, *Tumori intraoculari*.

Figs. 1 and 2. Sarcoma of the Choroid.

SARCOMATOUS, tubercular, and carcinomatous neoplasms may all develop in the choroid, but the sarcomatous varieties are by far the most frequent. As a rule they are unilateral; have their origin in the larger blood-vessels; are composed of round or spindle cells; and are usually pigmented—melano-sarcoma; but in a small percentage of cases the pigment is absent—leuco-sarcoma. The non-pigmented forms develop in the anterior parts of the uveal tract, and are met with as a rule at an earlier age than the melanotic, which very rarely occur before the age of forty. The disease, which in the choroid is almost always primary, destroys the eye, and, owing to its tendency to recur after removal, and to give rise to secondary growths in other parts of the body, is always most malignant, and certain, sooner or later, to result in death.

The progress of a case of sarcoma of the choroid is usually divided into four stages.

1. *The Quiescent Stage*.—As long as the tumour is small its presence may not be suspected, unless it originates in the neighbourhood of the macula, when vision is affected from the beginning. In all cases ophthalmoscopic examination will reveal a more or less extensive detachment of the retina. With the growth of the neoplasm this detachment becomes

INTRA-OCULAR TUMOURS.

Fig. 1. Sarcoma of the Choroid.
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Fig. 2. Section of the Eyeball in
Sarcoma of the Choroid.
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Fig. 3. Glioma of the Retina.
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Fig. 4. Section of the Eyeball in
Glioma of the Retina.
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Fig. 5. Melanosis
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Fig. 6. Purulent Hyalitis.
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INTRA-OCULAR TUMOURS.

Fig. 1. Sarcoma of the Choroid.
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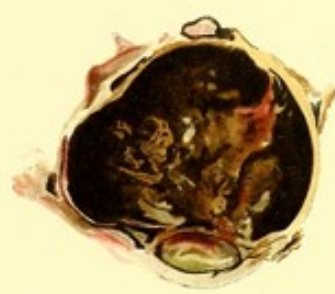
Fig. 2. Section of the Eyeball in
Sarcoma of the Choroid.
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Fig. 3. Glioma of the Retina.
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Fig. 4. Section of the Eyeball in
Glioma of the Retina.
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Fig. 5. Melanosis
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Fig. 6. Purulent Hyalitis.
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greater, and there is a corresponding increase in the defect in the visual field, until at length blindness may become total. Up to this point the appearance of the eyeball externally is unchanged, but after a time, usually averaging about eighteen months, there is sudden increase of tension, which marks the beginning of the second stage.

2. *The Inflammatory Stage.*—The increase in tension is accompanied by severe pain, and by all the signs and symptoms of subacute glaucoma. From its onset the patient's suffering is almost continuous, the eyeball is constantly injected, and large varicose veins are conspicuous over the site of the tumour. As the neoplasm increases, the sclerotic covering it becomes thin, bulges, and gives way. The duration of the second stage is shorter than that of the first.

3. *The Extra-ocular Stage.*—After the tumour perforates, it grows very rapidly, forming a bluish-grey projection from the surface of the globe. This is at first covered by conjunctiva, which, however, soon gives way, and the ulceration of the exposed surface of the growth gives rise to foul-smelling discharge and frequent haemorrhages. The pain is markedly less, but the tumour increases rapidly, and, if the perforation has taken place through the posterior part of the sclerotic, soon displaces the eyeball. The neighbouring lymphatics are never affected, but the disease spreads to the lids and surrounding skin (Fig. 5), and, extending backwards through the sphenoidal fissure and the optic foramen, reaches the base of the brain (Plate XLVII., Fig. 1).

4. *The Metastatic Stage.*—As soon as the tumour attacks the neighbouring tissues of the globe, secondary growths begin to form in distant organs, the liver being the one most frequently affected.

Figs. 3 and 4. Glioma of the Retina.

GLIOMA is the only neoplasm which occurs in the retina, and, although in structure it closely resembles a round-celled sarcoma, its features are

so distinct clinically that it is convenient to describe it as a separate disease. It occurs in very young children, and may even be congenital. At its outset it causes no irritation, and the first intimation of its presence is the appearance of a yellowish reflex emanating from the pupil. When the eye is examined, a nodular mass traversed by minute blood-vessels is seen behind the lens. The growth of this is so rapid that in a few months the eyeball becomes filled, and, if the pupil be dilated, the bright coloured reflex is so obvious that the disease received from the older writers the name of "amaurotic cat's-eye." A second stage is marked by the occurrence of inflammation, and after the onset of this the child's sufferings are very acute. Care must be taken not to confound glioma at this period with suppurative changes in the vitreous, the result of severe irido-choroiditis—pseudo-glioma (Fig. 6). The increase of tension in the former and the history of the case afford much help in making a diagnosis. As the tumour increases, it passes backward along the optic nerve to reach the brain, and bursting through the ocular tunics escapes into the orbit where it grows rapidly, till, if the disease be allowed to run its course, the eye projects from between the lids in the centre of a large ulcerated bleeding mass. The neighbouring lymphatic glands become involved, and the child dies from exhaustion, or from the development of a cerebral tumour. Although glioma is such a malignant disease, it probably admits in its earliest stages of a more favourable prognosis than can be given at a corresponding stage of melanotic sarcoma, for if, in the former, enucleation of the eyeball be performed before the optic nerve has become affected, the chances that the disease will be completely eradicated are good; while in the latter, though early operation greatly diminishes the chance of local recurrence, there is no stage free from the risk of metastatic infection.

PLATES XLVI., XLVII.

Sarcoma of the Choroid.

(σάρξ, flesh.)

A tumour of the choroid, composed of overgrowth of the surrounding tissues, which revert to the embryonic type.

Synonym : Melanosis.

French, *Sarcome de la choroïde*. German, *Sarkom der Aderhaut*. Italian, *Sarcoma della coroide*.

THE illustration in Plate XLVI. is taken from a woman sixty-three years of age, whom I treated in December 1891, for a prominent swelling in the right orbit, accompanied by acute suffering on the right side of the head. Her own account was that, six years before, while apparently in perfect health, she had suddenly been seized with severe pain in the right eye—which, to use her own words, “became inflamed and enlarged”—and in the frontal and temporal regions of the same side. The attack subsided gradually, and all symptoms disappeared within fifteen days. The recovery was apparently complete; but after the lapse of a year, during which she experienced no discomfort, a second and somewhat similar attack occurred, which again lasted for about a fortnight. On this occasion the vision of the right eye—which, according to the patient's own statement, had during the first illness been entirely unaffected—became permanently lost, the blindness coming on suddenly along with the onset of the pain and of the inflammatory symptoms. At the end of another year there was a fresh recurrence, during which the eyeball was pressed forward; and on this occasion the proptosis was permanent, but there was no pain except “after a hard

day's work." After this third attack there was little change till about three months before I saw her, when, without any evident cause, the eye became painful, and more and more prominent.

Examination showed that a tumour, which projected forwards a little more than an inch from the external orbital margin, and measured about two inches across in both vertical and transverse diameter, almost filled the cavity of the right orbit. The eyeball itself was seen to be very much atrophied, and occupied a position near the centre of the projecting mass. The cornea was small and flattened, and was surrounded by about a quarter of an inch of shrunken and wrinkled sclerotic, which showed deep indentations over the insertions of the recti muscles, and very gradually merged into the tumour tissue. The surface of the cornea was traversed by numerous small blood-vessels. The growth was most prominent at the upper and outer aspect of the orbit, was composed of lobules almost black in colour, and was traversed on the outside by large varicose blood-vessels. It was firm and elastic, freely movable in the orbital cavity, and without tenderness on pressure. The eyelids were swollen and stretched, and completely covered the whole mass, except at the inner canthus, where a fold of hypertrophied conjunctiva projected. As a result of venous engorgement, they were of a dark livid colour. There was no enlargement of the pre-auricular or other lymphatic glands.

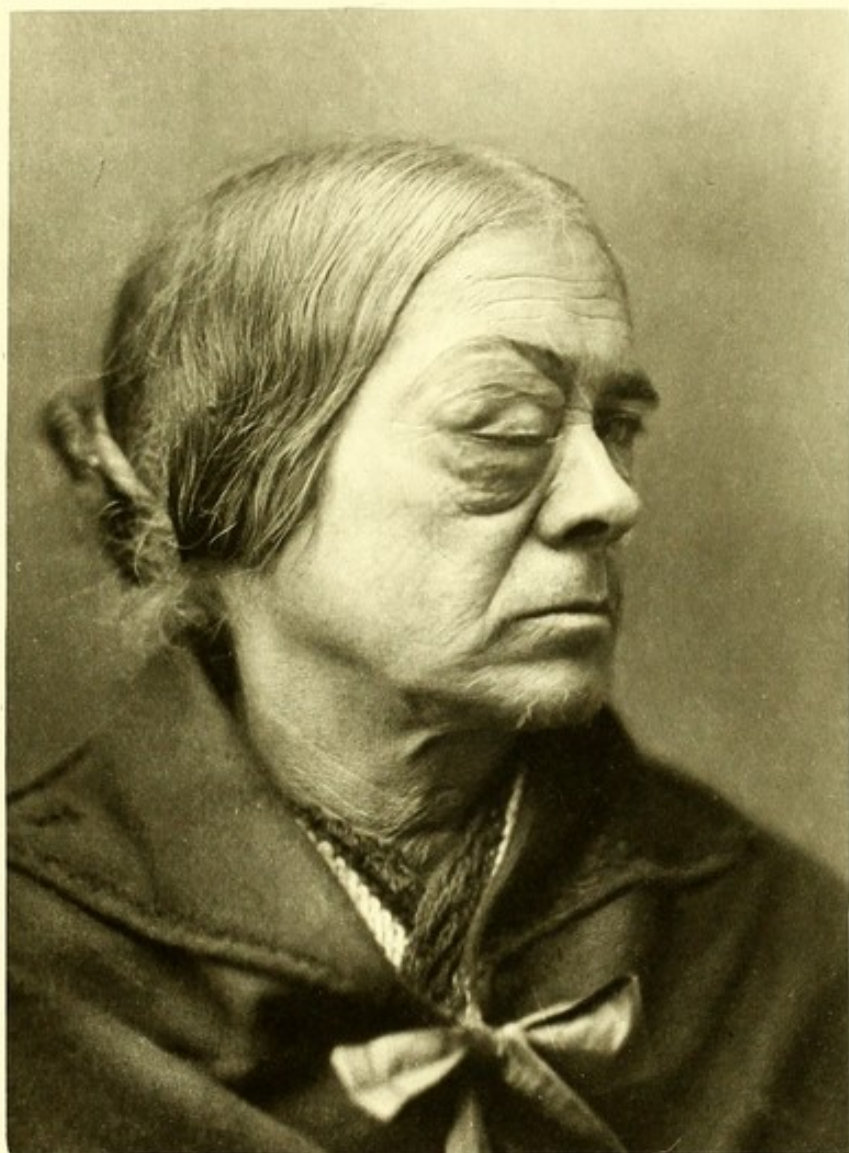
When the external canthus had been freely divided, and the whole contents of the orbit removed, it was found that the tumour extended backwards along the course of the optic nerve, through the track of the optic foramen, the margin of which was distinctly eroded, as was also the orbital plate of the frontal bone, from which the growth had (so firmly adherent was it) to be separated by a knife. There was profuse haemorrhage, which was, however, quickly controlled by compression. The orbit was afterwards packed with iodoform gauze, and the healing process went on uninterruptedly.

Though the patient complained on several occasions of severe pain

SARCOMA OF THE CHOROID.

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PLATE XLVI



SARCOMA OF CHOROID

over the right parietal region, careful examination failed to detect any organic disease. The thoracic and abdominal viscera were normal.

Dr. R. M. Buchanan gave the following report of the tumour: "The mass removed from the orbit measured 4 cm. antero-posteriorly, and the same transversely. In median vertical section the eyeball was seen to be shrunk to about one-half its normal size, and the optic nerve to be greatly elongated. The tumour tissue appeared packed around the nerve and the shrunk eyeball in a number of distinct masses, which varied in colour from greyish-white to black. There was no evidence of tumour-growth within the sclerotic in this section; but another section in the same plane revealed the presence of a small pigmented mass of new growth, about the size of a millet seed, evidently in connection with the choroid, and situated about the equator of the eyeball. Opposite this mass was an indication of invasion of the sclerotic by pigmented tissue, although to the naked eye there was no evidence that this invasion was continuous, directly through the sclerotic, with the extra-ocular tumour. There was visible infiltration of the sheath of the optic nerve. Immediately behind the eyeball the nerve was compressed by tumour tissue [Plate XLVII., Fig. 1].

"On microscopic examination the intra-ocular growth was found to consist of large cells loaded with dark pigment granules, the latter varying in size considerably. These cells extended into the sclerotic (at the point above referred to), and were traceable right through that tunic in two diverging and gradually diminishing tracks. The extra-ocular tumour was made up of spindle cells; and its blood-vessels, especially in the more pigmented portions, were mapped out by the presence of pigmented cells in and around the walls" (Plate XLVII., Fig. 2).

At the death of the patient, which took place somewhat suddenly two years afterwards, it was found that a new tumour about the size of a small orange had formed in the right frontal lobe of the brain. It was not incorporated with cerebral tissue, but had simply pushed the lobe

aside; and the absence of all symptoms during life showed that the brain had accommodated itself to the changed conditions (Plate XLVII., Fig. 3).

For the drawings for Plate XLVII. I am indebted to Dr. Alexander Macphail and Dr. Campbell M'Clure.

A somewhat similar case came under my observation in June 1893. The patient was a gentleman over sixty years of age. In 1883, when much over-worked, and suffering from whitlow, with great inflammation of the lymphatics and enlargement of the glands of the axilla, he awoke one morning to find that the left eye was quite blind; but ophthalmoscopic examination failed to detect any pathological changes to account for the failure of sight. Vision improved gradually, until when the eye was strongly turned inwards large print could be read, and, in walking or driving, passers-by and objects on the road could be distinguished. For more than six years there was no discomfort, but about that time, and after much exposure to cold and inclement weather, the ball became very painful, and an attack of irido-choroiditis confined the patient to his room for six weeks. Sight was completely lost, and never returned; and the eye continued sensitive to cold, and tender to touch. It was now noticed also that one globe was gradually becoming more prominent than its fellow. By November 1891, all these symptoms had become much more aggravated, and, in addition, the ball was being pushed steadily upward as well as forward. In July 1892, a growth was detected springing from the lower and outer aspect of the globe. Dr. Reid enucleated the eye, when it was found that the new growth was a spindle-celled pigmented sarcoma, almost entirely extra-ocular. The sclerotic had, however, been perforated, and a small flat intra-ocular tumour was found close to, but not involving, the optic nerve entrance. Within a few weeks after the operation a little nodule was felt at the inner angle of the upper eyelid. This increased slowly in size, and gradually filled up the orbit. The lids presented an appearance similar to that illustrated in Plate XLV., Fig. 5. By June the orbital growth

SARCOMA OF CHOROID.

Fig. 1. Intra-ocular Tumour, with the growth outside the Eyeball.

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Fig. 2. Microscopic Structure of Tumour.

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Fig. 3. Secondary Tumour in the Brain.

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Fig. 2. Microscopic Structure of Tumor.
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in Tumor, with the
the Eyeball.
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had increased so much in size that it formed a very considerable swelling projecting from the orbit, and adhering pretty extensively to its floor. On June 11th I assisted Dr. Reid to extirpate the tumour. The whole contents of the orbit were cleared out, and, in addition to removing both upper and lower lids, a flap of skin had to be cut away from the outer canthus, to which a nodule of discoloured tissue was adherent. The floor of the orbit was eroded, as were also the bones at the inner canthus. These were scraped with a sharp spoon until the antrum and the ethmoidal sinuses were exposed, but no trace of the tumour was found in these cavities. The growth extended backward beyond the reach of the knife, and at the apex of the orbit a small piece remained, to which chloride of zinc paste was applied. The wounds were dressed in the usual manner, and healing progressed satisfactorily. The patient complained of severe pain deep down in the orbit, where sprouting granulations were visible. These were thoroughly cauterised with chromic acid, and, as far as could be seen, they were completely destroyed. By the end of August the orbit appeared healthy, and the patient was able to go about again as usual. At the time of the operation the supra-orbital nerve had been divided, and the numbness of the skin over the area of its distribution caused much annoyance, which was so greatly intensified after exposure to cold that the patient had to give up driving in the open air. No further trouble was experienced for more than eighteen months, when pain again returned deep in the orbit and darting all through the head. It came in paroxysms, which, as time went on, became steadily more severe and of longer duration. From the very beginning of these attacks the sight of the right eye was affected. At first there was simply a diminution in the visual acuity during a paroxysm, while in the intervals between the attacks the sight was as good as before, and nothing abnormal could be detected on ophthalmoscopic examination; but as the pain became more severe and persistent, positive scotomata appeared in the field of vision, sight did not return in the intervals, and the ophthalmoscope revealed signs of neuro-retinitis. The sub-

sequent history of the case was one of more and more constant suffering, of gradually increasing blindness, and of steadily progressive failure in strength; and for some weeks before the patient died in July 1895, he was confined almost entirely to bed, the pain had to be mitigated by large doses of morphia, and, atrophy of the optic nerve being complete, the blindness was total. There was entire unconsciousness for several days before death.

No post-mortem examination was made, but there can be little doubt that the tumour invaded the brain from the orbit, and that the visual disturbances in the right eye were the result of pressure upon the chiasma.

PLATE XLVIII.

Fungating Sarcoma.

Synonyms: Fungus haematodes; Encephaloid tumour of the eyeball.

French, *Sarcome fongueux*. German, *Wucherndes Sarkoma*. Italian,
Sarcoma fungoso.

I AM indebted to Dr. Hector Cameron for the photograph from which this Plate has been taken. The case occurred in the practice of the late Dr. Dewar, to whose wards in the Glasgow Royal Infirmary the boy was sent from the Highlands. A large fungating tumour projected from the cavity of the orbit, between the eyelids, which were stretched tightly round its base. It was of soft consistence, and bled readily. The eyeball was completely destroyed, and formed a shrivelled mass in the centre of the tumour. An attempt was made to extirpate the growth, but the patient died shortly after the operation.

FUNGATING SARCOMA.

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FUNGATING SARCOMA

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