On cataract and its appropriate treatment by the operation adapted for each peculiar case / by Charles W. Gardiner Guthrie.

C. G. GUTHRIE
ON
CATARACT

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AND ITS

APPROPRIATE TREATMENT

BY

THE OPERATION ADAPTED FOR EACH PECULIAR CASE.

BY

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PREFACE.

The following observations contain the substance of that part of the Lectures on Surgery which have been for years delivered by Mr. Guthrie to the Medical Officers of the Public Service, and to the Students of the Westminster and the Royal Westminster Ophthalmic Hospitals; as well as of those Clinical Lectures given by me at the Hospital during the last winter, which relate to the treatment of Cataract. I have endeavoured to be explicit in enumerating the symptoms and appearances of each kind, and in the directions explanatory of the different operations most appropriate for them; with the hope that they cannot be mistaken by professional readers, whilst they are as far as possible divested of unnecessary technicalities, that they may be readily understood by every intelligent person desirous of becoming acquainted with this interesting subject.

CHARLES GARDINER GUTHRIE.

19, Savile Row,
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ON CATARACT,

AND

ITS APPROPRIATE TREATMENT.

GENERAL OBSERVATIONS.

Cataract, the Γλαυχωμα of Hippocrates, Ὑπόχυμα Καταρακτα of Galen, *Suffusio* of the Romans, *Gutta Opaca* of the Arabs, was supposed by Galen and the ancient Greeks and Romans, to be a disease of the crystalline lens, which they conceived, also, to be the seat of vision. They soon found the impossibility of maintaining these two opinions, for they were fully aware that during the rude operations then performed for the removal of a cataract, something was removed from the axis of vision and depressed below the pupil; this they supposed to be an adventitious membrane, formed by a deposition from the aqueous humor which occupied the space behind the pupil, and formed, as it were, a curtain before the lens.

Kepler, in the year 1604, proved by experiments that the crystalline lens being diaphanous, was incapable of retaining or reflecting light, and could only be considered as a double convex lens, peculiarly adapted for conveying the rays of light to a focus or point at the bottom of the eye. The real nature and seat of cataract was only known to a few, although it was privately noticed, and even publicly announced, as early as 1651. In 1707, Antoine Maitre Jan stated the fact rather as a discovery of his own, than as one he was about to confirm by his own observations. The

works of Brissiau (1709), Heister, St. Yves, Petit, and Daviel, in succession, completely established what Maitre Jan had advanced, and the different names which cataracts have since received, followed as soon as it was known what parts were concerned in the disease.

Cataracts were at first divided into true and false—true, when the disease admitted of removal by depression, the only operation then known; false, when the complaint could not be perfectly relieved by this operation; and they were said to be *doubtful*, when the appearances partook of the nature of both. They were again named according to the particular qualities or appearances they were supposed to possess. Hence the hard or horny, the black, the stony, the amber, the grey, the cheesy, the flocculent, the fleecy, the milky, among the true cataracts; and glaucoma, protuberant cataract, tremulous or shaking cataract, and the abscess of the crystalline among the false cataracts; dryness of the crystalline, and attachment to its capsule, increase in size of the crystalline and of its capsule, and a tendency to abscess or ulceration, among the doubtful cataracts.

In addition to these, there are cataracts from forcible displacement of the crystalline from external injury, spotted cataract, congenital cataract, membranous cataract from the formation of a new membrane behind the pupil, filamentous cataract, barred cataract, the starry or membranous cataract of the posterior capsule of St. Yves, or of the anterior capsule; the interstitial cataract, or of the humor of Morgagni; the secondary cataract, or opacity of the capsule after a previous operation; the partial, or incomplete, when only a portion of the membrane is concerned; lenticular, when the lens alone was supposed to be affected; mixed, when the lens and capsule were diseased with diversity of substance; complicated, when other parts were implicated; adherent, where the cataract adhered to the iris; hereditary cataract, where transmitted or common in families; elastic cataract, dependent on thickness of the capsule and unsoundness of the vitreous humor; and the encysted or hydatid cataract of a spherical form, in which a fluid is contained in an entire and opaque capsule, the lens being

dissolved or absorbed; capsulo-lenticular cataract, when the capsule is opaque as well as the lens, marbled or variegated, window or latticed, stellated, central and dotted, according as they resemble the things which are understood by these different designations; conical or pyramidal, when the protrusion of the cataract into the pupil affected that form; siliquose or husky, when it had a resemblance to a dried pea-shell; purulent or putrid, when accompanied by a cyst of purulent matter; and lastly, the aborescent, dendritic or choroid cataract, when a portion of pigmentum nigrum adheres to the capsule of the lens, in a manner which is not immediately perceived on a careless examination.

Cataracts have been termed ripe or unripe, with reference to their consistence, and the proper period for operation; but these terms are illusory. A cataract was said to be ripe when it had attained a degree of firmness sufficient to admit of its being depressed, or extracted as a solid body. It was supposed to be in a state of maturity when of a grey or pearly colour, when the patient was only able to distinguish between light and darkness, or to see the shade of an object when placed between his eye and the light. When this could not be done, the cataract was presumed to have become old, adherent, and complicated. A cataract was supposed to be unripe when in a recent, or incipient, or soft state; when the patient could still see objects in a moderate light, and when it was presumed it was not sufficiently firm to admit of depression; in which case it was generally found of a whiter colour. The opinion founded on the hardness or softness of a cataract, as dependent on its duration or colour, is frequently contradicted by experience; for cataracts of fifteen or twenty years' duration, and of a pearly colour, have been sometimes, although rarely, extracted quite soft; whilst others of a year's standing, and of a light colour, have been occasionally found hard. Many persons are met with suffering from soft cataracts, who are almost entirely blind; whilst others can still distinguish objects, and even colours, although suffering from hard cataracts. This difference is most frequently seen after the pupil has been dilated by atropine or belladonna.

An important distinction ought always to be made between those

cataracts which have arisen constitutionally, and those which have occurred from local or accidental causes, and especially with reference to the comfort of the sufferer. The local or accidental cataract being often confined under proper management to the eye which has been injured, either by external violence or active inflammation, whereas, the constitutional form of cataract is a disease which usually, sooner or later, attacks both eyes.

Cataract affects persons of all ages, but prevails among elderly and old people, males rather than females, and in them is almost always hard. It is found in the infant before birth, in which case it is usually soft, or capsular, but never hard. It occurs alike in persons of all temperaments, and has not been found to prevail in those of any known disposition, constitution, or idiosyncracy. It has never been shewn that persons have been more liable to cataract, who have suffered severely from the constitutional symptoms of either syphilis or scrofula. On the contrary, the general and equal appearance of cataracts in females of all ranks of society, and the little comparative difference between the sexes, must be satisfactory to every reasonable person that syphilis has no share in the production of cataract as a constitutional disease; and the most careful investigations have not been able to discover that persons who have suffered constitutionally from scrofula, or who were still supposed to be liable to or had a predisposition for it, were more subject to cataract than those who were considered free from it.

Rheumatism and gout frequently attack the eye, and cause blindness by rendering the lens opaque, but this is a local affection, dependant on a constitutional cause; and repeated careful observations have proved that opacities of the lens are not more frequent in persons who have suffered from gout and rheumatism than in those who have been exempt from those diseases. When gouty rheumatic inflammations attack the eye, and are not properly treated, the complaint frequently terminates in opacity of the lens, which is not usually a cataract, but the more complicated disease called glaucoma, and is not relievable by operation.

Cataract in some people appears to be hereditary, although the transmission from parent to child seems by no means to be so direct

as in consumption, gout, or scrofula; for few instances are recorded of its prevailing in families to such an extent as to render it remarkable. It may originate in one branch of a family, and attack in succession several generations, without affecting any of the collateral branches. It may then cease without any assignable reason. Sometimes it attacks only the males, whilst the females are exempt, or *vice versâ*. I have seen several children of the same family affected by congenital cataracts; and Janin, Morgagni, Petit, De Lyon, Richter, &c. all narrate similar facts.

The influence of the constitution on the formation of idiopathic, or constitutional, cataract, is beyond our comprehension. We can only acknowledge the fact, and admit, that few people who suffer from the complaint in one eye escape, after a time, the disease in the other. It sometimes commences in both eyes at the same time, although in general one eye is first affected, the other following the same course, after a shorter or a longer interval; few people living to extreme old age, having had a cataract in one eye without its occurring in the other.

The reverse takes place in cataracts which are caused by external violence. In these local or accidental cataracts, there is no general predisposition; there may, indeed, be so little injury committed, that the organ would seem to be almost unconscious of it. I have, at this time, under my care, a gentleman, whose horse, in hunting twelve months ago, fell with him in a thick edge; he was conscious that a bush had struck his head, but not that his eye had been injured. A thorn had, however, penetrated the cornea and punctured the capsule of the lens, giving rise to opacity of that part. The inflammation which in this case followed the injury was so slight, that the gentleman himself and his family could hardly believe that such an accident had really occurred. The lens has been absorbed, but the capsule will require to be removed by operation.

If much inflammation should follow the injury, there may be great sympathy between the eyes, but this, in many cases, only amounts to an increase of sensibility, although it may extend to direct inflammation, which has been even known to alternate from

one eye to the other in succession. This is a sympathy resulting from, and terminating in inflammation, and may if long continued give rise to cataract, or any other serious evil. These results are, however, the consequences of an intensity of inflammation, which is always capable of producing them; although it has been rarely observed, that a person having received an injury of the lens of one eye, shall have the sound one immediately, or even shortly afterwards affected by opacity of the lens alone, without accompanying signs of inflammation. I am aware it is not an uncommon circumstance for the second to be gradually lost, after the first has been destroyed by long continued inflammation succeeding to external violence; but this is a sympathy of inflammation attacking the proper coats of the eye, which ought always to be expected, and which may frequently be prevented by proper treatment, and generally cured, even when it does take place.

Observation has confirmed, in regard to local cataracts, what reason had presumed. Persons have been found to suffer with cataract in one eye for years, without the other being affected; and it may be inferred that the cause was accidental, when the complaint has occurred in one eye, in young persons, without affecting the other.

ON THE SYMPTOMS OF THE VARIOUS KINDS OF CATARACT.

When idiopathic cataract is about to take place, the patient usually complains of a little weakness of sight, or rather, that it becomes indistinct, or confused, and a greater degree of attention is required to fix and distinguish objects accurately. They appear as if seen through a thin mist, or a semi-transparent turbid fluid, or through a glass which is dirty or dull. This indistinctness of vision is constant. No change or motion of the head, or rubbing of the eye improves the sight, whilst the patient remains exposed to the same degree of light; but if the room be darkened, the vision is in some cases considerably improved. The patient is frequently seen to place his hand on a line with the eyebrow, or what is termed shading the eye from the light, under which circumstances

the pupil is dilated, and objects are seen more distinctly. The improvement takes place only in persons who are suffering from lenticular cataract, and particularly in those in whom the opacity commences in the centre of the lens. The advantage is gradually lost as the pupil contracts, or is exposed to a greater light; in which case he is obliged to bring every object nearer to his eye, whilst it is often more readily seen from one side, than when placed in the axis of vision. An elderly person with a hard central lenticular cataract, sees best in twilight, when the pupil is most dilated; and for the same reason, vision is greatly improved by turning the back to the light, when the countenance of a person can often be distinguished, which could not be seen while it was between the patient and the light. On looking at a lighted candle, the flame does not appear as distinct as usual, but seems as if seen through a mist and surrounded by a halo, which, when the disease is not complicated with an affection of the retina, is always white, or clouded white, and not of various colours, especially neither red nor blue, nor intermixed with flashes of light; the white halo becoming broader and more distinct as it is further removed from the eye. These defects increase with greater or less rapidity. The form of objects is lost, and the patient is oftentimes only able to distinguish between light and darkness, except when objects, such as the fingers, are passed before the eye in a strong light, when their shadows can be seen.

When a person is lying on his back, he may be able to see objects in the upper part of the room, at a distance, which he cannot distinguish when sitting up erect, inasmuch as the rays of light cannot pass under the iris, and through the transparent part of the lens, in the latter posture. In cases in which the disease begins first in one eye, the patient sees distinctly with the other, and does not perceive any of these symptoms, until, from some accidental circumstance, he happens to close the sound eye, and then discovers that he sees very indistinctly, or that he has even lost the sight of that eye; so that many persons are disposed to consider that the disease has come on suddenly, or in the course of the two or three previous days. Sometimes the patient complains

that objects appear irregular, misshapen, rough, straight lines appear crooked, candles or lamps, or other luminous bodies, may appear doubled or trebled, two or three moons may be seen at the same time: and this does not depend on any amaurotic affection, as successful operations have frequently proved, but on the lens becoming more opaque in different directions, as is frequently seen. These opaque parts, diverging from the centre, naturally intercept the rays of light passing to the retina, and reflect from their surfaces the objects seen, so as to distort or multiply them in the manner described. Persons often complain, at an early period, of little spots, like portions of thread, or flies, or muscæ, floating before the eyes, and which continue until they are nearly blind. These are not, however, essential symptoms of cataract, and may remain after the opaque lens has been removed by operation. Flashes of light of different colours indicate a complication of disease of an unfavourable character, as well as the constant appearance of the colours of the rainbow around the flame of the candle, which in a pure disease, is of a white clouded colour; instead of which primitive appearance, the lamp or light seems sometimes surrounded by burning rings, or circles of several colours.

The external signs of cataract are infinitely better marked, although they invariably follow the internal ones in all cases of idiopathic cataract, whilst they precede them in all cases of cataract, caused by injury of the lens and its capsule. In idiopathic cataract, the indistinctness and dullness of vision is usually observed by the patient some time before any appearance of opacity can be detected in the lens, which renders the diagnosis between cataract, and mild incipient amaurosis, oftentimes exceedingly difficult. In a short time, a slight and general haziness or muddiness may be discovered, which is of a deeper shade towards the centre, giving to the part behind the pupil an appearance as if seen through an opaque or turbid substance. This gradually increases, until an opacity can be distinctly observed, in most instances, situated in the centre of the lens in elderly or old persons. In others, the opacity begins from the circumference, although the defective state

of transparency at the central part, renders vision indistinct, before it can be clearly seen by the surgeon ; hence, the necessity for the application of belladonna, or atropine, in many, indeed in most cases, before any accurate opinion can be given, whether a cataract has actually begun to form or not. When in elderly persons, suffering from indistinct or confused sight, the pupil is fully dilated, and the edge or circumference of the lens and capsule can be seen ; small, white, triangular points are often observed on the capsule, at the part corresponding in position with the extremities of the ciliary processes, from the under part of which they would seem to be continued, and to be of different growths and sizes. With their occurrence and growth, the muddiness of the lens commences ; the part beneath them becomes opaque and striated, and their opacities gradually increase, until the whole lens becomes opaque. The opacity, in these cases, although not central, is deep, well-marked, and of a grey or amber colour, and of a whitish yellow, having a radiated, mother-o'-pearl appearance. It is said that cataract has formed in one night, after the occurrence of distressing mental circumstances, gout, &c.; but I doubt the fact of its actually taking place without previous disease existing, and suspect that in all such cases the complaint had occurred previously, in the manner I have described, in which state I have often seen it rapidly developed, implicating in a very short time, in a day or two in fact, the whole lens. In all these cases, the capsule of the lens is, and must be affected ; but the opacity does not extend to the centre in every instance, and the posterior capsule is certainly not implicated, as the eye remains perfectly clear after the opaque lens has been successfully removed.

The progress of the disease is usually and essentially slow,—many months generally elapse from the first commencement of the complaint until useful vision is destroyed, and as one eye is commonly affected before the other, two, three, or more years sometimes pass away before the patient becomes so blind as to render an operation advisable. In the commencement, and when only one eye is affected, the patient sometimes loses the power of judging accurately of distances ; so that he cannot snuff the candle,

or take up a pin, or other small substance from the table, and finds a difficulty in stepping over a gutter or in crossing the street. Glasses rarely give any assistance in this disease. Sometimes a slightly tinged plane glass will improve the sight when the patient is exposed to a strong light, by allowing the pupil to dilate, which in some instances is a little more dilated in a moderate light than in the eye of another person, and the pupillary edge (especially where the disease is a soft cataract) takes on a darker appearance, as if it were surrounded by a narrow black ring, which is its posterior edge covered by the pigmentum nigrum, pushed forward in consequence of the increasing size of the lens.

The appearance and motions of the iris in cataract are of the utmost importance, both as to the nature and treatment of this disease. The iris is usually described as a curtain placed before the retina, possessing muscular or contractile powers, for the purpose of dilating or contracting the pupil, and having its sensibility for stimuli so harmonized with that of the retina, that it contracts or dilates, according to the greater or less degree of intensity with which light is thrown on that membrane. The greater contraction of the pupil in a very vivid light, its proportionate diminution in partial darkness, together with its general state of immobility and dilatation when the retina is altogether insensible, seem to demonstrate its use, and have given rise to the opinion that the motions of the iris were regulated by the susceptibility of the retina for external impressions, and that the state of the iris, when uninfluenced by the sympathy with the sound eye, was an index of the state of the retina ; that a motionless and dilated iris indicated an unsusceptible retina, a moveable and contracted iris a healthy state of that membrane, the intermediate action pointing out the different shades of derangement. If the opinion had been found critically correct, it would have been an invaluable test of the state of the retina, and a certain guide as to the expediency of operating in many complicated cases ; but, unfortunately, this is not the case, for, although the motions of the iris do accord with the susceptibility of the retina, whilst both are in a healthy state, they differ materially when either part is diseased. We find, that in

many cases of complete amaurosis, the motions of the iris continue on exposure to light as if influenced by it, and independently of any sympathy with the retina; the same thing has been known to occur after injuries of the head which have deprived the sufferers of sight, vision being destroyed, although the motions of the iris were unimpaired. In mydriasis, which is essentially marked by a dilated and nearly immoveable pupil, the retina remains perfectly sound, and the patient recovers his sight, when a false iris is made by causing him to look through a small hole in a black card.

The motions of the iris are influenced in three ways—one by the direct stimulus of light, the patient being quite blind, and two by sympathy, or indirect influence; the first with the retina of the same eye when sound; the second with the iris of the other eye, whether the retina or optic nerve is healthy or otherwise.

The optic nerve is probably not a simple, but a compound nerve, possessing both incident and reflex fibres in addition to those of sensation; the former exerting an influence, perhaps, on the motion of the iris, which is more distinctly supplied with nerves from the lenticular ganglion. When the optic nerve is divided in the cranial cavity, the iris, it is said by Mayo and Flourens, loses its contractile powers, although it may be again excited, and the pupil made to contract, by irritating the root of the optic nerve still attached to the brain. A man may, however, be blind from a defect in the retina, or in the optic nerve, and utterly incapable of distinguishing light from darkness; yet the pupils will contract and dilate under the proper influence of light, proving that it is not on the optic nerve, as one of sensation, that these changes depend. The division of the optic nerve within the head, commits in all probability, a greater and a different injury on the parts than that which takes place in disease. The part of the brain may not be sound in which perception takes place, whilst that part may be healthy to which other impressions are conveyed. Vision may be lost, yet the iris may be moveable. The cerebrum may be injured, yet the cerebro-spinal column, and particularly the corpora quadrigemina, or upper part, may be sound. An injury to the third

nerve paralyses the iris; it is said that an injury to either of the corpora quadrigemina does the same.

My father had a patient in the Westminster hospital, who died three weeks after the receipt of a blow, which was considered to have caused only a concussion of the brain. Mr. Hancock, then house surgeon, made the post mortem examination. The pupils contracted for several days before her death, separately and conjointly, although the levator muscle of the left eyelid was paralysed, and the eyelids appeared to be nearly closed. An abscess had formed at the base of the skull, implicating and destroying the third nerve of the left side, at the point at which it leaves the crus cerebri, which led to the opinion that the mobility of the iris might continue after the motor oculi or third nerve was separated from the brain. The other muscles of the eye supplied by the third pair were also implicated, and the eye was fixed, and the conjunctiva inflamed. An injury to the fifth nerve may, and does sometimes, deprive a person of sight, but it does not always at the same time affect the motions of the iris.

The susceptibility of the iris for light seems, during health, to be on a par with that of the retina, and in sleep light is excluded from the retina and the iris, by the closing of the eyelids, when the pupil is partially dilated; if a strong light be thrown on the eyelids the pupil contracts, the retina becomes sensible of the stimulus, and the person frequently awakes. Under disease the susceptibility of both may be increased or diminished. The sympathy of susceptibility is, however, infinitely greater between the retina and iris, than between the iris and retina; whether it be from what is termed professionally sympathy, or from parity of disease affecting the origin, or referred to the sentient extremities of both sets of nerves; the healthy state of the iris, *generally*, being a good although not an unerring index of the healthy state of the retina; whilst a diseased state, or loss of function of the iris, by no means indicates, although it may lead to a suspicion of, a diseased state of the retina. Mr. Guthrie operated for artificial pupil on the right eye of a man who had been blind twenty-two years, no light having been transmitted to the retina, and yet at the end of that term it re-

tained its susceptibility for impressions, and the patient could see afterwards to read very well. I have done the same in several instances of less standing.

It is on the integrity of the healthy susceptibility of the iris for light, and not of the retina, that the contraction and dilatation of the pupil depends in cases of cataract; that a patient suffering from incipient cataract sees best towards evening, or in a moderate light, in consequence of the dilatation of the pupil allowing the rays of light to pass on to the retina through the edge of the lens, which is not so opaque as the centre, and is exposed by the enlargement of the pupil. This effect is produced by the application of belladonna or atropine, which cause the pupil to dilate, and thus allows the transmission of light in the same manner to the retina, which in general remains unaffected by it; for if it were equally under the influence of the application, the patient would not see, although the rays of light fell on the retina. I have met with several instances of persons using belladonna for years with evident advantage; nevertheless, it is a fact, equally deserving of attention, that in some instances belladonna seems from the first to paralyse the retina as well as the iris, the sight being rendered much more indistinct until its effects have ceased. When given internally, and in large doses, it not only influences the motions of the iris, the ciliary and the optic nerves, rendering vision very indistinct, or even temporarily destroying sight, but all the nerves of the face connected with the organ of vision; whence its efficacy in some cases of tic douloureux, as well as in other painful affections of parts around the orbit, and of the body generally, when applied externally in the form of a plaster.

A proper degree of sensibility of the iris generally implies a correspondent state of the retina, and the ready and quick contraction of the pupil on any sudden exposure to light, is a favourable sign; although immobility of the pupil does not deprive us entirely of hope, operations having been followed by restoration of sight under these circumstances. The immobility of the iris may be dependant on the form and state of the lens and its capsule, although not on its permeability by light. The motions of the iris may be prevented,

and it may remain fixed and dilated, or fixed and contracted, in consequence of adhesions formed between it and the capsule of the lens; or it may be fixed and dilated in consequence of pressure from the lens protruded by the parts behind. The diagnosis in these cases is important. In the natural and healthy state of the eye, the space between the posterior part of the iris and the capsule of the lens, is called the posterior chamber of the aqueous humour, and is best seen after freezing the eye in a dead body, when the layer of aqueous humour is readily demonstrated in a frozen state between these parts. It is into this space the needle is passed in the operation for dividing or cutting in pieces a soft cataract. When the iris is insensible from deficiency of susceptibility of light, from whatever cause, this space is preserved. The distance between the lens and edge of the pupil is readily perceived, and appears to be more or less natural, according to the state of dilatation. If the immobility of the pupil depend on adhesion between the capsule of the lens and the uvea, or posterior part of the iris, it may be suspected from the diminution of the natural space between these parts, by the irregular appearance of the edge of the iris, and by that of the capsule of the lens; and it will be proved by forcibly dilating the pupil by atropine or belladonna.

Immobility of the iris, and especially in the contracted state, is generally the consequence of previous inflammation, and implies nothing with relation to the retina, beyond what may be calculated upon as the effect of inflammation. In these cases the iris is irregular, and generally puckered; there is no space between it and the capsule, which adhere to each other, and the capsule is always opaque and white. If the edge of the pupil yields to atropine, which is more effective than belladonna, it becomes irregular, and shews the points of attachment in a more marked manner. If the iris be not contracted, or even if it be rather dilated, it always shews the edge of the pupil of a darker colour; and, on the application of the belladonna, it dilates and becomes irregular at the points of attachment which are the most conspicuous. In cases of cataract of long standing, it is possible that adhesions may be formed between the capsule of the lens and the

iris, from the simple increase of the lens causing it to press against the iris, or from slight irritation ; but in these cases, the pupillary edge will seldom, or never, preserve its natural colour, although it may remain unaltered in shape, whilst the iris may be very sluggish, or nearly motionless ; but the fact of attachment may be readily proved by the application of belladonna ; and a surgeon is highly reprehensible who does not dilate the iris by it some time before he operates, even if he be certain there is no attachment, because it is the only way in which he can acquire a full view of the surface of the cataract, and in many cases obtain information as to its nature.

Immobility and dilatation of the iris, when not of the first kind, in which the size or depth of the posterior chamber is obvious, may arise from pressure of the lens behind, without any attachment of the iris. In this case, the cataract is in immediate contact with it, sometimes even appears to protrude through it, the black ring round the pupil is well marked, and, on examining the eye from one side, the iris may also appear protuberant, its natural plane surface being lost, when the true state of the case is evident. The application of belladonna will cause a dilatation of the pupil, which it may not be able to return completely to its former state of contraction from the continued pressure of the lens.

Immobility of the iris is not a sign, in cataract, of paralysis of the retina, especially where there are attachments to the capsule of the lens ; because there is a local cause for its remaining immoveable ; but where the space of the posterior chamber is entire, or the iris does not seem to be dilated by pressure of the lens, it is a most unfavourable symptom. When combined with a total impossibility of distinguishing the shadows of bodies, or of light from darkness, it nearly amounts to a prohibition of the operation, which ought *on no account* to be performed, if it be accompanied by pain in the eye, orbit, or forehead, or with flashes of light shooting through the eye, which indicate approaching disorganization.

When the immobility of the iris only marks its want of sensibility, and the patient can readily distinguish light from darkness, there is good authority for performing an operation. It is right to

attempt it, where the patient has been deprived of that power from inflammation ; because it may have occurred in consequence of adhesions. But if it have suddenly occurred, the pupil remaining of its natural size, or being dilated, there is little or no hope of success, and particularly if both eyes are affected.

In mydriasis, or a dilated state of the pupil in which the retina is intact, the iris is insensible to any degree of light, its natural stimulus, although the pupil momentarily contracts on the application of stimulating substances, as spirits of rosemary, veratria, tobacco in infusion, or by electricity, or by rubbing the eyelids strongly over the eye, which does not occur in amaurosis ; neither are both eyes affected in mydriasis as they most frequently are in a greater or less degree in amaurosis. The pupil is clear, but when it is completely dilated, either by disease or by atropine, a slight haziness may be seen, situated apparently deep in the lens or vitreous humour, but which disappears or changes its situation according to the different motions of the eye, and is dependent on the refraction of light, and not upon any opacity of the lens. This is a most important point to attend to, for this hazy or semi-opaque spot has been often mistaken for incipient cataract, which error is obviated by changing the position of the patient, when the spot changes its position also. When the pupil is dilated without any opacity of the lens, objects are commonly seen smaller than natural and very confusedly, except in the shade or in partial darkness.

The third sympathy of the iris, or with the iris of the opposite or other eye, often exists when that with the retina and its susceptibility for light is destroyed ; — a state I have seen in very many instances. The iris of the affected eye in such cases is usually a little discoloured, and the pupil, which is black, remains unaffected when light is allowed to fall upon that eye alone, although it is enlarged or diminished, according to the motions of the iris of the opposite eye. When the sound eye is covered, the pupil of the diseased one dilates to a moderate extent (a movement which takes place in sound eyes similarly situated, and which should be borne in mind), and remains in that state and immoveable under the full glare of the sun ; but if the sound eye is uncovered

and exposed to the same degree of light, both pupils are eventually contracted.

In the natural state of the eye, the iris is a perfect plane, neither protruding forwards, nor slanting backwards, and is without folds or plaits. A deviation from this appearance indicates derangement of its structure, or is caused by pressure from behind, either of which influence the mode of operating in cataract. The plane of the iris is preserved by a due degree of pressure being maintained before and behind by the aqueous humour in which it moves, displacing it as the pupil is dilated or contracted. These motions of the iris are performed with such precision, and the balance of pressure is so little disturbed, that no vacillation of the iris is observable by our sight in a sound eye. I have however seen eyes, and Captain Kater, F.R.S., celebrated among other things for his observations on the pendulum, was an example, in which the iris of each was tremulous, although he saw very well, and never had any defect of vision. This state of eye usually indicates what is called a dissolution of, or a thinner state of the vitreous humor, than natural, and in an unsound eye is usually accompanied by a capsular cataract, from within which the lens has been absorbed, or become soft, or fluid, a state which forbids the operation of extraction. In all cases of cataract, moderate pressure should be made on the eye-ball with the finger, when, if the vitreous humor is thin or watery, the eye will yield more than it ought to do, and the iris will acknowledge the pressure.

Cataracts have been described of various colours; yellow, grey, brown, black, of a pearl, cheesy, silvery, or milky colour, speckled, striated, barred, &c. Of these, as two great outlines, the grey, pearl-coloured, yellow, and brown, may be considered as indicating a hard cataract: while the white, milky, or striated, rather point out a soft cataract: but the milky colour of a cataract is by no means a test of its solidity; many perfectly white, and supposed to be soft, having after extraction been discovered to be too hard to be readily divided or cut up; and the pearl-coloured on the contrary, have been found to be soft. Neither does the colour after extraction, always correspond with the colour observed before

the operation, being sometimes much darker. The size of the cataract is a surer sign of its nature than its colour, it having been found that the smaller the lens, and the darker its colour, the more solid was its substance ; except perhaps when there appears to have been some defect in organization, or growth, from early life ; in which case, a soft, bluish-white cataract, with a striated capsule, will often be observed, when the pupil is fully dilated, to be seated on the vitreous humour, and surrounded by a black transparent ring, the consequence of the deficiency of size of the lens and its capsule. The larger and more protuberant the lens, pressing forwards even into the pupil, and against the iris, the greater is the certainty of its being soft ; but on these points an experienced operator rarely errs ; observation and experience lead to a precision amounting almost to certainty.

Muscæ volitantes, by which is understood a variety of appearances moving before the eye, are often accompaniments or precursors of cataract ; they frequently give the first alarm, although they are not in themselves important, or essentially connected with cataract. They sometimes assume the form of small threads or filaments, which appear to float in the air ; or of a fly or flies, which the patient endeavours to brush or drive from before the eye, until he finds he cannot accomplish it, and that it is a defect in the eye itself. These objects sometimes look like zig-zag lines or spots of greater or less dimensions, and are more or less opaque. They are, occasionally, globular, or in small webs, or luminous spots surrounded by a halo, always moving but never *fixed* as regards the sensations of the patient. They are most readily seen on raising the eye quickly from the ground towards the sky, when they appear to ascend as long as the eye is in motion, and to descend on its becoming steadily fixed, as if they had been disturbed from, and were returning to, their original situation below the axis of vision. Of the different kinds of muscæ volitantes, the filamentous particles, turning and twisting in every direction, are the most common ; two or three of which are generally more observed than the rest, although accompanied by an infinity of others less distinguishable intermingled with small globules, which fall

like a fine mist when the eye has been gently raised and fixed on a white wall, or on the sky on a clear day. The filamentous particles being apparently the lightest descend the first, assuming the appearance of twisted semi-transparent tubes, or worms spotted in different places.

In the evening, or by candle light, these spots are scarcely to be observed ; they are not very perceptible in a room which is rather dark ; are but imperfectly seen when looking at the flame of a candle ; and but feebly marked when the eyes are raised to the sky with the lids shut, on a fine clear day. They appear much more brilliant on a clear bright day when the lids are half closed ; they are also very distinct on a misty day, or when attention is paid to them in light reflected from water or snow. These spots always appear to sink below the axis of vision by their own weight, when the eye is turned upwards ; and the opinion that they do so obtains great support from their falling and collecting, as it were, into a focus in the axis of vision, when this part is made the most dependant by bending the head forward and looking on a white sandy soil, in which way the patient can readily examine them ; or by lying down in the open air and looking at the sky, with the head and eyes turned back, they will be found to ascend and lodge themselves in what is the upper, but in that position the most dependant, part of the eye.

If a filament, which appears to be the tenth of a line in diameter, and an inch long, is examined by placing before the eye a sheet of paper, on which a strong light is thrown, it will be magnified to two lines in diameter, and a foot in length. If examined against a white wall, 20 or 30 feet distant, it seems, to a certain extent, to be magnified in proportion to the distance from the object against which it is inspected. It is not every one who is able to make these observations, and few can cause the appearance of the spots at pleasure, until they have been long accustomed to their casual production.

In some very rare cases, these spots increase forming a mist, which becomes less and less moveable, and may be at last followed by opacity of the lens. In others these spots may be seen for

several years, apparently semi-transparent, whilst a portion only of the lens becomes opaque, either in its posterior half or in parts; and the integrity of the aqueous humor in these cases has been demonstrated by puncturing the cornea and evacuating that fluid without any amelioration of these symptoms.

The principal discriminating mark of these appearances is their apparent *mobility*, which distinguishes them in a very decided manner from the fixed spots, of which patients frequently complain at the same time, and which appear to depend on a different affection of the retina. Muscæ volitantes are seldom entirely removed, or beyond a certain point, and when the patient is assured of their not proceeding further, appear to be lost sight of, and to give no inconvenience unless when attention is directed to them. They are very rarely followed by cataract, and it is a great consolation to the patient to be assured that they are not dangerous.

When these spots are accompanied, or are about to be followed, by amaurosis, or general defect of or loss of vision, one or other of these spots, which appeared to be moveable, becomes fixed, or one that was fixed, increases in size and in density, so that it actually impedes vision, and goes on increasing until it obscures it altogether, the patient seeing gradually less around the dark central spot until he becomes blind.

The retina in ordinary cases retains a perfect sensibility for objects, and receives their impressions very distinctly, the muscæ not being in that respect inconvenient, nor obscuring vision in a manner similar to that which results from amaurosis or incipient cataract. When the muscæ are dependant upon functional derangement they frequently increase, and again diminish in number, and in such cases they are not always even permanent, but then they are manifestly dependant upon debility.

These phantoms have been attributed to an insensibility of some fibres of the optic nerve, by Willis; to a varicose state of the vessels of the retina, by Pitcairn; to some defect in the aqueous humour, by La Hire and Le Roi; to inspissated portions of the lacrymal secretions adhering to the cornea in their passage over the eye, by Morgagni; and to some small portion of the humor Mor-

gagni having acquired an increase of density, weight, and refractile power, by Demours. Mr. Mackenzie contends that muscæ volitantes cannot be formed by any opaque spots anterior to the retina; that such spots might produce an obscurity of vision by intercepting a certain number of rays of light exactly as specks on the cornea, deposition in the pupil, or incipient cataract do; but that no object within the eye can be brought to a focus on the retina or produce any other impression than a degree of dimness, far different from the defined character of muscæ. He is, therefore, of opinion that muscæ volitantes arise from a varicose state of the vessels of the retina or choroid coat. It may be, however, that they are caused by certain parts of the retina having become insensible to light, which may arise from various causes. In cases of fulness of blood in young and middle-aged persons, about to end in inflammation of the brain or its membranes, and which more often occurs in children, objects of this kind are suddenly seen to float before the eyes, combined with other spectral illusions of a more definite character, and which are so obviously dependant on functional derangement of the brain as to demonstrate the cause. This complaint is almost immediately removed by bloodletting, followed by purgatives, rest, and a proper diet.

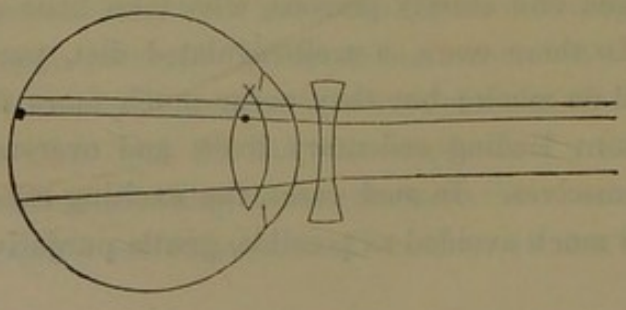
The true muscæ rarely occur as a consequence of congestion within the head, although this state may greatly add to the inconvenience resulting from them, and should be removed by bloodletting, either general or local. They occur frequently towards the end of pregnancy in weakly women, and during the period of lactation when too long continued by delicate females, and disappear under an invigorating treatment, the depressing cause being removed. They occur from the over use of the eyes, the abuse of spirituous liquors, &c., and very often, without any obvious cause, in middle-aged and elderly persons, who take little exercise and live well. In these cases, a well-regulated diet, purgatives, and exercise, will do much; but they occur much more frequently in weakly persons leading sedentary lives, and over-working their eyes and themselves. In such cases, the exciting causes being removed, or as much avoided as possible, gentle purgatives, and mild

mercurials, followed by change of air, and tonics of various descriptions, answer best, although a cure is rarely effected. Among the tonics, the preparations of iron are, perhaps, the best; and amongst bitters, the East Indian charayeta answers remarkably well; one to two drachms of the wood of the stems of the plant being infused in a pint of boiling water, for daily use.

The only external remedies of service are occasional hot fomentations, alternating with stimulating embrocations applied to the forehead and temples, such as equal parts of the sp. rosmarini and camphor, or combined with the liq. ammoniæ aromat. and the sp. æther. sulphurici, than which nothing of the kind more effectually relieves uneasy sensations about the eye dependant on irregular actions of particular parts.

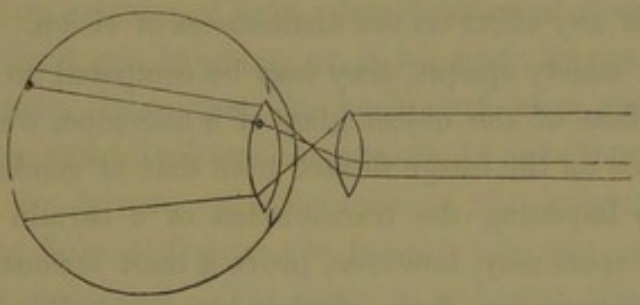
As many persons, not professional, are greatly interested in spots or muscæ in the eye, I here add some observations of the late Capt. Kater, F.R.S., which were addressed to Mr. Guthrie in the year 1834, with three diagrams.

"If the flame of a taper, at the distance of about twenty feet from the eye, be viewed through a concave lens of about a quarter or half an inch focus, a circular disk of light will be perceived, which, if the diameter of the lens be greater than that of the pupil of the eye, will appear fringed at the circumference. Now, if any spots exist, either upon the cornea, the crystalline lens, or in the vitreous humour, the shadow of such spots, if the light be not too strong, will be projected upon the retina. But, in order to be assured that such spots exist in the eye, it is necessary to turn the glass around its axis; when, if the spots move, they are imperfection of the glass, and not of the eye. If such spots remain perfectly stationary, it may be concluded, that they are either imperfections in the cornea, or the crystalline lens.



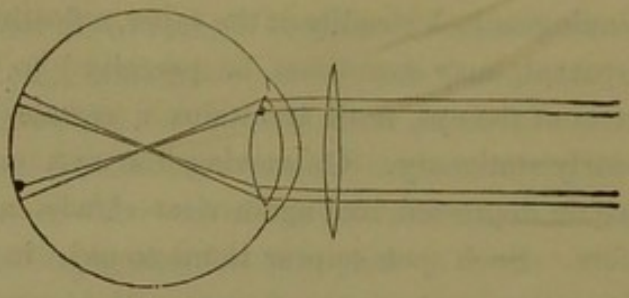
"On continuing to look steadily at the taper, a floating spot, more or less transparent, may sometimes be perceived to arise slowly from the bottom of the eye, until it attains a certain place, where it becomes nearly stationary. On moving the eye, or rubbing it, such spot is again depressed, and again rises slowly, and takes its station as before. Such spots appear to me to exist in the vitreous humour.

"On first looking through the concave lens, many spots will, perhaps, be seen, more or less moveable. These arise from particles of mucus upon the cornea, and are dissipated by rubbing the eye; though sometimes the mucus is so thickened as not to be dislodged without some difficulty. The fringe at the circumference of the luminous disk is the shadow of the edge of the iris forming the pupil.



"The same effects occur if a convex lens be used, the focus of which is so short, that the rays cross before they fall upon the crystalline lens; and in this case, also, the spots are represented as they actually exist in the eye with respect to the pupil.

"But if a convex lens, of about an inch and a half focus, be employed, so as to form with the crystalline a compound lens, the focus of which will be somewhere in the interior of the eye, we have a means of discovering in what part of the eye the spot is situated; for if the appearances be reversed, viz., if the spot which was seen at the lower part of the luminous disk, when the concave lens was employed, should now appear on the upper part of the disk, the spot must be either in the crystalline lens, or somewhere between it and the compound focus formed within the eye, and the approximate distance of which focus from the crystalline lens may be calculated.



"But if the apparent situation of the spot be the same as when the concave lens is used, such spot must be in the vitreous humour, and at a greater distance from the crystalline lens than the distance of the compound focus of the crystalline and the convex lens employed.

"The spots, which I have described, are not visible under ordinary circumstances to the person in whose eye they exist, and have little, if any effect on the distinctness of vision. If they are perfectly, or nearly opaque, they may be compared to wafers put upon the surface of the object glass of a telescope, which have no other influence on the image formed than that of rendering it less luminous, by impeding the transmission of a certain quantity of light. Such spots may, however, prove a most serious evil to the scientific observer, as their shadow is perceptible on looking through a telescope of high power.

"If a spot is constantly seen by a patient under all ordinary circumstances, that spot, I conceive, must originate in some imperfection of the retina."

DISCRIMINATION BETWEEN INCIPIENT AND CONFIRMED AMAUROSIS AND CATARACT.

Incipient constitutional amaurosis is usually preceded, or accompanied, by some of the symptoms experienced in muscæ volitantes, the spots being however fixed, of a darker colour and permanent, whilst a general indistinctness of vision takes place and increases, neither of which signs are so well marked in cataract. When the confusion or indistinctness is not always present, it some-

times increases, or diminishes. After a long continued application of the eye, sight is sometimes found suddenly to fail for a short time, or the patient describes himself to have lost a part of it, so as to be only able to distinguish a portion, or a half of an object, which states of derangement are, for the most part, accompanied by more or less pain in the forehead, temple, or eye. There can be little doubt of the retina, in these cases, being the part implicated, and more particularly if these defects have come on suddenly. If they should have increased so as to deprive the patient of his accustomed power of sight under ordinary circumstances, whilst no opacity can be perceived, the disease will be sufficiently marked. Vision, in incipient amaurosis, is not improved by the use of spectacles, or by the application of belladonna, which rather increases the defect, and the sufferer usually sees better under an increase of light; for instance at noon-day, when the rays of light are brighter, or if he reads by candle-light, he throws a strong light upon the book, and even then brings it nearer to the eye. Incipient amaurosis is sometimes, however, accompanied by increase of sensibility of the external parts, and then a strong light distresses the patient, who can only see when it is carefully moderated. The flame of a bright lamp thus seen, is usually more or less coloured or variegated, blue, yellow, or red, like the rays observable in a rainbow, or more broken and confused, whilst in incipient cataract, the flame of the lamp seems to be surrounded only by a whiter mist of milder light, and which appears to make objects larger than they really are. Flashes of light, or white and brilliant circles, or luminous spots, are equally indicative of amaurosis, more particularly if seen when the eye is closed during the night, and the patients in whom these symptoms occur, usually suffer from headache and pain, especially in the forehead and over the eye, or from giddiness, symptoms which are not common accompaniments of incipient cataract.

In the very early stages of amaurosis, the external signs of derangement are scarcely observable, although, after a time, the different motions of the eye may not be perfectly executed, or some little awkwardness may be observed in them, or some vacancy in

the general aspect of the eyes themselves. The cornea in incipient amaurosis, is not altered from its natural state, although, at a later period of disease, it evidently loses somewhat of its perfect transparency and clearness: the iris is from the first, sluggish in its movements, or the pupil may have even begun to be dilated, and, as the disease advances, it becomes more dilated, and the motions of the pupil are very limited, even if the pupil should not be fixed. In incipient cataract, the pupil is contracted and expanded under the influence or obstruction of light, as readily as in health. If belladonna be applied, its complete dilatation is rapidly effected; but this is much more slowly accomplished in incipient amaurosis, and the effect of belladonna remains for a much greater length of time, except in that form of amaurosis in which the actions of the iris are unaffected, although vision may be extinct. The cloudiness which may be observed in some long-continued cases of amaurosis, is always distant from the iris, and is for the most part, dependant on a change in the vitreous humour, which allows the bottom of the eye to be seen through it, of a pale horn colour, giving to the whole somewhat of the same hue; and if in any way there is a real cloudy appearance, it will, on being examined sideways, assume a concave form. If an opaque spot should be observed in the lens, in such cases of amaurosis, it will be found to change its place as the positions of the eye and head are altered, being dependant on refraction of light, and not on any permanent opacity.

The catoptrical test recommended by Purjinke, Sanson, and Mackenzie, is valuable in distinguishing incipient amaurosis from incipient cataract. The pupil having been fully dilated by atropine or belladonna, the patient should be seated with his back towards a moderate day-light; the surgeon standing before, and a little above him, with a lighted candle in his hand, burning with a bright, but not flickering or blazing flame.

If such a lighted candle be moved at the distance of a few inches, say from four to six or eight, before a healthy eye, three reflected images will be seen; two erect, and one inverted; the first erect one is from the surface of the cornea, the second from the anterior

surface of the lens, and the third, or inverted one, from its posterior part, being also more sharp and defined than the erect one, which is reflected from its anterior surface, is much smaller, and seems placed before it. It requires care and habit to distinguish the inverted one immediately, and it follows the motions of the candle, being seen to the left when the candle is moved to the right, and *vice versâ*.

In amaurosis the three images can always be distinctly perceived. In incipient cataract, the inverted image is early obliterated, or rather its appearance is nearly prevented, and cannot at last be seen. The deep erect one, which also becomes very early indistinct, declines at last into a mere general reflection, difficult of observation, but which is of no consequence, as the disease is otherwise distinctly marked.

DISCRIMINATION BETWEEN GLAUCOMA AND CATARACT.

Glaucoma is essentially an alteration of the component parts of the vitreous humour, with derangement of the structure of the hyaloid membrane, the retina and choroid coat: the vessels of the choroid coat are always in a varicose state, and the lens, which is not at first implicated, at last assumes a yellowish green opaque colour, from which characters the disease is termed *glaucoma:* it is frequently mistaken for cataract by those who are unacquainted with these complaints. The opacity of the lens is often first perceived, constituting really a cataract; but it is the alteration of structure of the surrounding parts, amounting sometimes almost to disorganization, which constitutes the essential disease, renders any operation useless, and which, if it should be performed, causes great subsequent distress to the patient. It is, therefore, of importance that an accurate distinction should be made between these two complaints.

This disease sometimes begins by inflammation of the choroid coat, and perhaps of the retina in an acute form; and in the course of eight and forty hours the distinctive signs of glaucoma are so well and characteristically marked, that an experienced surgeon is

aware of the unhappy fate which in all probability awaits his patient. I have three cases of this kind under my care at this moment. I did not see them until it was too late to render them the benefit I could have desired, and I am not sure I could have been of any real utility, unless I had seen them within the first six or eight hours after the commencement of the complaint. In the more ordinary or chronic state of the disease, the eye has a general unhealthy appearance, arising from the cornea having lost some portion of its brilliancy, although it is in no part opaque. The sclerotica does not preserve its natural white appearance, being more or less of a blue yellowish colour; whilst several tortuous dark red vessels may be observed, which penetrate the sclerotica at a distance not exceeding an eighth of an inch from the cornea; and when they are numerous they give rise to the appearance of a narrow white ring or circle situated between them and the cornea. They are varicose and enlarged vessels of the choroid coat, coming from within the eye, and extending themselves outwardly on the surface of the sclerotica. These darkened blue red tortuous vessels are characteristic signs of the disease, and under whatever circumstances they appear, forbid an operation for cataract. The ball of the eye, if examined by the touch, will be found rather firmer or harder than natural. Another character is to be observed in the iris, the pupil of which is invariably dilated in an irregular manner, and is perfectly fixed or immoveable.

The disease cannot be mistaken, and no person suffering from these symptoms can distinguish light from darkness, whether the lens be opaque or not; its opacity may be said to be a mere consequence of the disease, not a distinguishing character of it, and its removal can do no good, whilst it may do much harm by giving rise to pain and inflammation, which at this period do not exist. When the disease is a consequence of the acute inflammation I have alluded to, the patient has been rendered blind under great pain in the first instance, and does not suffer much pain after the acute inflammation has subsided, for it is a fact, no less remarkable than true, that in whatever manner this disease may form, and it is more observable in cases that are slow in their progress, that the pain is

coeval with the continuance of sight, and ceases when vision is extinguished, although it should continue for months—a consolation, however small it may be, for the unfortunate sufferer. The iris in these cases is very rarely attacked by inflammation, neither are its vessels varicose ; it seems merely to partake of the withering influence of the disease, without being its particular seat ; if naturally of a blue colour, it becomes grey ; if formerly of a hazel, or dark colour, it changes to a dirty brown. It becomes thinner in its structure, and sometimes disappears, or forms merely an irregular ring around the opaque lens, to which even some remains of its pupillary edge may be attached. In cases which are slow in their progress, with respect to the opacity of the lens, the gradual change behind and in the part may be observed ; the usual brilliant black seems dull and deeply concave, enabling the distance to the posterior part of the eye to be more correctly estimated, so that the thickness of the lens anterior to it may be accounted for. The concave appearance becomes more of a yellowish colour, and the vitreous humour more turbid, and as the disease advances, the space between it and the lens becomes less, until at last it partakes more or less of that opacity which causes it in these cases to be mistaken for cataract. In some instances this opacity never exceeds the yellowish-green colour of the posterior parts, and in others, but more rarely, the opacity of the lens is so free from any glaucomatous tint, and possesses so perfectly the character of a striated opaque lens, that if the appearance of it alone were to guide the judgment of the surgeon, the disease would be pronounced to be " cataract." The external characters I have described ought always to prevent such an error, but, even if they should be mistaken, the internal symptoms which accompanied the formation of the disease are so well marked that they ought to prevent it. The patient cannot distinguish between light and darkness, he knows not night from day, and the loss took place under the ordinary symptoms of amaurosis, with flashes of light of various colours in the eye ; and, above all, the progress of the disease was marked by pain of a severe, and often excruciating nature, affecting

not only the eye periodically, but the eyebrow, the forehead, and the side of the head, until sight was lost.

The catoptrical test with a lighted candle already referred to, appears to me to be useless in the diagnosis of glaucoma, whether with or without disease of the lens, as the complaint is essentially indicated by the other and more plainly discernible symptoms, which, when once known, cannot be mistaken.

THE CAUSES OF CATARACT.—IDIOPATHIC OR CONSTITUTIONAL.

The causes of cataract are enveloped in considerable obscurity, which is not likely to be dissipated until the nature and formation of the lens shall be better understood. Among the occasional causes of constitutional cataract, age seems to be the most prominent, few except infants being affected by it before forty years of age, although many suffer at a later period of life ; yet, as very many persons live to extreme old age free from cataract, there must be some more immediate causes superadded than those which can be presumed to depend on defective circulation, or deficient nutrition. It is supposed by Beer that it may be a low insidious inflammation or action affecting the lens and its capsule, and he lays great stress on the misuse of the eye, such as the continual employment of it on minute objects, &c. ; but I am disposed to consider that all such causes tend to give rise to amaurosis rather than to cataract. When the capsule of the lens suffers from common inflammation, it is never a pure disease of that part alone, and does not give rise to what may be called an idiopathic, but to a spurious or complicated case, in which an opacity of the capsule and lens form parts of the complaint, although perhaps they are not the most important obstacles to vision.

Gouty, or other unhealthy inflammations are capable of giving rise to similar cataracts, formed precisely in the same, but in a more marked or decided manner. The capsule is inflamed, vessels may be distinguished on its surface when the eye is examined with a lens having a short focus, the patient being so placed with respect to the light that the parts within the pupil can be well illuminated, and not shaded by the glass or head of the examiner ; and

as the sensibility to light is usually diminished, the patient commonly bears this examination in a strong light, and with a dilated pupil, without much inconvenience. The capsule soon becomes turbid, and at last opaque, and is often covered with a deposition of lymph, so as to render it perfectly white or grey, or even of a brown colour. In many instances all these appearances may be completely removed, and the part restored to its natural and diaphanous state, showing that the lens had not been affected. If the lens should, however, have been implicated, then the opacity is permanent, and the lens often adheres to the capsule, which is a very unusual circumstance in true cataract. If the inflammation should have been less violent, although more permanent, the capsule remains partly or entirely opaque, yet the lens continues transparent, as has often been proved by operation ; a circumstance which I believe never occurs in the true capsular cataract of adults, the lens always partaking of the disease. When the inflammation is less permanent, although, perhaps, equally violent, an opaque spot or mark of greater or less extent, will often remain during life on the capsule without the slightest change ; a circumstance equally inapplicable to true capsular opacity. In the *cataracta choroidea* of Richter, the posterior part of the iris often adheres so completely to the capsule of the lens, that a space as large only as the size of a small pin's head, remains transparent in the centre, yet continues so for life, which none will say it is probable it would do, or even for one year, if the opacity of the rest of the capsule had arisen from that inflammation or cause which usually gives rise to cataract.

The common or specific inflammations of the iris, or ciliary processes, which are active in their nature, and quickly cause a deposition of lymph or fibrine, are the most readily arrested, and their effects removed under proper treatment, so that the capsule may be restored to its original transparency ; whilst those which are slow in their progress, and deposit a small quantity of fibrine, such as the arthritic, or gouty inflammations, are very difficult of cure, and usually leave some defect. If the disease be neglected, it terminates in adhesion of the iris, with a pupil nearly closed, with

capsular and sometimes lenticular cataract. It may even end in a disorganization, which leaves no hope of relief from an operation.

Congenital cataracts are usually dependent on defective formation, as will be hereafter explained. It is said that they occur as a consequence of the rupture of the capsule, during the severe spasms by which the eyes are affected, in the convulsions to which children are liable; but no reliance can be placed on this opinion, nor on that which supposes that these cataracts are not always congenital, but occur immediately after birth, from the effect of too strong a light falling directly on the eyes of the infant.

Traumatic cataracts, as they are termed, or those which arise from injuries, are of frequent occurrence, and always take place when the injury or blow causes a rupture of the capsule, or the wound penetrates its substance. When the blow is so severe as to dislocate the lens, it falls forward into the anterior chamber of the aqueous humour, and shortly becomes opaque, from exposure to the aqueous humour, or from its loss of vitality. I have seen some few cases, in which the lens has remained transparent in the aqueous humour for several days, in one as long as a month. If the capsule is only punctured, the lens then becomes more slowly opaque and white, although it remains *in situ*, and, if the rupture or puncture be of considerable size, the lens will be gradually removed under the influence of the aqueous humour, and the patient restored to a fair degree of sight; although it seldom happens that the capsule is absorbed in a similar manner, some portions of it usually remaining to impede vision, until removed by operation. If the wound in the capsule should be small, or even close up, the lens may or may not be entirely removed; but the capsule will assume an irregular, thick, white appearance, through which the shadows only of objects can be perceived.

ON THE CLASSIFICATION OF CATARACT.

The most efficient and least troublesome arrangement of cataracts is to include them in two classes: the *true* and the *false*, or *spurious* cataracts.

The *true* cataracts are those of whatsoever description they may be, which have been caused by disease of the lens or its capsule, or by both, but unconnected with any perceptible general derangement, or of attachment to the iris or adjacent parts. The *false* or *spurious* cataracts, are those of whatever kind, which are combined with derangement or disease of the iris or adjacent parts, the sequelæ of inflammation.

The term *complicated* may be retained to mark the presence of other more important diseases, such as amaurosis, glaucoma, cirsophthalmia, &c., which forbid any operation.

The principal object of these divisions is, to point out at one view, those true cataracts which are relievable or removable, with every prospect of success by the usual known operations; and to comment on these in the second class, as of false or spurious cataract, which require a different or more complicated operation, and are not so likely to be followed by favourable results.

ON THE DIAGNOSIS OF TRUE CATARACT, OR OF THE FIRST CLASS.

This class contains three genera :—

1. Cataracta lenticularis, or lenticular cataract—when the lens alone is affected.
2. Cataracta capsularis—when the capsule alone is affected.
3. Cataracta capsulo-lenticularis—when both lens and capsule are affected.

Of each of which there are several species.

ON THE DISCRIMINATION OR DIAGNOSIS OF LENTICULAR OR HARD CATARACT.

It having been ascertained that some opacity really exists behind the iris, inquiry should be made whether the dimness of sight or loss of vision which preceded or accompanied its formation, were attended by pain either in the eye or forehead, or with increased sensibility to light. In what manner the complaint came on, to what diseases the patient is hereditarily disposed, particularly

gout, rheumatism, erysipelas, or fits of any kind; and whether his parents suffered from this disease. These questions being answered favourably, imply the probability of the disease being a true cataract. The eye should now be examined by the touch, in order to ascertain that it possesses its natural firmness; the iris should be attentively examined, in order to see that it is of its natural colour, perfectly plain on its surface, and that the pupil possesses its regular motions when exposed to the influence of light. The cornea should be pellucid, and the white or sclerotic coat free from discolouration or enlarged vessels. The patient on being placed before a window on a clear day, should be able to distinguish the shadows of objects placed before the eye, such as the fingers, the bars of the window, &c., &c. The state of the lens next demands attention: it should be examined under a direct front view, at the time the motions of the iris are under inspection; and subsequently sideways, in order to discover how far the lens interferes with the posterior chamber of the aqueous humour, whether it retains the proper distance from, or presses forward against, or recedes from, the pupil. The opaque hard lens is seen at the usual distance from the iris, the depth of the posterior chamber of the aqueous humour being intact. The distance of the iris from the lens when the parts are otherwise healthy, causes a slight narrow shade of a dark colour to be thrown on the opaque part on the side next the light when it falls upon it obliquely, which cannot be seen when the cataract is large, and advances forwards against the iris. The surface of the lens under the naked eye seems to be finely polished in a hard, small, lenticular cataract; but which appearance it loses if the capsule should be also opaque.

The pupil should now be dilated by the application of atropine or belladonna to the eye itself, or where persons are easily alarmed, by applying a solution of either substance once or twice a day to the forehead or brow, until the dilatation of the pupil is effected. Under these applications the pupil will be fully dilated and round in every part, or the points of adherence of the iris will be clearly demonstrated by their remaining fixed, and whilst the other parts have become equally dilated, the salient or irregular points mark

the attachments to the capsule of the lens behind. The pupil may resist the influence of the atropine, showing that the whole internal surface of the iris has adhered to the capsule, in which case no separation or distance can be perceived between them; or if the pupil should remain undilated after a fair and free application of atropine, the distance between the iris and the opaque lens being natural, the cataract is complicated with other derangements, oftentimes with a tremulous state of the iris, and the case is not one fitted for any of the ordinary operations for the removal of the lens.

The whole of these parts should now be submitted to examination under a double convex lens, or such other glass as may be best suited to the eye of the surgeon. In the hard lenticular cataract of middle-aged and elderly persons, the lens is usually of a grey or amber colour, deeper in the centre, and verging to a yellow, or a brown walnut hue; its distance from the iris and its central situation can be clearly perceived. It is said that cataracts have sometimes been seen perfectly black, and capable of being mistaken for amaurosis, from the deep black colour observed behind the pupil; all, and every part of which statements I doubt, and believe that they are founded in error; my father never having seen in the whole of his great experience a single case of the kind, although in many the colour of the opaque lens has been of the darkest brown mahogany, easily however and at all times to be distinguished within the eye. He suspects that in the cases alluded to the pupils were not dilated by belladonna; and he does not believe that a perfectly black cataract was ever removed from a human eye.

When the opacity begins rather behind the centre of the lens, all the symptoms of hard cataract may be present, and the patient be nearly blind, the anterior part of the lens scarcely partaking of the disease; in which case when the pupil is dilated the opacity will be seen deeply seated, and the surface of the lens will show what may be compared to a thicker coat of polish than is usual in ordinary cases of cataract. The lens in these instances is generally found to be very hard on extraction, and thinner than usual.

When the opacity does not actually commence in the centre, it

oftentimes occupies three different parts, corresponding to the three portions into which the lens may be divided, by boiling or charring it; the divisions between these parts being semi-transparent, and of a different colour. In some cases the central division appears to separate the lens into five different parts, of which I have seen several instances.

In persons about the middle period of life, and sometimes much later, the opacity, as I have already stated, does not begin in the centre in an observable manner, but from the circumference, which can only be perceived when the pupil is fully dilated by atropine. I saw within the last two days a gentleman eighty-four years of age who complained of the gradual but increasing dimness of vision, from which he had suffered the last two years, and which, unless the pupil had been dilated by belladonna, might readily have been mistaken for amaurosis by those unacquainted with the distinguishing symptoms of cataract. The eye was so perfect and sound in every respect except the dimness of vision, and the state of parts behind the pupil was so clear and transparent, that the formation of cataract could only be suspected. The atropine removed the difficulty, by withdrawing the curtain formed by the iris, and showing the commencing points of opacity, corresponding to the ciliary processes around the circumference of the lens, which, when carefully examined, showed a very slight deviation from its normal pellucid state. This gentleman was thus saved an unnecessary treatment for amaurosis, which might materially have injured his future health and prospects from an operation.

In such cases the lens gradually becomes more and more implicated; the central part loses its transparency; white striæ are seen running from the circumference towards the centre, which, as the disease becomes completely formed, which sometimes occupies months, and even years, assumes a deeper hue than the surface, which is usually of a slight yellow, or pearly colour. The central part is hard, and will so rarely yield to the knife, as not to admit of the operation by division, or for removal by absorption. The point the most important for consideration in selecting the method of operating for the disease, and the point on which inexperienced

persons are the most likely to commit an error. The surface of such cataracts is softer than the centre, and of a lighter colour, easily separating from it after extraction, or under the knife, when the operation is attempted by division, leaving however the hard central nucleus in a situation to cause all sorts of evil: such as long-continued pain, inflammation, and suffering, and the eventual loss of the eye, unless this hard part can be fortunately depressed, and even then this small portion will sometimes spring up again after the lapse of years, and give rise to a state of irritation, which often terminates unsatisfactorily.

When a hard cataract is nearly white, it may be compared to a white cornelian; it does not tend towards a bluish tint, has always a dense appearance, implying a solid body, and is of a fine, smooth, and polished surface to the naked eye. It is not, in general, of a dead white colour, neither is it clouded, nor speckled,—marks which are indicative of a soft cataract. It is proper to remark, that although a hard cataract usually preserves its natural size, or is even less, and at a distance from the iris, a white, and even a soft cataract, is not always protuberant.

ON THE DIAGNOSIS OF CAPSULAR CATARACT.

Capsular cataract may be, and is considered to be, the consequence of an action of a peculiar kind, which is looked upon as inflammation, and confined to the capsule of the lens, and to the ciliary processes, from which it principally derives its nourishment.

The capsule of the lens is divided into two parts, an anterior and a posterior. The anterior part of the capsule is much stronger and thicker than the posterior, which does not seem to receive its supply of blood so directly from the ciliary processes.

The posterior capsule, probably from this circumstance, is not affected by opacity in a similar manner with the anterior capsule, and it constantly happens that it remains transparent, when the anterior portion, and even the lens are opaque; a fact which is generally exemplified after the extraction of a hard lens, accom-

panied by a greater or less degree of opacity of the capsule. It is also shown in those cases of depression, in which the lens has been lowered below the upper edge of the pupil before it has been carried backwards to be deposited deep in the vitreous humour, and out of the axis of vision. I am therefore disposed to believe, and it appears to me to be satisfactorily proved, that opacity of the posterior part of the capsule of the lens is a rare disease. The surgical fact is confirmed by some anatomical investigations made at the College of Surgeons by Mr. Quekett, who finds that, although the posterior capsule of the lens can be injected in the fœtus through the central artery of the vitreous humor, it can only be injected from the artery of the retina in the adult, and then principally when the eye is diseased. In the puppy and kitten, two vessels can be shown, running from the membrana pupillaris to the posterior capsule, but they disappear with it. In the reptilia, the posterior capsule can be injected from as many as four branches of the arteria centralis retinæ.

The appearance of the capsule in a true case of insidious disease, free from any local causes, is that of a fine semi-transparent membrane, or of the silk which is termed white Persian in this country, drawn perfectly tight over a white or colourless substance, which peculiar shade is best seen by allowing the light to fall obliquely upon it. It is not always of an equal hue, but appears to be veined of different shades of colour, and does not possess that polish which is observable when the capsule is not affected. In other instances, the appearance of the capsule is best represented by what is called silver, or thin tissue paper. In most instances, the commencement of the opacity, and at all events its greater density can be observed very distinctly to begin, when the pupil is fully dilated, from its circumference or edge being of a white and shining colour, somewhat resembling spermaceti, and passing on in a less defined manner towards the centre. These triangular points are situated at equal distances from each other, and remain sometimes stationary for a considerable time; but when the disease increases rapidly, the capsule often thickens, depositions seem to take place in it, and upon its surface; it assumes a spotted, chalky, streaked, or pearly

colour, giving rise to appearances, which have induced German ophthalmologists to invent names for them, which are however perfectly useless. The opacity very rarely begins in the centre, and is never uniform, and whenever a central white spot is seen, the complaint is, in all probability, congenital. When the capsule is alone affected in an adult, (which it seldom is for any time,) the opacity does not necessarily approach to, and therefore does not alter the appearance of, or interfere with the movements of, the iris. When the lens is affected, the complaint becomes a capsulo-lenticular cataract, and as the case must always be treated as such by operation, a further diagnosis of the state of the capsule is useless.

I have stated that posterior capsular cataract is a very rare disease, the opacity usually supposed to commence and exist in that part being, in fact, an affection of the lens itself. In the first edition of Mr. Guthrie's work on the Operative Surgery of the Eye, published in 1823, he stated that he had operated in such cases, at an early period of this complaint, with the hope of arresting or preventing the occurrence or progress of the disease in the other eye, and found the opacity to be in the posterior layer or layers of the lens, and not in the capsule, which induced him to doubt the disease existing, or commencing alone, as an opacity of the posterior capsule,—a fact which has since been appropriated by subsequent writers as a discovery of their own.

When the complaint begins at the posterior part of the lens, it often remains stationary, or nearly so for years ; the patient complaining of indistinctness of vision, which is oftentimes improved by a magnifying glass. On looking into the eye, a muddiness can be observed in the situation of the lens, but more deeply seated, so that the thickness of the lens may be estimated anteriorly to it ; and on examining it sideways, or from the side of the eye, it has a concave yellowish turbid appearance, generally accompanied by lines, which can be often distinctly perceived, crossing it, but seldom intersecting each other. These appearances may be irregular, but they do not resemble the chalk-white, or shining light-coloured spots observed on the anterior capsule. As the lens becomes

opaque, they are of course lost in the general opacity, and as it is usually hard, it assumes the characters indicating that state, and the opacity of the posterior capsule can only be ascertained after the operation, if it should be then perceivable.

When the capsule becomes affected, or remains opaque after an operation or accidental injury, which gives rise to the removal of the lens, the complaint is called *secondary capsular cataract.*

ON THE DIAGNOSIS OF CAPSULO-LENTICULAR CATARACT.

Capsulo-lenticular cataracts are most commonly fluid, soft, caseous, or siliquose, and occur principally before and during the middle period of life.

Of fluid cataracts, there are three varieties having names :— 1. The *common fluid cataract.* 2. *Cataracta Morgagniana*, lactea, or puriformis. 3. The *cataracta capsulo-lenticularis*, cystica, or encystid, or hydatid cataract, under which designation may be included the cataracta cum bursâ ichorem continente, or bursal cataract, and the cataracta cystica tremulens, which two last are really not genuine capsular, but spurious cataracts, complicated with other states of disease of the eye.

A *fluid* cataract generally resembles milk, or milk-and-water in colour, or is even less distinctly white, although clouded, as if of unequal density. When the pupil is dilated, and the eye put into quick motion, or if the eye and eyelids be sharply rubbed, the cloudiness will sometimes appear to change its situation, to render the whole surface of the opacity of an equal colour. This cloudiness of a particular part again becomes apparent after the eye has been a short time at rest, whilst in other more marked cases, a separation and subsidence of the denser parts may be distinctly perceived, forming a white layer at the lower portion of the opacity, the upper part being still opaque, although less deeply coloured ; and then the patient can, in particular cases, perceive the difference of opacity between the two layers. The cataract does not from the first possess the polished surface always to be observed when the capsule is diaphanous, and although this part

may remain in some instances nearly transparent, it very seldom does so, and the fine tissue-like appearance will be readily seen on examining the eye by a side light.

When the lens and fluid retained within its capsule, which is called the liquor Morgagni, are altered from their natural state and the former becomes fluid, both are rendered more or less opaque. This change is usually effected with some increase of size, so that the convexity of the lens is more marked, and it occupies a greater portion of the posterior chamber of the aqueous humour, so as to appear in many instances to press the iris forward, and to render its anterior surface convex. The pupil undergoes a slight change, it is a little dilated, and its edge becomes black, which blackness is the posterior part of the edge of the uvea, which is pressed forwards and rendered evident from the same cause. The motions of the pupil under the influence of light are slower and less lively than natural, or than in the other eye, if it should not be affected. If the belladonna is applied, the subsequent return of the pupil to its usual state requires a longer time for its accomplishment than if the lens was sound. The opacity is close to the edge of the pupil, its convexity is readily perceived even protruding into it, and I have seen cases, in which, on bending the head forward, this protrusion became distinctly marked, and subsided on the head being restored to the erect position. No shadow of the iris can be seen, or be thrown upon it. These signs indicate a cataract larger than the natural size, even if it should not be fluid, and as large cataracts are almost invariably soft (although small ones are not always hard), it may be fairly concluded that a cataract which possesses these characters is *soft*, and will yield to the needle in the operation by division for the purpose of facilitating absorption. The appearance of the opacity, if not fluid, will almost always enable an experienced eye to detect its nature, unless the capsule has become so much thickened as to preclude all observation. The cataracta Morgagniana, lactea or puriformis, is of the fluid kind, and does not deserve consideration as a distinct genus. It is supposed to depend on an accidental effusion of the liquor Morgagni in a turbid state, which may be doubted. It is said to occur more suddenly

than all others, and to be often caused by exposure of the eye to the fumes arising from the oxydation of metals, severe sea-sickness, &c., of which I believe nothing. The lens in dissolving may be rendered gelatinous, or it may remain diminished in size, but hard, giving rise to the barbarous name of cataracta *fluida dura*. The existence of a portion of the lens in a hard state may be sometimes suspected by an experienced surgeon, but the distinction and the name are both useless.

The cataracta capsulo-lenticularis cystica or encysted or hydatid cataract, the cataracta cum bursa ichorem continente, or bursal cataract, the cataracta cystica tremulens or natalalis, *cataracte tremblante* of the French, are complicated diseases, none of them being genuine cataracts, and the practical conclusion to be drawn is, that few persons having such complaints recover their sight after operation, and if any operation is done, it should never be by extraction, but always by the needle. These cases are said to occur in consequence of blows on the eye, or after inflammation, which is quite correct, and the eyes in which they occur are usually amaurotic. My father has seen several cases of staphyloma, in which, after removing the anterior part of the eye, the lens and capsule have rolled out in a fluid state, the little bag changing its shape as it was moved over in the palm of the hand. He has never seen this occur after the operation for extraction, as asserted by Beer, Richter, De Gravers, and others, to have taken place with them, because the operation of extraction is not adapted for, and ought not to be performed in such cases, which can always be distinguished without the least difficulty.

A *soft*, *gelatinous*, or *flocculent* lens is sometimes, although rarely seen without any affection of the capsule, especially in the latter species ; but the capsule usually partakes of the opacity, and often in a manner sufficiently remarkable to give a name to the peculiarity. When the capsule is little affected, the lens is generally of a dead white colour and flocculent in appearance, conveying to the eye the idea of softness, in opposition to that of density or solidity, which is entertained from the examination of a hard lens, in which case there is a fine polish on the surface, instead of

the membranous shining appearance of a semi-opaque capsule. When the lens is of a gelatinous substance, it often assumes a semi-transparent grey colour, or the bluish green appearance of deep sea water: the capsule has the membranous appearance, resembling thin silk stretched over it, and is occasionally semi-transparent, or partly unaffected, in spots or lines.

When the capsule of the lens has undergone a further change, as it frequently does, and has become thicker either wholly or in parts, and the lens has obtained greater consistency, the difference of colour between them can often be perceived. The chalky yellowish white of the lens may be seen covered in parts by the mother-o'-pearl colour of the capsule. This appearance of the capsule again often covers a lens of a whiter colour; and sometimes whilst the white circumference of the lens marks its softness, the darker centre indicates a hardened nucleus. The sensation of light is very obscure, the lens is always large, presses against the iris, nearly obliterates the posterior chamber of the aqueous humour, renders the iris convex, and causes the black ring round the pupillary edge to be very evident. The motions of the iris are slow, and the pupil, after having been dilated by belladonna, returns to its former size with great difficulty, and sometimes, although rarely, never becomes as small as before.

The alteration on the surface, and the thickness of certain parts of the capsule, have given rise to appellations, which it may be considered necessary to know, although they are of no utility in practice; provided it be understood, that whenever these appearances originate from, or have been dependent upon inflammation, as indicated by alteration in the form of the pupil, and attachment of the iris to the capsule, the disease becomes a false cataract, and the operation by extraction would be improper.

When the chalk white depositions, or thickening of the capsule, assume the variegated appearance of marble, it has been termed *cataracta marmoracea*. This name would, however, be more useful if it were commonly intended to designate also a hardened state of the capsule, which often accompanies the marmoraceous appearance, and in which calcareous matter is deposited, in spots or scales,

amounting, as has been sometimes supposed, to the formation of bone. When these striæ in the capsule happen to cross each other in a particular manner, something resembling the bars of a window, the term *cataracta fenestrata*, or window or lattice capsulo-lenticular cataract is applied to it; but it yet remains to be settled whether it be the cross bars alone that are entitled to this appellation, or whether lines running in parallelograms, or lozenges, are to be included in it or not: it having been decided that when they run in a radiated direction, the proper name is *cataracta stellata*, or stellated; and when the striæ are so incompletely formed as only to appear in dots, it should be called *cataracta punctata;* but if they happen to run into each other, and form a white spot on one half of the capsule, whether to one side or the other, it ought to be called *cataracta dimidiata.* Here, however, another difficulty remains for consideration; it being evident, although a spot occurring in the centre of the capsule, whilst the rest of it remains probably clear, may entitle it to the appellation of *cataracta centralis;* that if one fourth of the capsule only is affected, neither *punctata*, nor *dimidiata*, will apply to it; and it appears to me, unless one be forthwith coined, such as *quadrata*, it will, like many other parts of the body similarly situated, be obliged to take that of *innominata*, all of which is unworthy of men of sense.

Cataracts, accompanied by any marked alterations of the capsule, such as are or may be hereafter described, will for the most part, be found to be soft; and the practical rule to recollect is, that in whatever way the operation is performed, the destruction of the capsule must be a principal object of attention.

When the capsule of the lens is wounded or ruptured in such a manner as to prevent union of the divided edges from taking place, the lens is gradually absorbed, the capsule thickens, resembles white leather or parchment, is frequently as tough, shrinks, and the anterior in uniting to the posterior capsule often in the adult encloses a small piece, or remaining nucleus of the lens, which renders the central part of it thicker and more dense in appearance. This, which is called *cataracta arida siliquosa*, or dry hulled, pea-shell, or coriaceous cataract, generally takes place after

an accidental injury, although it may occur after the operation of puncturing the cornea. In the former case, the cicatrix will be visible ; the pupil is for the most part irregular, and the edge of it attached to the capsule. I have never known it occur in the adult, unless in consequence of an operation, or from injury ; but so far from the capsule being loosened from its connections, or any diminution of adhesion having taken place between them, as Beer would seem to imply, there is generally a much firmer attachment between the thickened capsule and the zona ciliaris or Zinnii, than is met with in health, the surrounding parts appearing to partake of the opacity and toughness to nearly the same extent as the capsule, and rendering a separation of them very difficult of accomplishment. In children, as well as in adults, the opacity is always situated at a distance from the iris, even if it be attached to it at a particular point, which it frequently is ; the motions of the rest of the pupil are perfectly free, and the depth of the posterior chamber of the aqueous humor can be readily estimated by looking at it from the side at which the iris is attached. The cataract is of a decided white colour, shining like the smooth surface of a kid glove, exhibiting a more dense appearance in some parts than in others ; it is always irregular, uneven, or flat, but never convex on its surface ; and only after operation is frequently separated in parts from its natural attachments. In some cases of adults, when the bright white of the capsule is intermixed with spots of a dirty yellow colour, it has obtained the name of *cataracta gypsea*, or gypsum cataract, from its supposed resemblance to that substance. Schmidt conceived that when this cataract took place in infants, it occurred from rupture of the capsule, or a separation or loosening of its cohesion from its vital connection, in consequence of convulsions — an opinion which cannot be relied upon. When it takes place in consequence of a blow on, or a concussion of, the head, vision is generally very defective, although in many cases occurring from direct injury, it is as perfect as in any other case of cataract after the operation has been successfully performed.

ON THE DIAGNOSIS OF CATARACTS OF THE SECOND CLASS, OR FALSE OR SPURIOUS CATARACTS.

A false or spurious cataract is said to have occurred when inflammation of the surrounding parts has given rise to an effusion of coagulable lymph, or fibrine adhering to the iris, or edge of the pupil, and to the capsule of the lens; to obliteration of the posterior chamber, accompanied by discoloration of the iris, thickening of the capsule and deposition upon its surface. A slight adhesion of a point, or part of the edge of the pupil does not render a true cataract a false one; it only requires peculiar attention in the method of operating. Under the head of false or spurious cataracts, may be included the *adherent*, or *concrete cataract*, the *cataracta lenticulo-capsularis lymphatica*, *spuria purulenta*; *pyramidata*, *grumosa*, or sanguineous, *trabecularis*, or *cum zonâ*, or *balkenstaar*, of Beer and Schmidt, the *cataracte barré* of the French, the *cataracta capsulo-lenticularis cum bursâ ichorem continente* of Schmidt, the *putrida* of Scheferli, the *cataracta lenticulo — capsularis arborescens* or dendritica of Schmidt, the *choroidalis* of Richter, the *pigmentosa* and the *cartilaginous*, and *stony*, or *earthy* cataracts of others.

The history of a case of false cataract is very important, as it will frequently point out its nature, and with the appearances of the part itself, indicate what probability there will be of success attending an operation for its removal—the great point after all for consideration. A false cataract is a consequence of inflammation or injury of the surrounding parts, including the iris, the choroid coat, and the retina, and symptoms will be at the time dependent on the extent of mischief which has been done to them, and which may remain permanently, shewing the value of the history of the case; although to a very experienced person the appearances and the present symptoms will be sufficient to mark the complications of disease. Glaucoma, amaurosis, a varicose state of the vessels of

the choroid coat, may, for instance, be readily distinguished by the discriminating signs which have been given between them.

The *adherent or concrete cataract* is essentially marked by the adhesion of the iris, either wholly or in part to the capsule of the lens, its pupillary edge being irregular, the pupil contracted, and generally, if not altogether, destitute of motion, and even if the capsule should not be perfectly opaque behind the opening in the pupil, it would be too small for correct vision. These cases, therefore, and indeed all those of false cataracts, with diminished or adherent pupil, forbid altogether the operation by extraction, or by any other of the ordinary modes, except by drilling, or by those recommended for closed or artificial pupil, the cataractous or capsular opacity being in instances of this nature a secondary consideration.

The *cataracta lenticulo-capsularis lymphatica*, and the *cataracta purulenta*, are only consequences of inflammation of the iris, and of the capsule of the lens, followed by the symptoms enumerated in adherent cataract. When the lymph, infused into and behind the pupil, forms a delicate net-work, deviating from a snow-white to a straw colour, it has been called *membranous*. It is called *spuria purulenta*, when a greater quantity of fibrine or lymph is thrown out, intermingled with points resembling pus, and giving it an irregular appearance—a distinction not worthy of consideration. It is called *cataracta capsulo-lenticularis pyramidata* by Schmidt and Beer, when the substance takes on a pyramidal form, and projects through the pupil to which it adheres, and which in a very irregular, contracted, and immoveable state, it may carry forward with it against the cornea, constituting generally a very complicated, and oftentimes an incurable disease.

The *cataracta grumosa*, or sanguineous cataract, obtains its name from the addition of a small quantity or various spots of blood, giving to the surface of the capsule not covered by the iris, the appearance of a red net, with silvery white strings passing through it. Unless the red spots be large, they can only be seen through a good magnifying glass, when a distinction can be made between the cataracta grumosa and the cataracta spuria purulenta—a

distinction which, when made, is of no real or practical utility, and only tends to render that confused which is otherwise very simple.

The *cataracta capsulo-lenticularis trabecularis, or cum zona*, the *balkenstaar* of Schmidt and Beer, is similar in its causes and nature to the preceding ones, except that a perpendicular, horizontal, or diagonal bar, or some such mark, generally of a whiter colour than the rest of the capsule, being its distinguishing feature, is usually thicker in substance and has been found almost *cartilaginous.*

The *cataracta capsulo-lenticularis cum bursá ichorem continente*, and putrida of Scheferli, do not deserve the least attention, being more imaginary than real, and at best differing but little in the manner in which lymph or pus has been deposited. They are said by Schmidt and Beer, the inventors of the names, to consist essentially in a small cyst or bag of purulent matter, formed after inflammation, accompanied by all the other symptoms alluded to, and situated behind the lens, according to Beer, before according to Schmidt, which part, however, has been generally if not entirely removed by absorption. The Germans fancy this cataract is distinguishable by its deep lemon colour, by the extinction of the posterior chamber of the aqueous humour, by a heavy motion of the iris if the pupil is not immoveable, by its convexity, and by the trivial perception of light. These cases are instances of a disease, which may more properly be called complicated ; the distinction is of no value, and any operation to be done for its relief, should be attempted only by the needle or very small iris knife.

The *cataracta capsulo-lenticularis arborescens, dendritica or choroidalis*, means that a portion of the pigmentum nigrum, or the dark covering of the uvea, or posterior part of the iris, is separated from it usually by a severe blow on the eye, and remains attached to the capsule of the lens, giving rise to the arborescent appearance seen in the stone called *dendritis.* The patient, immediately after the accident, complains of a sensible diminution and indistinctness of vision, although no change can be observed on a casual inspection of the eye, except a dilatation of the pupil to a greater or less extent. The detachment however of the portion of the pig-

mentum nigrum alluded to, will readily be distinguished by the aid of a magnifying glass. Inflammation usually follows an injury of this kind, and is oftentimes destructive of sight under the best treatment, and which under ordinary circumstances is frequently somewhat impaired. A disease, more truly deserving of the name, occurs in a very different manner, in consequence of a rheumatic or anomalous inflammation of the iris, which is followed by a gradual closure of the pupil nearly to a point, at which point the part of the capsule behind remains more or less transparent, and is seldom so opaque as to prevent the person ultimately from seeing objects with the aid of spectacles. On the application of atropine, the pupil is apparently enlarged, but the uvea or posterior part of the iris in retracting, does not keep pace with its anterior part, and is attached to the capsule of the lens by irregular points through which the rays of light cannot pass ; and a minute inspection by the short focal, or a magnifying glass, shows that a very small point of capsule alone remains transparent, although the whole of the lens behind may be pellucid.

Cartilaginous and stony cataracts are rarely met with ; they are generally capsular, and partake of the nature of those that are denominated *siliquose;* of which they are generally only peculiarities.

When in false or spurious cataracts, or indeed any other kind of cataract, the pupil is dilated and fixed, and the patient cannot distinguish light from darkness, although the cataract may be otherwise distinct, an operation is contra-indicated. If the iris should adhere to the capsule of the lens, the complicated nature of the case is more distinct, and the addition of the other appearances I have described, only shew that the inflammation has been more general. It is in these cases that the value of experience, founded on careful observation, is best estimated by the student, and is of most importance to the patient.

ON THE CURE OR REMOVAL OF CATARACT WITHOUT OPERATION.

The cure of cataract in its incipient stage, has been often considered practicable, and the methods or means of doing it, have been often recommended by different persons, who whilst they impose upon the public, lead medical men to place some confidence in the methods proposed, which have hitherto, under proper observation, always ended in disappointment. It may therefore be supposed, that the cases in which success has been said to follow each, or any particular treatment, were not incipient cataracts, but other complaints which were mistaken for them.

There cannot be a doubt that persons who have had opacities behind the iris, perceptible to the eye of an observer, have been cured under a course of medicine of various kinds. It is also indisputable that these recoveries are very rare, and should only be considered as exceptions to the general rule. The opacity in such cases may have arisen from slight depositions in the capsule, the result of simple inflammation, rather than from any affection of the lens itself, for an opacity or rather a haziness of the capsule, caused by an inflammation extending to it from the iris, may almost always be relieved under the treatment proper for the cure of iritis; and when after inflammation of some months standing, the appearances lately described as following a rheumatic attack, and giving rise to the *cataracta capsularis choroidea*, dependent on the attachment of the pigmentum nigrum of the uvea, accompanied by contracted pupil, and what is often called an incipient cataract, may be relieved by proper treatment. I have one very marked case under my care at this moment, of a gentleman who, after having nearly lost his sight for eight months in this way, has nearly recovered it, and would, without the least hesitation, declare publicly from what had been before told him, that I had cured him of cataract.

Opacities in the capsule are well known to remain stationary for a series of years. Cases in which the pupils were dilated, and

cataract was supposed to exist, from the haziness at a particular point caused by the refraction of light, have been much relieved since remedies have been discovered capable of causing a contraction of the pupil, by which sight has been much improved, as in ordinary cases of mydriasis, whilst from the contraction of the pupil the hazy spot was rendered invisible. It is well known that a poor man, some two hundred years ago, having met with an accident, which rendered him blind, was advised at the end of many months to say some hundred prayers at the shrine of a saint, celebrated for her skill in restoring sight in cases of blindness. At the end of several weeks the poor man was rendered happy by discovering a glimmer of light. After a few more Paternosters and Ave Marias, and a certain number of masses, the bystanders actually saw the opaque spot breaking into pieces. The miracle was now complete, and no one afterwards doubted the capability of the saint to restore sight to blind people, who could afford to *pay* and to be prayed for, for a sufficient length of time, and who were not wanting in a proper degree of faith; a loophole to escape by, when the skill of the saint was not supported by the operations of nature.

False or spurious cataracts have been said to be cured by antiphlogistic, alterative, and other measures. Stimulants and counter-stimulants have been said to be successful in the removal of incipient cataracts; many charlatans, and some respectable but inexperienced practitioners, have entertained similar opinions, and some acute literary persons have been ready to swear to it, not knowing any thing about the matter, and not thinking it worth their while to understand the subject, on the principle, perhaps, that where "ignorance is bliss, 'tis folly to be wise." Mr. Guthrie admits, however, that he has seen in the course of his long experience in diseases of the eye, some very few cases in which incipient cataracts or commencing opacities disappeared in one eye, after operating on the other, and in two cases after suppuration of the eye-ball of the other eye from accidental causes. In the first of these cases, the right eye was lost after the division of a soft cataract, in consequence of a stranger having improperly

examined the eye, and given the woman great pain. There were some opaque spots observable around, and on the circumference of the lens of the other eye, when the pupil was dilated, but which were not perceived seven months after the accident, and did not return for years, whilst she was in the habit of calling on him. In the second case, the woman lost her left eye by suppuration after operation, in consequence of inflammation supervening after a hard day's employment as a washerwoman, which duty she was obliged to undertake, having left the hospital in a fair state of recovery, on account of a family of young children she had to provide for, and she did not return to the hospital till the eye was nearly lost. On her recovery, after the subsidence of the eye-ball, the right eye was again examined after thoroughly dilating the pupil, when no vestiges of the opaque triangular point previously seen in it could be perceived. The completion of cataract in this woman's eye was certainly prevented, and the commencement was removed, and she remained free from the complaint for at least three or four years, whilst under his observation. He regrets that he is obliged to say, that in three or four instances of incipient cataract in one eye, in which the other was so far disorganised as to permit his trying what the effect would be of causing that eye to sink, he entirely failed in arresting the progress of the cataract in the other.

In some few instances, the extraction of the cataract from one eye seemed to have caused the removal of the commencing opacity in the other ; but in all these instances the opacity was never central, but was commencing from the circumference. Dr. Bowen, who practised in Italy, relates the case in his work, of Padre Bora of Rome, 71 years of age, on whom he operated for soft cataract of the left eye, with an incipient one of the right. The operation was successful, and was followed by the disappearance of the opacity in the other.

The result of Mr. Guthrie's observations on all the cases he has seen, is, that no dependence can be placed on either the destruction of the eye, or the operation on one eye for the removal of a cataract in the other ; and he is inclined to suspect that the removal of the

opacity, whenever it has occurred, was not dependent on the loss of the other eye, nor on the operation performed upon it.

It is a fact however which may be relied upon, that cures have been completed by the operations of nature, whatever may have been the cause or means employed, but no reliance whatever can be placed up to the present moment, upon any thing that has been recommended, either as internal remedies or external applications. In one instance, my father has seen a re-formation of the lens. The young woman in whom it took place, Ann Whalley, aged 23, came under his care in the year 1825, when fourteen years old, having congenital cataracts of both eyes, on which he operated with success. Some circumstance induced the mother to go out of town suddenly, before the eyes were quite clear, and he did not see her again until the 11th of March, 1834, when a small portion of capsule appeared to impede vision at the lower part of the pupil of the right eye, the left being quite free. Supposing that the removal of this portion of capsule would improve her sight, he proposed it to her ; and on doing it he found to his great surprise, that the lens had been reproduced, and was quite transparent. It became of course opaque, and was dissolved in the usual manner.

The possibility of the recovery of the transparency of the lens, after it has become partially opaque, must be admitted ; but that it cannot be effected at present, by any known means, must be equally admitted by all practitioners of honour and honesty.

When the cure of cataract is not effected by the removal of the opacity, but by that of the lens itself, the restoration of the patient to his former state of vision is not implied, and ought not to be so understood. Convex glasses will always be required as a compensation for the loss of the lens, and a person successfully operated upon should have two pairs of glasses, one for close and the other for distant vision. In some cases the recovery is so far complete, that the sight restored is equal to the performance of all the common offices of life, including sometimes in young persons a fair degree of reading and writing.

ON THE PROPER PERIOD FOR OPERATING.

It has been supposed by many surgeons, and the opinion has been entertained and acted upon, particularly in France and Germany, that operations for cataract, and especially those by extraction, should only be performed during the spring and summer months, that is from April to October. This opinion or rule is a good one, as far as regards poor people, who cannot receive proper attention at home or in hospitals; but the experience my father has had in these complaints, induces him to believe that the season of the year makes little, if any difference to persons in that situation of life, which enables them to have every comfort and accommodation about them. Poor people are apt to be neglected during the long nights of winter; they cannot be prevented from putting out their hands to help themselves when they want any article of drink, &c., and they then involuntarily move their eyes, and do themselves mischief. He is therefore disposed to attribute any thing unfavourable that there may be in the winter season to the length of the nights, and the less degree of attention which is paid by night, rather than to the coldness of the weather, or any other cause. As this neglect may take place with persons even of condition, he prefers long days and mild weather for these operations, unless delay is very inconvenient to the sufferers, in which case he does not hesitate about operating; taking however more than the ordinary precautions as to the attention given to the patients, and to the maintenance of a regular temperature in their rooms of about sixty-six degrees, especially by night.

The age of the patient is of no consequence, provided the state of health is good. Operations of all kinds succeed as well between seventy and ninety years, as at any previous period of life; and age alone is not therefore a cause of prevention, unless it should be conceived that the strength of the patient would not admit of the necessary privation from accustomed comforts which the operation might render requisite. The state of health should be what is

usually considered good for the period of life, and the person should be free from any inflammatory disease. If liable to gout, rheumatism, or erysipelas, the operation should be done after a fit or an attack of either, and not when one is impending, or likely to occur on the application of any exciting cause. In persons subject to dyspepsia, hypochondriasis, or hysteria, it will be proper to strengthen the patient for two or three weeks previously to the operation by attention to the bowels, and by the exhibition of some light alkaline bitter remedy, for the less irritable and nervous the patient is, the milder are the symptoms consequent on a successful operation, and the better able will the patient be to bear the means of cure necessary to be resorted to, should the symptoms unfortunately become severe.

A course of preparation has been insisted upon by some, and has been as much neglected by others. It is certainly necessary in all instances, although it is more required in some cases than in others; and particularly in those persons who have a tendency to inflammation, so that they may be in the best possible condition to support the actions which may be induced by the operation, and to bear the means necessary for their repression if required. If the patient is of a good habit of body, not inclined to indulge in great eating or drinking, and not prone to inflammatory affections, he should be restricted from animal food for a fortnight or three weeks, and all stimulating drinks; and he should be purged twice or three times during that period. If not far advanced in life, from ten to twelve ounces of blood may be drawn from the arm the evening previous to the operation, but this is a point which requires that knowledge which can only be acquired by experience in the practice of physic and surgery. If the patient is of a rigid fibre, inured to hardships, of a wiry form, and in high health, it may be proper to enforce a greater degree of abstinence. If the condition of the patient should be the reverse, or if he is far advanced in life, or of a nervous, pallid, pasty, leucophlegmatic habit, a few days' quietude and a gentle aperient will only be necessary.

If the eye or its membranes be in a chronic state of disease, it

should if possible be remedied, and any minor operation be performed: such as ectropium, entropium, &c., before that for cataract is attempted. Derangement of the lachrymal passages is not a sufficient cause for preventing the operation; it only precludes the mode by extraction, if it can be accomplished in any other way; for the tears finding an obstacle in their transit to the nose, regurgitate upon the eye, and interfere with the union of the edges of the incision. If from hardness of the cataract or other cause extraction is the only mode of operating considered advisable, one eye should be done first, and the patient be made to lie on the opposite side, so as to favour the passage of the tears into the nose, or over the inner angle of the eye.

The eyelids are frequently in elderly people in a state of chronic irritation, slightly tumefied, looking red, and causing a watery appearance of the eye, independently of disease of the lachrymal passages, and accompanied with a secretion of mucus in a greater or less quantity, which encrusts on the lids about the roots of the eyelashes, and glues them together in the morning; sometimes there is only a weeping of the eyes, with great relaxation of the fold of conjunctiva passing from the lower lid to the sclerotica. In this case a slight touch of the sulphate of copper every other morning, will soon give tone to the parts; whilst in the former relief will be more readily obtained from the ung. hydrarg. nitrico oxydi, diluted with three or even six times its weight of the ung. cetacei, according as it excites irritation, gently rubbed every night on the edge of the tarsus within the cilia, whilst a little of the ung. hydrarg. nitr. or a drop of the tinct. ferri muriatis, diluted with three drops of water, may be instilled into the eye every morning. This application I have found of essential service in many chronic states of the eye; it is useful in most cases, in which the liq. plumbi diacetat. or the vinum opii are considered serviceable, and in some it has been found more useful; a solution of the sulphate of zinc alone, or combined with the nitrate of potass in water, may be used with advantage, until the conjunctiva assumes its natural appearance, and the eyelids have recovered their usual softness and flexibility.

Pregnancy is usually considered as a state unfavourable to the operation, and during which it ought if possible to be avoided.

When one eye only is affected, the propriety of operating on it is a question on which much difference of opinion has been entertained. It appears to me that a person had better be blind of one eye, seeing well with the other, than be obliged to carry a glass before the affected eye, to avoid having confused vision with the other. That the inconvenience of the loss of sight of one eye is scarcely felt, must be acknowledged by every one conversant with diseases of the eye ; for many persons are only made acquainted with their loss by some accidental circumstance, which induces them to depend on the blind eye when they find, to their great surprise and alarm, that it is utterly deficient. That the sphere of vision laterally, is diminished by the loss of one eye, cannot be doubted ; but an operation seldom enlarges it in such a satisfactory manner as to render it worth undergoing the risk attending it ; and admitting that the eye has the power after a time, of adjusting itself to the alteration which has taken place, no one will venture to contend that direct vision of both will be improved by it, although it may be urged that it is not much impaired by it even without a glass. I have however met with several cases in which great inconvenience was sustained by the confusion of vision caused by a successful operation ; and have no hesitation in declaring, that, as far as the improvement of sight is concerned, the operation should not be attempted on one eye, whilst the other remains perfectly sound. If the sight of that one should become deranged from the commencement of cataract, or any other cause, the objection is of course completely removed. In local or accidental cataract, I do not believe the presence of an opaque lens in one eye has any influence on the other ; neither does the removal of it prevent the formation of an opacity in the other at any subsequent period. The only reason there is for performing an operation, is to remove the deformity, and to restore that intelligence of countenance which is much diminished by the presence of an opaque lens. If the patient has lately had inflammation of either eye, and especially if it has alternated, as it is frequently observed to do, the performance

of an operation which might re-excite dormant sympathies would be manifestly improper until a considerable time had elapsed, so as in all probability to allay this increase of sensibility; for it is frequently seen that inflammation will be produced at one period from a very trifling cause, whilst at another and subsequent one great liberties may be taken with impunity. In forming our decision, much will depend on the nature of the cataract; if it be simple and will admit of removal without difficulty, the operation will in all probability succeed; for in the healthy state, one eye seldom sympathizes with the other, unless considerable inflammation be induced.

A question has arisen as to the propriety of operating on both eyes at the same time, which has been as much disputed by one party, as it has been strongly enforced by the other. When cataracts are completely formed, the patient being only capable of distinguishing light or the shadows of objects when passing before the eyes, and every thing else promises a favourable result, both eyes should be operated upon at the same time; but it ought not to be done when any circumstances are present likely to render the event doubtful, so that if the first operation should fail, the patient will have one eye left for another attempt, under perhaps more favourable circumstances. The best argument which can be adduced in favour of operating on both eyes is, that the same treatment, the same time and confinement answer for both, which in delicate nervous people is an object of importance, as the general health may be injured by the repetition of them, and particularly if any unfavourable circumstances should have taken place. If the patient should be subject to gout, rheumatism, or erysipelas, or is of a bad habit generally, one eye only should be operated upon at one time.

The state of the opacity and of vision materially influences our decision on this point. It frequently happens, that a cataract is completely formed in one eye long before vision is impeded in the other so as to prevent its being of service. In such a case, the patient should submit to his complaint, keep himself in a good state, and have the operation done on the eye first affected as soon as the other becomes nearly unserviceable, so that he may perhaps

have the good fortune of never being completely blind; or if not conveniently situated to effect this, or if both eyes are nearly in the same state as to vision, to wait until he be blind of both. The advocates of the operation on one eye whilst the other remains perfectly sound, have relied on the belief, that the removal of a cataract from one eye would prevent its formation in the other—an opinion which can in no way be depended upon as I have already shewn. I have seen many persons who have been operated upon ten and twenty years ago on one eye, the other being as they supposed perfectly sound; nevertheless, in scarcely one did it appear that the occurrence or progress of the disease in the apparently sound eye was prevented, for the sight of that eye became gradually worse after the operation had been done on the other, until the cataract was completely formed and vision was destroyed. In several of these cases the patient can see so well with the eye that had been operated on that they would not submit to its being done on the other. It has not been found that operating on the eyes of pregnant women has always prevented the occurrence of the appearance of cataracts in the eyes of infants at birth, although the children of such persons have not all had cataracts.

ON THE OPERATION FOR THE EXTRACTION OF A CATARACT.

The operation of extraction ought only to be performed in cases of hard cataract, which may be easily distinguished from all others by persons of moderate experience, it being impossible to mistake a hard cataract for any thing else but what it seems to be and really is.

The surgeon who proposes to perform the operation for cataract by extraction, should have been accustomed to operations on the eye. He should have performed every other several times over before he approaches this, the *ne plus ultra* of perfection in such operations, and his hand should be so steady that the point of the knife, when duly poised between the fore-finger and thumb and slightly resting on the second finger, shall not be seen to move in the slightest degree for twice the time necessary for the perform-

ance of the operation; and no man should attempt it, unless his fingers and nerves are of a conformation to admit of this being done. Practice in operating often gives a confidence which overcomes this evil, when it depends on nervousness alone; which is the reason for the direction given that it should be the last operation on the eye the inexperienced surgeon should attempt. If the defect or tremor is a physical inconvenience, the surgeon who is the sufferer should not operate by extraction.

The knife is the next important point. I prefer the triangular one, commonly called Beer's cataract knife, made with certain modifications that have from time to time occurred to me and to the instrument makers. As every thing depends on the goodness of this instrument, there should be sent with each case a piece of very fine thin leather, made for the purpose, through which, when stretched moderately tight across or between two fingers, the knife should pass, when held perpendicularly, without a scratch-like sound, or indeed any sound at all, when it may be said to cut well. If it requires any effort or gives the least sound in passing through, it should not be used. The knives I recommend are made by Mr. Weiss, 60, Strand, and by Messrs. Philp and Whicker, 67, St. James's-street. Mr. Guthrie sometimes uses one with two blades, the under of which should be blunt in every part, the upper, the usual cutting knife. This kind of double knife can only be used after the cornea is opened, when it may be carried across the interior chamber in any direction; the blunt blade raises the cornea, and presses back the iris, when the cutting blade, which is a sliding one, is to be advanced or pushed forwards, so that it may penetrate the cornea and complete the punctuation, if that has not been previously accomplished; it afterwards cuts its way out, the blunt blade protecting the iris. It is an excellent instrument for remedying a defective incision, but should not be had recourse to if the cornea can be divided by one incision, or by leaving the smallest possible piece uncut at the upper part, and should only be used to enlarge the incision when it appears to be necessary. I have been able to complete many operations successfully by it, which could not have been well done by any

other means. No young operator should be without one of these knives for each eye, and older ones will often reap great advantage from their use.

Mr. Scott has lately invented a small knife for making the section of the cornea, convex on its cutting edge, and hollowed out on the opposite or blunt edge or back, with which he is of opinion he can divide the cornea with greater certainty, and more effectually prevent the escape of the aqueous humour, and the falling forward of the iris upon the cutting edge of the instrument. The instrument makers inform me, they cannot always secure so good a point to this curved knife as they can do to the straight instrument I have described, and as perfection in the point is one great cause of success, and its imperfection the most common cause of ill success, whilst the knife I have described, when well made, is exempt from all the causes of failure attributed to those formerly in use, I am of opinion that it maintains its character for pre-eminence, and ought to be preferred before all others. The surgeon however must know how, and be physically able to use it.

The second instrument required, is a small pointed needle, or a hook for tearing or scratching the capsule.

The hooks sold in the shops were totally incompetent to accomplish the purpose intended, and those who used them must have altered them after they came into their possession, or suffered much inconvenience. Mr. Guthrie took some pains to correct this little irregularity, and to have the point of the hook placed at a right angle with the shaft of the instrument, so that when it is turned to the capsule, it may penetrate it without difficulty. This trifle constitutes nevertheless, one of the greatest improvements in the instruments sold for the operation of extraction hitherto made. The other end of the handle, to which the hook is affixed, should have attached to it what is called a curette, an instrument very like a small marrow spoon, with which the lens may be assisted if it appears to be impeded in its progress, or the hook itself may be stuck into it.

The short rectangular hook may be advantageously exchanged for another with a less curve, or resembling a needle slightly

curved at the extremity, somewhat like that for depression, and commonly called Scarpa's, to the other end of the handle of which should be attached, instead of the curette or grooved spoon, a thin flat probe, which will be found useful in adjusting in many cases the flap of the divided cornea.

The operation by extraction should always be done by making the incision upwards, and any deviation from this should be considered as an exception to the rule, caused by the great inconvenience which would attend its performance upwards, from the protuberance of the orbit, the sunken state of the eye-ball, or from that fear which will sometimes so pervade persons, that they cannot be induced to turn the eye downwards, so as even to allow the pupil to be seen, much more to expose the upper part of the cornea. In such cases the division of the cornea must be effected downwards, or downwards and outwards, which if it can be done, prevents the edge of the flap of the cornea from being raised by the edge of the lower eye-lid, an accident which will not however occur so often as is supposed, if the incision should have been happily made. The real evil of the incision downwards is, that the edge of the flap will be raised more certainly when the incision has not been well made; and that when any accident occurs, of whatever nature, to prevent the adhesion of the incised parts by the first intention or the adhesive process, there will inevitably be a cicatrix of a greater or less extent, into and behind which the pupil may and usually will be drawn, so as to prevent vision. If such accidents should occur when the incision is made upwards the lower part of the cornea is clear, and the iris behind it is sound, in which an artificial pupil may be made with the greatest advantage; a small pupil below being of much more advantage than a considerably larger one above. The irritation and distress arising from exactly the same accident upwards, is nearly as nothing when compared with what takes place when it occurs downwards.

The position of the patient is of importance. Some operators prefer the recumbent. I always place the patient in a high-backed chair, with the head well supported, and capable of being turned a little backwards; but whatever may be the position preferred, it

is advisable to adopt it always if it can possibly be done. There is something in the habit of doing a thing; and a slight change from the usual mode of operating may lead to an untoward event, that might perhaps have been avoided. The surgeon should always operate with the hand he is in the habit of using commonly. A man may learn to operate well with both hands, but unless he is naturally ambidexter, he learns it at the expense of many an unfortunate person, who pays with his sight for the acquirement of a very unnecessary dexterity, which is by much too dearly purchased, and at by far too high a price to avoid a simple change of position. To prevent this dreadful evil the surgeon should stand behind the patient when operating on the right eye, and before him when operating on the left.

The patient should be placed opposite a single clear steady light, without sunshine, and a northern light is the best, although it is not of much consequence what light it is, provided it is unaccompanied by the beams of the sun. He should be seated in an arm-chair, the back of which should be low enough to support the head when gently inclined backwards. A night cap fitted exactly to the head, so that it cannot move, should now be put on; the fore part should be turned up if it comes too low down on the forehead, and the middle of a light thin spongy kind of linen bandage, two inches and a half wide, and just long enough to cross over the eyes and to pin on the sides of the head, should be sewed to the centre of it behind, ready for use.

For the operation on the right eye, the surgeon should place himself behind the patient, and he will usually find it necessary to stand on a stool, in order to raise himself to such an height that he may readily lean over, and have his hands at perfect ease; and in that position and distance from his own head or chest, which is most convenient to him. The patient's head being a little inclined backwards, and duly although gently and comfortably supported by the cushion or back of the chair, the surgeon leaning over from behind, brings the *two* fore fingers of the left hand over the forehead gently down on the eyelid, and raises it up slowly and tenderly, so as to fix it ultimately against the upper edge of the orbit; and to

be able to retain it there so perfectly with the end of *the* fore finger only, that the patient cannot lower it, or close the eyelid by any effort he can make. He should also be able to do this, and to make a little pressure on the eye-ball, in order to fix it at the moment the incision is begun. As soon as the index finger is in this position, the second finger leaves the upper and lowers the under lid pressing it towards the edge of the orbit below. The eye is thus completely exposed, and may be almost fixed between the two fingers. To do all this well requires a certain degree of practice, but which is very easily acquired. It must be done very gently, very tenderly, and without giving pain, or almost uneasiness. The error usually committed is in using too much force with the extremity of the fore finger, which gives pain and makes the patient swerve; and it is an error of such great importance, that the surgeon must practice this part of the operation until he feels that he does it as a matter of art, not of force.

The left eye may be fixed in a similar manner; or the surgeon standing before the patient, raises the upper lid with the side of the fore finger of the left hand, and depresses the under lid with the thumb, the hand being over the nose. The pressure of the fore finger tends to fix the eye at the same time, and to render it as immoveable as possible; and this mode of proceeding I generally adopt in preference for the left eye.

The eye being thus opened, and the eyelids retained asunder, the eye loses all the extreme sensibility with which it is endowed for its security and preservation in its ordinary state. Public opinion, which on medical subjects is generally erroneous, although for the most part founded on professional authority, is in no instance more injurious than in relation to the eye. It pronounces it to be an organ of a very delicate nature, exquisitely sensitive, requiring the greatest delicacy of touch, and the utmost nicety of management; which opinion some oculists formerly found it convenient to support, and which the public may still continue to believe without any great disadvantage; but students in surgery must be taught otherwise. They must learn that the eye is not so very delicate; that it will suffer more comparative violence with less injury, than

any other organ of importance in the whole body; that so far from being exquisitely sensitive, it is when exposed in a healthy state, nearly the reverse, only becoming permanently so on the occurrence of inflammation; and that the ablest and most successful operators are not apparently, although they are in reality, the most tender in their proceedings. The opinion of the exquisite sensibility of the eye has arisen from the pain which is felt on the admission of a small piece of dirt, or a fly between the eyelids: but this occurs from a wise and preservative provision of nature, on account of the insensibility of the eye-ball itself. Let the eyelid be raised, and the same piece of dust applied to the surface of the eye, no pain and scarcely a sensation will be produced; remove the piece of dirt, turn out the lid, and whilst it is retained everted, place the piece of dirt upon it, no greater sensation will be induced than is felt when it is applied to the eye-ball. The inference is, that both surfaces when touched separately, are nearly insensible to this species of irritation. But let the same piece of dirt be put between the eyelid and the eye-ball, and the sensation produced is exquisitely painful. To give rise to this sensation, it is necessary that the two surfaces should come in contact, and that the foreign body be grasped between them. If this were not the case, an irreparable injury would often occur to the transparent part of the eye before it would be observed; and if the raising of the lid, and the separation of the surfaces did not nearly annul sensation, an operation could not be performed for cataract; for who could bear quietly the sensation which must arise from pushing a needle into the eye, if it were analogous to that arising from a fly, or a dry solid substance between the eye and the lids? The experiment may be tried in a very simple and conclusive manner by any one on himself, by merely keeping the lids apart by an effort of the will, when the end of the finger may be placed boldly on the eye-ball without any inconvenience. Inflammation by enlarging the vessels, gives rise to pain in the same way; and the sensation is at first, as if some extraneous matter were interposed between the lids. The sensibility presumed to exist in the organ naturally led to the conclusion, that the operations required to be performed

upon it must be difficult of accomplishment; and the science of optics, in showing the beautiful arrangement of its structure, and the complexity of its functions, induced a belief that the slightest alteration in its composition must be fatal to its mechanism: but this is not found to be the case. Few persons can however duly estimate the liberties that may be taken with the eye, until they have seen several operations performed; when the false ideas they have imbibed will be completely removed, and new feelings will arise in admiration of the benignity of the Creator, who in rendering the eye-ball nearly insensible, enables it in its quiescent state to undergo those operations which are frequently necessary for the recovery of sight.

If the extreme sensibility of the eye was not removed by the separation of the lids, it would be impossible to perform an operation upon it; no person could submit to it however firm and courageous he might be; and those who were once afflicted with cataract must have remained blind for life. The sensibility of the eye after the separation of the lids is so comparatively dull, that nothing beyond uneasiness is experienced on touching its surface; many persons are nevertheless extremely agitated when this is done for the first time; the eye rolls in every direction, and is drawn forcibly backwards into the orbit with a considerable effort. If the patient be kindly spoken to, and soothed into a little quietude, the eye is seen to advance again, the muscles which have retracted it are relaxed, and it may now by gentle pressure be fixed, although oftentimes not so steadily as to prevent its turning inwards at the instant the operation is commenced. Where persons are naturally irritable or nervous, I always separate the lids, and fix the eye two or three times at an interval of two or three days, and touch the eye with a probe, which removes their fears, and renders them more quiet, and capable of undergoing the operation with less alarm and distrust.

The object gained by the operator's fixing the eye, and in fact doing the whole operation himself without assistance, is unity of purpose; an advantage which every one soon learns to appreciate,

and there are few so awkward that they cannot in a short time acquire it. The other eye may be advantageously left uncovered: it will follow the motions of the one to be operated upon.

The patient having been duly placed, the eye fixed, and the apprehensions naturally excited by the approaching operation having been soothed and somewhat allayed, the eye which was in all probability drawn into the orbit, will gradually advance, and become more prominent. The patient should be cautioned not to offer resistance, nor to strain, but to leave the eye quite loose, and entirely at the disposal of the surgeon. It has been proposed to occupy the patient's attention by making him count fifty aloud whilst the operation is going on, or to say ba, ba, ba, like a sheep, or bo, bo, bo, like a hypnologist; either of which sounds answer very well, provided the person thinks fit to repeat them. Every thing being thus prepared, the knife should be laid flat on the cornea with a very gentle pressure, yet sufficient to enable the patient to feel it, when it will be immediately seen whether the eye is or is not steady; whilst the distance across the cornea which the knife has to traverse is estimated. If the patient moves the eye much, this gentle application of the flat of the knife should be repeated two or three times, until the apprehension excited by it subsides, when if the knife be steadily passed through, it will scarcely be felt or distinguished from its previous application to the surface. It is at this moment that the steadiness of the surgeon's hand is of the utmost importance; if it trembles in the least he ought not to operate by extraction.

The knife should be held between the thumb and fore-finger, resting slightly on the second for further support, the thumb being straight, and inclined outwards, the two fingers outwards and a little backwards, so as to allow the knife to be moved forwards by the straightening of the fingers, and by a change in the inclination of the thumb from backwards or outwards, to forwards and inwards; in other words, the knife is to be passed through the cornea by the motion of the thumb and two fingers, and not by any motion of the whole hand, the little finger of which should rest by its side on the

face as a rest or support, although an experienced operator having a steady hand cares little for this assistance.

The next step, and really the first of the operation is the most important; it is the place at which and the manner in which the point of the knife is to enter the cornea. It is the great secret to be acquired. Some writers say it should be done one quarter of a line, others half a line, and a few a line distant from the apparent junction of the cornea with the sclerotica. It is not however a matter of indifference. In elderly persons a semicircular, and sometimes even a circular white line, can be readily seen a little way from the edge of the cornea; it is called the arcus senilis; and when this is situated at the upper half of the cornea, and is a semicircle, it exactly describes the incision which ought to be made in the cornea. The direction of making it is therefore precise as to size and situation. The great error in commencing this operation is made by entering the point of the knife nearer the sclerotica; and the consequence of this is the undue escape of the aqueous humour and the falling forwards of the iris, the great evils to be dreaded, and which will almost inevitably occur, unless the operation is begun in the right place. If on the other hand it is entered too far forwards, or at a greater distance from the edge of the cornea than the usual situation of the arcus similis, the incision will not be sufficiently large to admit of the exit of the lens without pressure and difficulty, which always tend to cause internal inflammation.

The manner of entering the point of the knife is disputed. The cornea being composed of several layers, constituting a substance of a certain thickness, there is some danger of passing the knife between the layers, and not across the anterior chamber of the eye in front of the iris, if care be not taken that the cornea is fairly penetrated in the very first entering of the knife; which accident may happen if the anterior chamber is small, and the iris is close to the cornea. In order to avoid this error modern authors (I believe without an exception) recommend that the knife should be entered perpendicularly to the iris, as if the point were to be carried directly against it, but that as soon as the cornea is penetrated

and the point is in the anterior chamber, the handle of the knife is to undergo a sort of almost imperceptible inclination towards the temple, by means of which the blade is to be placed with its flat surface parallel to the iris, across the anterior chamber; and it is said that the more quickly this is done, the less chance there is of the escape of the aqueous humour. The knife should be held flat, and the point ought to be introduced steadily in the same direction at the proper place; and if the operator can neither see nor feel when it has penetrated the cornea and is in the anterior chamber, the sooner he abandons operating the better.

If this first step of the operation is well done, the operator may reasonably hope to be able to carry the knife fairly across the anterior chamber; but he will not always succeed, however well-shaped the eye may be. At the very moment that he has penetrated the cornea, and is about to carry the knife on, and the motion should be a continuous one, the patient will often move the eye inwards: it is an involuntary motion which the person cannot help; and as it is of common occurrence the surgeon must be prepared, and do his best to prevent it. This can only be done by waiting in the first instance before he begins the operation until the spasmodic action of the muscles of the eye has ceased; and then just before he enters the knife, by fixing the eye as much as possible with the two fore-fingers if operating on the right eye. The upper one presses gently on the upper part of the globe; the lower one whilst it depresses the lower lid, also applies itself to the inner and under part of the eye, by which an effort is made to counteract the turn inwards, if such an occurrence should take place.

If the turn takes place just after the point of the knife begins to advance across the anterior chamber, none but a calm, deliberate, and experienced operator will be able to finish the operation successfully. If he hesitates the aqueous humour will escape, the point of the knife will be entangled in the iris, which immediately falls forward against the cornea, and the surgeon has nothing to do but to withdraw his knife, let the wound heal, and try again three or four weeks afterwards. If on the contrary the turn inwards of the eye only takes place as the point approaches the opposite side

of the cornea, the case is different, and a steady operator will readily complete this part of the operation, by carrying the knife onwards, even if the point should be out of sight; and if he can carry the point through the cornea, which is called completing the punctuation, he is safe. If the accident should not occur, and the eye remains steady, the knife will in all probability go safely across the anterior chamber; but if the hand of the surgeon wavers for an instant, or the patient endeavours however unwillingly to retract the eye on feeling that it is wounded, the pressure caused by this effort of the muscles forces out the aqueous humour, and the point of the knife in either case may be even enveloped by the iris. If all these evils should be avoided, and the knife has swiftly, as well as steadily crossed the anterior chamber, it may not be able to penetrate the cornea on the opposite side. This entirely depends on the perfection of the point of the knife, and therefore on it the success of the operation rests. The inner layer of the cornea, or membrane of the aqueous humour, as it is improperly called, is much more dense and firm than the outer one, and the knife which will easily enter will not always be able to come out on the opposite side. This greater degree of denseness of the cornea must always be reckoned upon, and in every case a proportionate degree of power must be applied, as the point of the knife touches the inside of the cornea, that it may go through without any delay, at which moment the aqueous humour frequently escapes in part or in totality. In order to prevent this, and the evil consequences which may ensue, there must be no hesitation in this part of the operation. From the moment the knife enters on the one side, it should be carried swiftly but not hastily on, with a steady undeviating progressive motion of the thumb and fore-finger, or two fore-fingers, until it passes through the opposite side, and the centre of the blade is in the middle of the anterior chamber, exactly opposite the pupil. This is the acme of perfection in operating. I am aware that it cannot always be done, and that it suffices to have the knife fairly through on the opposite side; but then the after steps are not so certain. If the width of the knife be compared with the width of the upper half of the cornea, it will

be seen that they are nearly equal ; and as the flat sides of the knife lie one against the cornea, the other against the iris, the latter part is kept back and can scarcely get before the edge of the broad part of the knife ; indeed it cannot do so, and the knife is either carried on with the same motion, so as to cut its way out, or if the angle of the eyelids, or the nose, or any accidental motion of the eye upwards prevent it, the knife must be made to cut its way out, not by one forcible effort, but by gently acting with the blade first towards the point, and then towards the heel or angle ; so that the inner portion of the upper part is divided by the blade near the point, the outer by the angle ; for the cornea is often tough, and requires this sort of zig-zag or sawing motion to be made before it will yield ; or the edge of the nail of the fore-finger may be applied to the outside of the cornea, against which it is readily divided. In all these cases there has been a defect in the knife, either at the point or half way along the edge, the part which is more usually neglected, and to which great attention should be paid. The section of the cornea thus completed, should be one perfect half, and a little more rather than any thing less, and the incision should be at an equal distance from the sclerotica, or from the edge of the cornea all round : but this is of little consequence, as the cicatrix is out of sight.

The difficulty in doing this part of the operation arises from the escape of the aqueous humour ; for as this fluid lies before and behind the iris, the two portions communicating through the pupil, the sudden escape of even one-half of it causes the thin membranous iris to fall forward flat against the cornea, and of course against the knife, the slightest withdrawal of which allows the escape of the remainder, when the whole of the contents of the eye are pressed forward by the action of the recti muscles against the cornea. It is at once obvious that no sharp-pointed instrument can now cross this space. If the escape of the aqueous humour does not take place until after the knife has crossed the anterior chamber, but has not penetrated the cornea, the operator must not hesitate, the knife must go on and complete its object ; for the iris

will not be cut by that continued progressive motion of the knife, which will enable it to perforate the cornea.

When the perforation or punctuation is completed and well done, the patient and surgeon are in a very different relative situation to each other than before. The eye is almost entirely under the control of the surgeon; it moves with and of course follows the motions of the knife. If it has turned inwards, even into the very internal angle, the knife can bring it gently back to its due central position, but scarcely without the loss of the aqueous humour; and the iris is now seen upon the edge of the knife, sometimes even overlapping it: an event however which will very rarely take place if the knife has been well made, and has been entered at the right spot, and the punctuation has been well completed. It is at this point that a young operator is confounded; he sees that the iris must be cut, if it cannot be moved out of the way; he thinks he has failed, becomes confused hesitates and does mischief, or withdraws the knife and abandons his operation. If he is a clearer-headed person, he bethinks him of the directions he has read upon this subject, and proceeds accordingly; but he does not succeed one whit the better, and in despair accuses himself of awkwardness. He is not, however, the person in error; it is those who wrote the directions. I do not mean that these gentlemen have willingly deceived the public, but it is my opinion that they have told only half the truth. It may be that they did not know the other half. The directions given in such a case by the Baron de Wenzel, and which the late Mr. Ware said were the most important in his whole book, are: that the cornea must be gently rubbed with the point of the fore-finger, which causes a contraction of the pupil, and consequent drawing back of the iris, when the surgeon must complete the operation; but if the iris again fall forward before this is accomplished, he must keep the finger on the cornea until it is effected, by which all danger of the iris suddenly protruding will be avoided. It is also recommended that the surgeon should wait a little, and allow the spasm to subside; and he may wait and press, and wait again, and then rub again if he

pleases ; but he will rarely succeed, unless he does something more, and that is to raise the eye, or in other words, to draw it as it were a little out from the orbit, whilst at the same time he presses the cornea flat against the blade of the knife. This is the other and the best half of the secret, and without he does which, he will not succeed in disentangling the iris. A little consideration will show why it can only be done in this manner. When the aqueous humour has escaped, the cornea becomes flaccid, and the remaining humours of the eye advance, or are brought forward by the action of the recti muscles so as to press the iris against it. If the knife is between the iris and the cornea, it keeps these parts asunder as far as its width extends, but not farther, and as it raises the cornea in every part it would make a vacuum below its edge, between the iris and the cornea, if the iris did not rise up to fill the space, or if the air did not rush in to do it. This effect of the air is however counteracted by the muscles acting on the eye with greater power, and the consequence is that the iris is forced upwards into the vacant space, and the air if any has entered is expelled. The iris can however be only elevated or protruded to a certain extent, in consequence of its circular attachment and of its disposition to contract towards its pupillary edge or centre. When the cornea is well raised so as in some degree to raise the eye along with it, whilst at the same time the cornea is pressed against the blade, the iris is withdrawn from between them, and the operation may be completed so as to give rise to a highly-successful operation. The effect of an injury to the iris is very greatly overrated, and if the operation cannot be completed without injuring it, the injury must be committed. *No good operators* in London do otherwise. When the iris bulges much over the edge of the knife, it is often not possible to get it quite clear by any effort exertion or dexterity on the part of the operator ; he has only a choice of evils, to proceed under any circumstances or to abandon the operation. If the operation is completed, the iris is slightly shaved as the knife advances, or a piece may even be cut out, but the patient will nevertheless have a very good eye. The cut in the iris will often not be discernible unless the upper lid is raised to look

for it, and the patient will see remarkably well after a very speedy recovery.

There should not be even the slightest stop, from the moment of entering the knife until the cornea is wholly divided, or at least until the incision is nearly completed. In very nervous or agitated persons I always leave the smallest possible portion of the upper part of the cornea uncut, and withdraw the knife, which prevents the sudden expulsion of the contents of the eye, and the slight division of this part afterwards is easily effected. It may be done with a narrow curved blunt pointed knife, or with the double guarded cataract knife. The most difficult thing to acquire in surgery is the happy tact which enables a surgeon to begin and complete his operation without hesitation, and nothing but experience can give it; but the necessity for the experience becomes less onerous to all parties when it is confined to one point alone.

The cornea in some cases is large and full which renders the operation apparently more easy, whilst in others it is flatter and nearer to the iris, the anterior chamber of the aqueous humour being smaller and the space less across which the knife is to pass. It is in these cases particularly that a good commencement of the operation is important.

The incision should include nine-sixteenths of the whole cornea, and this does not make a large flap when it is considered that the point where the knife enters and where it comes out on the opposite side, are at a greater distance from the apparent junction of the cornea and sclerotica than is usually described to be proper. If somewhat less than eight-sixteenths of the cornea are cut, the nine-sixteenth part acts upon the surface of the lens like a band drawn across it and keeps it so steadily fixed in its place, that it will sustain a considerable degree of pressure made on the under part of the eye before it begins to move from its place. The pupil cannot dilate so readily and the lens is rather forced through it than otherwise, bruising its edge and bringing with it a portion of the pigmentum nigrum from its inner surface. This pressure should always be avoided, inasmuch as it is often still more injurious by causing a sudden instead of a gradual expulsion of the

lens, and with it in all probability a discharge of the vitreous humour. Inflammation of the internal parts always follows the removal of a lens when it has been accomplished in this manner. It is therefore for many reasons a matter of great consequence that this incision should be made sufficiently large in the first instance so as to allow the lens to pass through the pupil without bruising the iris. It is a *sine qua non* of a good operation.

After each step of the operation or the introduction and withdrawal of any instrument, the upper eyelid should be allowed to fall and the patient to rest for a minute or more if necessary, this operation being one requiring coolness on all sides. The division of the cornea having been completed to its due extent, the next thing to be done is to divide the capsule of the lens. The division of the capsule is to be effected by introducing the hook under the flap made in the cornea and between it and the iris until it reaches the pupil. The end of the hook forming a right angle with the shaft is to be introduced on its side, the point being backwards so that it cannot catch or tear any thing until it has arrived opposite the centre of the pupil; when the point is to be turned towards it and several slight scratches are to be made in the capsule in a circular or in different directions; the hook is then to be turned on its flat side with the point reversed or downwards, in which state it can be easily withdrawn without entangling the iris. During this part of the operation, a bright light should not be allowed to fall on the eye as the pupil will contract and offer some little impediment to its performance. The lid need not be allowed to drop after the removal of the hook unless the patient shows symptoms of restlessness, when it should be done; if he is quite quiet, the natural but not increased pressure of the muscles will cause the opaque lens or cataract to advance, and will ultimately expel it without any assistance, provided the capsule has been sufficiently divided so as not to offer any resistance, and the incision in the cornea is large enough to allow a free passage through it. The other end of the handle to which the hook is affixed, called the curette, may be used to assist the lens, if it appears to be wedged in the incision or otherwise impeded in its progress outward, or the hook itself may assist

it; or if any portion of it or of the capsule should be soft and is separated from it, or if any blood should be effused from a wound in the iris, it may be brought away by it, and this must be done with great care and gentleness, the falling of the lid being regulated by circumstances.

When the lens will not advance under ordinary circumstances after the capsule has been duly opened, there are two points to be attended to as offering impediments to its progress. One is a deficiency in the extent of the incision in the cornea, the other an insufficient rupture of the capsule. If the lens should be large it cannot come through a small opening, and it will not even ascend from its situation to come through one which is large enough to allow it to pass if drawn through with a hook.

When the lens does not begin to move from its situation, after the capsule has been torn, the surgeon must satisfy himself that the incision in the cornea is sufficiently large; or if it is not he must enlarge it. He should be equally certain that the capsule is sufficiently torn through, by repeating the operation; when, if there be nothing to impede the advance of the lens, it will be seen to rise from its situation, its upper edge gradually passing through the pupil and sliding over the iris, unless the external incision is not sufficiently large, when it should be assisted by the hook, or curette, and on its expulsion the lid should be allowed to fall. If the flap made in the cornea should by accident be turned downwards, it must be replaced in its situation by the end of the flat probe, after the lid has been again raised.

If the lens should tilt forwards a little and partially ascend, although it cannot come through the incision, this is easily enlarged and without any difficulty with the point of the cornea knife, the lens being a sort of protection to the iris unless this should be brought outwards with it, in which case the incision is much too small. These are very delicate operations and must be done with great gentleness and dexterity to succeed, and the eyelid should be allowed to fall after each and any attempt which may be made, in order to prevent a spasmodic action of the muscles occurring from uneasiness.

If the incision in the cornea is much too small, of which the operator can readily judge, the lens will not ascend on a reasonable degree of pressure being made with the point of the fore-finger through the under eyelid against the lower part of the eye, such pressure not being directed backwards into the orbit but diagonally upwards. The incision must now be enlarged at one or perhaps both ends, and by a little touch at a time with the point of the knife used for dividing the cornea; or if the incision is much too small, the guarded knife is to be preferred, to the exclusion of all others, and even of scissors.

The lens does not however always come out so easily and regularly. It sometimes happens that instead of rising up by its upper edge, the vitreous humour which appears black because it is transparent, and allows the black pigment beneath to be seen through, is perceived pushing forwards between it and the iris. Nothing can prevent a portion of this vitreous humour being protruded and expelled, and no attention need be paid in order to obviate it, for it cannot be done. But attention must be paid to the fact, that its expulsion under pressure will not in general be accompanied by that of the lens, which having lost its support, will sink down towards the bottom of the eye, and must infallibly cause its destruction by inflammation if not removed. The surgeon aware of this circumstance, and knowing that pressure of any kind, that even the mere action of the muscles, will cause the expulsion of the vitreous humour without the lens, passes either the large or the small hook through the vitreous humour, and affixes the point into the under part of the lens, which is to be drawn out with it. A portion of vitreous humour must of course escape, it cannot be prevented; it was inevitable from the first; but the great object, the extraction of the lens has been attained. If the surgeon hesitates, and does not calmly and steadily introduce his instrument and hook the lens at once, the vitreous humour begins to escape, the lens sinks, and the eye will be lost if he does not instantly pass the hook through the pupil, and hook the lens, as he would catch a fish with a landing hook. There is no alternative, it must be done or the eye will be destroyed.

It is always better that the loss of a portion of the vitreous humour should not take place, but it is not of very material consequence if it does; the principal inconvenience accruing from it being an irregularity of the pupil, which does not in many instances impair vision. It is however an evil, but it is also one which happens very frequently in the hands of the best operators, and cannot be avoided. It sometimes occurs from a change of structure which has taken place in it, and in the attachment of the capsule of the lens to the membrane which surrounds it; a change which may be in some cases ascertained, but which in others cannot be known.

The irregularity of the pupil, which occurs from the sudden expulsion of the vitreous humour and from its resting on or adhering to the iris, is neither easily nor generally overcome; the pupil is drawn in the direction in which the expulsion or evacuation has taken place, and usually remains more or less in that situation. The best method of causing its return to its natural place is to allow the lid to fall, and then to rub it very gently with a soft and wet sponge for two or three minutes, which often brings the pupil very nearly back to its central position. I have seen cases in which little or scarcely any deviation from the proper situation of the pupil has taken place after an evacuation of the vitreous humour; but it is more usual for it to remain drawn upwards or downwards, as the incision may have been made, constituting principally a defect in the appearance of the eye, which persons on recovering sight do not usually much regard or lament. A greater inconvenience arising from the evacuation of the vitreous humour is, that a portion interposes between the cut edges of the cornea when they are supposed to be placed in apposition; and whilst it prevents a rapid union between these parts, also tends by allowing the newly secreted aqueous humour to escape, to draw the iris into the line of the incision. If this takes place, the iris adheres to the cut surface, the pupil is permanently and more completely drawn in that direction, and the anterior chamber of the aqueous humour is less perfect, both in shape and appearance, in consequence of the cornea and the iris being brought nearer to each other. This

inconvenience, arising from the interposition of the vitreous humour between the edges of the incision in the cornea, is to be avoided as far as it can be done, by carefully removing with the curette or flat probe any part of it which can be seen, and by gently rubbing the eye in the way I have directed, in order to cause the pupil to return to its proper place.

The last point of importance in the operation is to place the cut edges of the cornea in apposition, and this should be done most carefully. In many cases it is best effected by a gentle friction on the lid; in others, the cornea will require to be replaced *in situ* by the end of the flat probe, but in all it must be done so that there is no appearance of separation between them; and the operator should satisfy himself of the fact before he desires the patient to look upwards, and close the eye for the last time.

It is satisfactory to know that all these difficulties may generally be avoided; that the operation does not occupy one-tenth part of the time required for its description, and that it is attended with scarcely any pain.

Before the eyes are finally closed, great care should be taken to ascertain that the edges of the incisions are in apposition, and that the pupil is regular and clear. When the lens has not been hard at its circumference, some small pieces may have been broken off in passing through the opening made in the cornea, and remain beneath it: these may be removed by the curette, which should always be used with the greatest gentleness and care. A portion of the capsule may occasionally remain in the pupil, and its removal must so often be a dangerous proceeding, in consequence of the great liability to injure the vitreous humour, that it need not be done unless it stands up or lies loosely upon the iris so as to be readily seized with a pair of fine blunt forceps, but it must not then be forcibly extracted, as very little pressure at that time will readily rupture the hyaloid membrane and cause an escape of the vitreous humour. This will cause a greater inconvenience in all probability than would occur from a considerable portion of opaque capsule remaining behind, which might all be removed by absorption; and at the worst would only require the introduction of a needle

for its destruction at a subsequent period when this operation could do no harm. If the iris has been cut near the margin, giving the appearance of an additional pupil, the slip between them may be divided by a pair of fine scissors.

When the eyes are finally closed, the surgeon should carefully observe their appearance, with respect to rotundity, form, &c., so as to be enabled to form an accurate opinion as to whether any swelling has taken place on a subsequent examination. If the eyelid remains of its natural form and colour the operation will be successful. If the eyelid swells, a greater degree of inflammation has taken place than is compatible with perfect safety, although every eye will not be lost where the eyelid swells even considerably. The swelling of the eyelid is as much a warning to the surgeon of impending evil as the falling of the barometer is to the sailor, and requires equal precaution.

The last act of the surgeon should be to depress the lower eyelid, for the purpose of being assured that no tears are retained between the lids, that might by their quantity disturb the edges of the incision. The patient should be directed not to attempt to move either eyes or eyelids, and small pads or compresses are applied for the purpose of preventing any motion from taking place. These compresses should be composed of soft spongy old linen, folded twice of a reasonable width to cover the eye, and should be pinned on the forehead to a cap which has been fitted tight to the head to prevent motion, and to the back of which a bandage, made of the same old soft and elastic linen, has been properly fastened. This bandage should be again pinned or sewed, as it passes under the ears, so as to admit of its being brought up diagonally over the eye on each side, and of a length to be pinned on the opposite side of the head; the two ends of the bandage thus cross over the root of the nose, and restrain the motions of the eye on their own side, with a degree of pressure which the patient should just be sensible is sufficient to keep the compresses steady, but in no way to compress the eyes, or to do more if possible than to keep the eyelids closed. A greater degree of pressure would act on the cornea and do mischief.

The room in which the patient is to sleep should be large, airy, and of a temperature of from sixty to sixty-six degrees of Fahrenheit. He should lie on his back, with the head a little raised, and with a sufficient quantity of bed clothes to keep him moderately and comfortably warm. As little motion as possible should be allowed, and the room should be kept perfectly quiet and nearly dark, but not so much so as to prevent the nurse or attendants from seeing what they are doing by day; and by night the candle or light should always be shaded and held behind, not before the patient, when any examination of the eye is going on. The nurses should watch the patient carefully and incessantly for the first two or three days, so as to prevent his attempting to assist himself, to rub his eyes when he awakens from sleep, or even to turn in bed without aid. If the patient should have a habit of putting his hands to his head, they may be tied or fastened, so as to prevent it; he should neither blow his nose, cough, nor sneeze, if he can avoid it.

The eyes should not be disturbed until the morning subsequent to the operation; when it will be satisfactory to see that the eyelids are not swelled, and that but little watery fluid has run out on the pads. If the eyes should become uneasy, the lids should be carefully and gently cleansed at their edges by a very small piece of fine sponge and warm water, the patient being cautioned not to raise the lid; and to prevent alarm the chin and then the nose should be touched by the wet sponge before it is applied to the eyes. The less that is done to them the better, the examination being principally to ascertain their state from the appearance of the lids, and to change the pads, which become uncomfortable from the overflowing of the tears, and in the first instance of the aqueous humour, which continues to be discharged for three or four days, if the adhesion of the edges of the incisions should not take place. The eyelids under the most favourable circumstances should never be opened before four complete days have passed away, during which time the patient should be kept in bed; he should then only be allowed to sit up.

After the eyelids have been carefully cleansed, he may be per-

mitted to place his hand on the bed clothes, and to raise the eyelids very slightly, to enable him to see his hand, which effort brings the pupils downwards ; and if the light falls with moderate power on his hand, he will see it and the fingers move, and the surgeon will be able to observe whether there is any undue redness which under favourable circumstances will not be the case. I seldom allow the patient to sit in an arm-chair until the sixth day; nor do I examine the incision until the eighth, and that in the simplest manner, by making the patient look downwards whilst I retain the upper lid for a moment which has been raised voluntarily by the patient. If the incision should appear to have united, the patient may sleep without a compress or bandage ; he may wash or foment his own eyes as frequently as he pleases ; open them a little occasionally, and finally in a day or two more use a shade to protect them from too strong a light. It is desirable that no effort should be made to evacuate the bowels for the first forty-eight hours ; and bread and milk, or sopped toast, rusk, or biscuit only, should be given for food twice a day. This may be gradually augmented as the case proceeds favourably, by a little jelly, broth, fish, and chicken, until the success of the operation is assured by the patient's being able to wear a shade.

There is always some little soreness after the operation, which continues from two to four hours, but it should gradually diminish and at last subside, probably with a discharge of tears, leaving the eye quite quiet and easy. If however towards evening, supposing that these operations are always done by the middle of the day, the pain returns, or not having subsided becomes more acute, there can be no doubt that the inflammatory action which ought necessarily to follow on such an injury is in excess, and must be subdued. If this pain should come on without any acceleration or augmented force of the pulse, a full dose of opium, after gently fomenting the eyelids and changing the pads, will often remove it altogether ; but this should only be relied upon where the patient is of a weakly habit, for the opium will act much more efficiently after the loss of a quantity of blood proportioned to the age and state of the patient than without it, and there are few people who

cannot bear one bleeding well. It is of importance however that the pain should be arrested, and that the powers of the patient should not be too much reduced, or adhesion will not take place; hence the effort to relieve the pain by opium, and by removing any unnecessary irritating cause, and by watching the state of the eyelids. The lids stick together and are cleansed with difficulty. Compresses as such even in the slightest degree do no good, and recourse must be had to the application of hot anodyne fomentations. Leeches should be applied to the neighbouring parts, and calomel and opium should be administered at intervals, the activity of treatment being dependent on the seat of the inflammation, and judged of by the throbbing or deep-seated nature of the pain. The subsidence of the swelling of the upper eyelid is the first sign of improvement after the cessation of the pain, and a purulent discharge on the linen covering the eye is among the worst. In a case of this kind adhesion very rarely takes place, and the upper lid should not be raised for many days, the surgeon confining his observation to what can be seen by depressing the lower lid.

Some cases go on very favourably until the third day, promising a favourable result, when an attack of gouty or arthritic inflammation, as it is termed by the Germans, sets in suddenly, and often does mischief. The pain is sudden and severe; the pulse rises and becomes full as well as quick, and as the patient is probably subject to gout, he considers it himself as that complaint flown to the eye; a vigorous antiphlogistic treatment combined with full doses of colchicum, aconite, and opium, will alone arrest the inflammation, which is certainly of a specific nature, and not to be trifled with.

A frequent cause of mischief occurs about the fourth day, and sometimes immediately after the patient has attempted to open the eye and see his hand. It is a separation of part or of the whole of the incision, which had not been sufficiently firmly united to resist the slight pressure occasioned by the muscles of the eye on moving it, shewing the necessity which exists at this time as much perhaps as at any other, for the greatest gentleness and care being observed in touching the eyelids. The yielding of the parts which

had adhered allows the aqueous humour to escape like a gush of water from the eye, of which the patient is sensible, and is accompanied by a sudden pain. This is frequently relieved by a hot fomentation, a gentle compress, and a full dose of opium. The eye remains however sore, slightly inflamed, perhaps a little swelled, and may require the application of a few leeches; and even in persons of a full habit the loss of a little blood from the arm. In these cases the iris is always brought in contact with the external edges of the wound, and generally protrudes a little. A compress gently applied, is always as agreeable as it is useful, until the first inflammatory effects caused by the accident have subsided, when the eye may be examined by causing the patient to look downwards whilst the upper lid is retained raised. The protruding portion of the iris will be seen between the edges of the incision, having a tendency to advance rather than to be withdrawn. It should be lightly touched with a fine point of argentum nitratum, which occasions some pain at the moment, to be followed by a sense of relief and a diminution of the size of the protruded part, which will often require to be thus touched two, three, or more times at the interval of three or more days, before it has diminished sufficiently to allow a covering from the cornea to be laid down upon it. Great care is necessary in applying the argentum nitratum, not to make too much pressure in trying to fix the eye, lest more iris should be forced out, when a fresh attack of inflammation ensues. The eye, in fact, should not be fixed at all; the nitrated point should be applied by an unsupported hand, quickly and dexterously, so as not to cause the destruction but merely the shrinking of the iris. The pupil is sometimes drawn towards the incision as a consequence of the accident; but it is rarely so much so as the retraction this part undergoes, even without a hurt, when the first incision in the cornea is made too near its junction with the sclerotica and iris.

I apprehend it is the separation of the flap or the commencement of ulceration on its edge, which gives rise to almost all the serious attacks of inflammation which take place after the fourth day, and which are sometimes considered to be dependent on damp, cold, or

a debilitated state of the constitution. In some rare cases suppuration seems to be induced almost without sufficient cause and without pain ; the patient complaining of a little uneasiness only, and of a slight muco-watery or purulent discharge from the eye, on the third or fourth day, without swelling of the lid. Union does not take place, perhaps from the apposition of parts not being perfect; and from the inflammatory action being low in these cases, it at once passes on to the suppurative stage, with scarcely any sign which can indicate the probability of such a serious evil, although the eyelids are carefully examined morning and evening. It may arise from the iris being bruised in the passage of the lens through it.

Mr. Soden of Bath, mentioned to me some time back, that he had seen two cases in which hæmorrhage, from the internal part of the eye, came on the second day after the operation, and was followed by the loss of the eye. I considered that under these circumstances, the vessels of the choroid coat were, in all probability, in a varicose state, and which might perhaps have been discovered and have prevented any operation being done. I have since that seen a case in which I augured the most favourable result, both from the appearance of the eye and the successful manner in which the operation was accomplished. Hæmorrhage however supervened on the second morning, and did not cease until the eye was lost.

Operations, for the various causes I have assigned, are not always accomplished in the most favourable manner : the incision may be irregular, and the cut edges do not adapt themselves readily to each other ; they may not be after the frequent introduction of instruments, in a proper state to admit of adhesion ; the iris may be bruised more than is consistent with safety ; and the deeper seated parts may be more or less deranged, so as to render some degree of inflammation an almost necessary consequence. This however takes place within the first forty-eight hours, and must be treated in a strictly antiphlogistic manner, in order to prevent suppuration, and to keep the ulcerative process within bounds ; and calomel and opium will in these cases be sufficient

remedies, when not carried to too great an extent. The general health and strength in elderly persons, will require to be supported by a nutritious but not stimulating diet, almost from the first, in a manner commensurate with the debility which is likely to ensue, and which is as much as possible to be obviated.

In some cases of elderly persons of irritable habits, in whom the powers of the constitution are weak, and in whom the cut edges of the cornea do not readily adhere, inflammation takes place about the third or fourth day, of an unhealthy character, and which has been called asthenic, in opposition to phlegmonous; here it is sometimes difficult to decide upon the proper treatment to pursue, except in extreme cases where the pulse is weak, the hands and feet cold, the countenance pale, and the debility evident. The attack in these cases is sudden: the pain is not confined to the eye, but extends to the orbit, and to the top and the side of the head; considerable lachrymation follows, the eyelid swells; and, on depressing the lower lid, a serous chemosis is seen protruding, of a yellowish red colour, looking somewhat as if contained in a loose sac, rather than within the cells of the sub-conjunctival membrane; the swelling of the eyelid does not remain of its natural colour, nor does it become red as in the phlegmonous attack about to terminate in suppuration, but takes on the yellowish-blue colour of serous erysipelas, in persons of a weakly habit. The eye, under these circumstances, should not, and indeed cannot be opened so as to shew the edges of the upper incision, and it should not be attempted. The eye should be fomented, whilst the pain continues, with a hot decoction of poppies, or of hot water and opium, or of belladonna, or hemlock. Opium should be given in such doses as will allay pain and procure sleep, combined with the carbonate of ammonia and camphor, and the patient's strength should be well supported by a nutritious diet, and even by stimuli, if the state of the pulse should render it necessary. On the decline of the attack, mild stimulants applied to the eye sometimes do good in removing the irritability which is apt to remain, but such patients seldom recover without some defect in the cornea, and the eye is always in the greatest danger. The general treatment in all

these cases must be an object of the greatest attention ; and it is in consequence of such attacks, and of those which are dependent on a gouty and rheumatic diathesis, that it is advisable to refrain if possible from operating in damp and cold weather.

Spectacles should never be used until from two to three months after the most successful operation ; and they should be of two kinds, one for near and one for distant sight.

ON THE OPERATION FOR CATARACT BY DEPRESSION OR DISPLACEMENT.

This operation is performed in two ways, by depression and by reclination, which may be done through the sclerotic coat, by introducing the needle behind the iris, or through the cornea in front of it.

For the operation of depression called Beer's, the spear-pointed needle, formerly used, should be made smaller and rounder at the neck. On the sides of the handle corresponding to the flat surfaces of the needle, a small piece of ivory should be inlaid to mark them and prevent error. It is introduced with the flat surfaces upwards and downwards, half a line below the horizontal diameter of the eye, that there may be less danger of injuring the long ciliary artery and the ciliary nerves. It is directed backwards to prevent its doing mischief if it should pass too forcibly into the eye, as it ought merely to penetrate the vitreous humour and avoid the lens : whilst at the same time it prevents the point of the instrument being turned or broken, which will often happen from a sudden motion of a fold of the conjunctiva, when the point is allowed to fall on the eye-ball in a straight or an oblique direction forwards. The object is to pass the needle through the coats of the eye, viz., the conjunctiva, sclerotica, the choroidea, the insensible retina, the hyaloid membrane, and a little way on into the vitreous humour, so that the neck of the instrument may turn in the slight opening made in these parts without materiaily separating their edges. It is passed into the sclerotica, a line from the cornea, that the roots of the ciliary processes may not be injured ; and it should not

exceed the distance of a line and a half to two lines, or the sensible retina will be implicated; the medullary or sensible portion of this membrane not extending so far forwards as its insensible or membranous portion.

The instrument is now to change its position; instead of passing behind the lens it is to be directed before it, and the flat surface placed against its anterior face. To effect this it is obvious two parts are exposed to injury, the ciliary processes and the lens itself. When the double motion has been given to the needle, it is previously to passing it on, parallel to the iris, and its point is between the edge of the lens covered by its capsule, and the anterior circular edge of the ciliary processes. The point of the needle in its progress, so as to be seen behind the pupil, must either raise or penetrate a portion of the processes or pass through the edge of the lens. Of the two injuries, the piercing of the lens is by far the more important, not as to the injury done to the part, for that is of no consequence, but as it impedes, and in many cases effectually prevents the completion of the operation by precluding the possibility of finally depressing the cataract. To enable the operator to depress and leave the lens in any given situation, it is necessary that it should have little connection with the needle by which it is depressed, or it will in consequence of this connection follow the needle when it elevated, and resume nearly its original situation. The same thing occurs, only in a more remarkable manner, in the operation for cutting up the cataract. If the needle in passing the front of the lens has been entered too far back, it passes through the edge of the cataract, and, to use a homely expression, pierces it like a fowl on a spit. When the edge is turned towards the lens to cut it in halves, and force is used for that purpose, the cataract recedes from the pressure of the shaft of the instrument; but the edge does not cut, and the operator soon perceives that the lens follows the motion of the instrument, that it is actually spitted upon it, that he can do nothing with it, and must withdraw the needle for the purpose of re-introducing it clear of the lens. In some instances, if the very edge of the lens only be pierced, it will yield to a turning motion of the needle, but this is not to be depended

upon ; the knife must be withdrawn and re-introduced, when the lens separated from its attachments will be found to roll or turn round it, can be depressed but with difficulty, and seldom or never cut up, if that be the operation attempted. I consider it then a point of great importance, and fully established in *this method of operating*, that the lens is on no account to be pierced, and that this object (the integrity of the lens) is to be obtained, *if necessary*, at the expense of the ciliary processes.

The third stage of the operation commences by placing the flat surface of the needle on the upper edge of the lens, injuring the ciliary processes running towards this part as little as possible. The flat surface of the needle being placed on the upper edge of the cataract, a question naturally arises, how far or how low is it to be depressed, in a perpendicular direction, or a little inclined outwards? Beer says, only until the handle of the instrument is brought into the horizontal position, that the lower edge of the lens may not press upon the retina ; but then the upper edge is only half a line below the lower edge of the pupil, and by pressing against the iris, will excite inflammation, and ultimately terminate in the closure of the pupil. Two great evils are then impending, like Scylla and Charybdis, one of which it is not easy to avoid ; and perhaps they are only to be avoided in lenticular cataract, by the fortuitous circumstance of the lens being small. If the lower edge of the lens should descend perpendicularly, and the pressure is continued after it has passed below the lower edge of the pupil, it will be pressed between the retina and choroidea, either of which may be torn or bruised ; and if amaurosis does not immediately follow, vision is soon impaired or destroyed, and the eye diminished in size, from the low inflammation which takes place on these membranes. If it be not sufficiently depressed, but allowed to touch the posterior part of the iris, it will irritate that membrane as well as the ciliary processes, and equally cause the loss of the organ through low inflammation and amaurosis, even if it does not immediately produce a closure of the pupil and wasting of the eye.

From a due consideration of these two circumstances, with the almost impossibility of avoiding them both, I have no hesitation in

condemning this method of operating, as one which ought not to be practised in any case of hard cataract, although it has the sanction of Beer, for such as are of small dimensions.

In Scarpa's operation the needle should be introduced from a line and a half to two lines from the cornea, that it may the more readily pass into the vitreous humour behind, without touching the lens, until the point of the needle, with the convexity turned forwards, has been placed upon the summit of the opaque crystalline. To do this, the point of the needle must be elevated, passed over the edge of the lens, raising up the anterior edge of the ciliary processes before it, and passing in front of the capsule, through the opening thus made by laceration. If the operator should slightly depress the lens to be enabled to pass the needle over the edge of it, and then through the capsule (which may be done) without injuring the corpus ciliare, he may perhaps not pierce the capsule, but finish the operation leaving it unbroken if still transparent, and from the disturbance it has suffered, to form a secondary membranous cataract. This inconvenience will be avoided by attending to the appearance of the convex part of the needle. When perfectly uncovered, or really in front of the capsule, it shines through the aqueous humour and cornea as it would through water, whilst if covered with the capsule, the brilliancy of the steel is diminished in a manner that cannot be mistaken when it has once been perceived ; the instrument will also be confined in its motions in pushing it forwards into the anterior chamber, and the tissue-like appearance of the capsule may be observed with facility. When a doubt even exists on this point, the operator ought to turn the needle so as to bring the point forwards, and by rotating it a little he will directly see whether it is covered by capsule or not. Having satisfied himself that the needle is free the point is to be turned backwards, and carried on horizontally between the iris and the anterior hemisphere of the capsule towards the internal angle of the eye, when it is to be passed into the capsule and lens, and both depressed into the vitreous humour. The capsule being torn in the first instance, to allow the needle to be placed in front, is again pierced on the lens in the act of depressing it ; the double

puncture and the subsequent laceration must then destroy a considerable portion of it, and almost entirely prevent the occurrence of secondary membranous cataract. The last step of the operation is termed that of depression, but it is not a pressing of the lens downwards, so as to place it on its edge, that is intended to be expressed by the words "moving it in the arc of a circle," but having firmly fixed the needle near the internal edge of the cataract, that it be carried from before backwards, downwards, and outwards, so as to lodge it deep in the vitreous humour, in the space between the insertions of the outer and inferior straight muscles, the anterior surface of the cataract looking upwards, the posterior one downwards. In this manner the lower ciliary processes are uninjured, and the tearing up of the retina and choroidea is avoided. The needle should be retained for a short time to allow the vitreous humour to close in over the lens, which on the other hand settles in its new situation; and when the needle has been loosened by a gentle rotary motion, and raised to a level with the pupil, any opaque membrane which may appear should be destroyed by moving the needle backwards and forwards until the pupil assumes the black colour of velvet. If the lens should follow the needle, it is generally in consequence of some attachment of its capsule at its lower edge to the iris or zona ciliaris, which must be separated, and the cataract again depressed as before; and if after repeated trials the operator should be foiled, he has the satisfaction of knowing that the lens is at such a distance from the iris as will not give rise to inflammation, and that he will have an opportunity in a few days of making another attempt without endangering the eye. If in the act of removing the lens the pupil becomes of an oblong form, and this increases as the depression proceeds, it is a certain sign that the capsule of the crystalline is adherent to some part of the posterior surface of the iris, and more precisely at the part where the pupil is elongated. This attachment is to be broken through by the point of the needle, when the pupil will become circular and the lens remain depressed. If the lens follow the motions of the needle, and nearly recover its natural situation, the

instrument must be withdrawn and entered on a future occasion further back, when the lens may more readily be separated and depressed.

An operation similar to this has received the name of reclination from Willberg, Beer, and the oculists of the German school, to distinguish it from simple depression, and prevent error by a mistake in the term employed. The needle is to be introduced precisely in the same manner as in other cases of depression, until it reaches the fore part of the cataract; when, instead of depressing the handle of it so as to place the point on the edge of the lens, the point is to be carried exactly in the front of the capsule towards its upper edge; when, by pressing on it, and by bringing forward the handle in a diagonal line, obliquely upwards and forwards, so that the point of the instrument may press the cataract backwards, downwards, and outwards, it may be placed in the space between the under and outer straight muscles. The anterior face of the cataract looking upwards, the posterior downwards, the upper edge backwards, the lower edge forwards, having been pressed through the posterior capsule, and placed as it were on a layer of the vitreous humour, the external membrane of which separates it from the retina. In a dilated state of the pupil it is barely out of sight, and in some cases not actually so, although it does not interfere with the axis of vision.

The disadvantages and the accidents attending these two operations being those of depression generally, may be of course considered together; the advantages of each are, in Scarpa's opinion, that greater facility is afforded in rupturing the capsule and depressing the lens by a curved than by a straight needle; in reclination, that the operation is more simple, therefore more easily accomplished by a beginner with a straight needle. Reclination is not however more certain in its result than Scarpa's depression. And I have as little reliance on reclination through the cornea, recommended by Willberg, as through the sclerotica, and do not advise the performance of either.

The late Dr. Bowen proposed that the needle should be entered at the distance of three lines and a half from the cornea, the pupil

having been previously dilated, and thought that by this process the lens is more readily and safely depressed, and the capsule more effectually removed. He termed it hyalonyxis from *hualos*, glass (the vitreous humour being so termed from its resemblance to glass) and *nusso*, I pierce; and considers that it is equally applicable to soft as to hard cataracts.

The principal peculiarity in this operation is that of entering the needle as far back as three lines from the cornea, and thus wounding the sensible retina, which certainly does not seem as sensitive of injury as has been supposed, whilst a greater facility is given in placing the lens in any given situation.

In rejecting the operation by reclination altogether, and particularly through the cornea, it may be useful to students to describe Langenbeck's method of doing it.

The pupil having been previously dilated to its utmost extent by the application of belladonna, the patient is to be seated and the eyelid secured in the usual way; the small curved needle held in the manner of a writing pen is now to be introduced at the middle of the lower half of the cornea, the concave part being upwards, the convex downwards, and pushed quickly but steadily through the anterior chamber until it touches the lens. This part of the operation will be assisted, and the point of the instrument more readily and certainly introduced at the precise spot intended, if the operator fixes the eye with the fore-finger of the left hand immediately below this part, so as to be able to allow the needle to pass along, and to be supported by the nail in its passage into and through the cornea. The convex part of the needle which is turned towards the cataract is now to be passed upwards, and placed against its upper edge and face, when the handle is to be raised so as to cause the point to pass backwards and downwards, carrying with it the cataract, which is in this manner reclined; the lower edge being forwards, the upper backwards, the anterior surface upwards, the posterior downwards. If the opaque lens should not be out of sight it is to be depressed by lowering the point of the instrument; which should be kept steadily upon it for the space of a minute, and then gently raised, when, if the lens

should not follow, it is to be withdrawn and the eye closed, when the operation is completed. If the lens should rise and follow the needle into the axis of vision, the same proceeding for its depression must be repeated under the same circumstances as in reclination or depression behind the cornea ; but if it be observed that in consequence of the softness of the lens the point of the instrument has sunk into it, a rotary motion must be given to it between the finger and thumb, to extricate it previously to depressing the handle of the instrument, which must be repeated until it is effected, and the lens remains reclined, although it will not always be depressed so deeply as not to be visible when the pupil is dilated.

This operation is evidently adapted for hard cataracts only ; but if a mistake should have been made, and the cataract be found to be so soft as to allow the needle to pass through it, the capsule must be torn in every direction, and as much of the substance of the lens brought forward into the anterior chamber as can be effected ; the remainder will be removed by absorption, but in such a case a second operation will in all probability be necessary. The pupil must be kept dilated in all these cases of depression or reclination until every sign of inflammation has disappeared ; and, although an irregularity of it may sometimes take place as a consequence, it will be attended by a moderate degree of dilatation, whilst the same quantity of inflammation in an undilated state of the pupil, would cause as great an irregularity with a corresponding degree of contraction. In performing this operation, as in that for puncturing or breaking up the lens, the keratonyxis to be presently described, two great evils are to be avoided, the loss of the aqueous humour through the opening in the cornea and pressure on the edge of the iris by the instrument, in depressing the lens after it has been reclined. The first may be prevented by using an instrument properly made ; the second will be best avoided by entering the needle at such a distance from the union of the cornea and the sclerotica, as will allow it to pass clear of the edge of the dilated pupil in the act of depressing the lens, and yet not so high up as to be in the axis of vision, when the pupil is restored to its

natural state ; for a small white spot or cicatrix usually remains, marking the place where the needle passed through the cornea.

The principal difficulties experienced in these operations have occurred from the disposition of the lens to re-ascend after it has been depressed, and from the mischief to the neighbouring parts which is apt to ensue, if it should be improperly placed. The principal objects of all modern improvements have been to obviate these difficulties, and it is to be regretted that they have not effectually succeeded in doing it.

The first of the operations by depression lately suggested differs from the operation of Scarpa, in introducing the needle through the sclerotic coat, at the inferior and external part of the eye, a little more than an eighth of an inch from the cornea, the eye being turned upwards and inwards, and retained in that situation by the point of the fore-finger of the left hand when operating on the left eye. The needle, after penetrating the sclerotic and choroid coats, the insensible part of the retina, the hyaloid membrane, and the vitreous humour, is to be gently and carefully brought forwards by turning the handle towards the temple, between the ciliary processes and the lower edge of the lens, until the flat convex part near the point is seen in front of the pupil, which should have been dilated by belladonna. The point of the needle, turned against the anterior part of the capsule of the lens, should now be made to scratch or tear it in different parts, particularly in the centre, so as to prevent vision being impeded by an opaque capsule if it should remain entire. It should then be gently entered into the upper part of the lens for a sufficient distance to give a slight hold of it, so that on withdrawing the needle exactly in the same line, and in the same manner in which it entered, the lens may come down with it and be placed on its face, with its posterior part upwards, at the inferior and outer part of the vitreous humour close to the retina, without rupturing the hyaloid membrane further than the opening which has been made in it by the needle passing in and out ; when it is presumed the lens will be scarcely if at all visible, if the pupil should remain dilated, which it rarely or never does long after the operation has

been commenced. The needle is easily detached from the lens by a rotary motion just before it is withdrawn from the eye ; but it should not be entirely withdrawn until it is seen whether the lens will re-ascend or not. If it should do so, the needle not having been withdrawn, must be re-advanced and the lens again removed from out of the axis of vision and depressed.

In this operation and in all others by displacement, whatever may be the method pursued, there are two points to be especially attended to, when the lens does not remain in the situation in which it is attempted to place it. They are, firstly, that the attempt at depression should be repeated until it can be seen that the lens will remain at some distance from the iris, although it may not be out of the axis of vision ; and secondly, that, under such circumstances, the pupil be kept fully dilated by belladonna, in order that if the lens should advance, it may not if possible rub against the iris, and give rise to that degree of inflammation which will in all probability be destructive to vision.

It has been presumed that a greater certainty will be obtained of placing the lens in its proper situation, by transfixing it in the first instance with the needle by a rotary motion ; and after the lens has been by it carried down to the place it is intended to remain in, the needle is to be disengaged by a similar rotary motion which it is supposed can be accomplished in the generality of instances without drawing the lens against the side of the tunics of the eye, but which I am very much inclined to doubt in those cases in which the lens is hard.

It has been proposed to modify this operation by introducing the needle through the sclerotic coat at the usual place, and conveying it horizontally inwards to the margin of the lens, into which it is to be inserted as far as it can be made to penetrate without displacing it inwards. The front of the needle will then be firmly fixed on the lens, which can be readily moved by it in any direction. By turning the needle half round or forwards, the inferior margin of the lens will be displaced backwards, the superior edge will be turned towards the cornea and appear in the pupil, when it is to be carried obliquely downwards and backwards by a corres-

ponding motion of the needle until it is presumed to be placed in its proper situation in the vitreous humour, immediately above the retina, but not upon the external layer of the hyaloid membrane ; and at a sufficient distance from the iris to prevent its rubbing against that part. The needle is then directed to be freely rotated, so as to disengage it from the lens, when it is to be withdrawn, great care being taken not to raise the point in so doing, whereby the lens would also be elevated.

The lens spitted as it were on the point of the needle, cannot be extricated from it by the mere rotation of the instrument, however carefully and delicately it is done, unless it rests against some resisting part ; and the objection to this operation is on this account somewhat stronger than against the preceding method, whilst the anterior capsule is more likely to be left entire, giving rise to a secondary membranous cataract.

The operation by displacement which I usually adopt in persons of a very nervous disposition, or with sunken eyes, or very projecting orbits, is effected by a needle resembling Scarpa's. Of these I have two kinds, both shorter than those commonly made; one, in which the curve at the extremity is sharper or greater, the point turning as directly backwards as is compatible with a reasonable facility of introduction, and intended for membranous, congenital, and milky or fluid cataracts. The other less curved at the point, but sufficiently so to admit of its readily penetrating for a short distance the substance of a hard lens, or of its passing through a thickened capsule. The pupil being well dilated, the needle is to be introduced through the sclerotic coat, at the distance of from one to two lines, or the supposed extent of the insensible part of the retina from the cornea, and a little below the horizontal line of the eye ; the point being backwards, the convex part towards the surgeon, the handle being turned backwards, in the direction of the temple, to be brought forwards as the instrument pierces the coats of the eye, without which motion, a needle strongly curved at the point cannot be readily entered. The point of the needle being in the vitreous humour, with its convexity towards the surgeon, is to be brought forwards in a gentle curve, descending

a little as it advances, until it evidently disturbs the position of the under, or under and outer edge of the lens, between which and the ciliary processes it should make its way, without wounding either, or displacing the lens, either forwards or upwards. The point of the instrument being thus in front of the lens, and its capsule, although turned towards them, is to be directed upwards, so as to tear the capsule if it can be readily done in two or three places, and finally to be affixed to, rather than to penetrate the substance of the upper part of the face of the lens. This is to be done in a sufficient manner to admit of its controlling the motions of the lens, and of forcing it to accompany the point of the needle in its removal from the axis of vision, which is to be effected by a corresponding, although retrograde movement to that by which it entered, until the opaque lens or cataract shall have attained the place at which it is considered advisable it shall remain. At this moment the handle of the instrument will be a little more raised than when the point was entered ; the back part of the point attached to, or as slightly as possible inserted into the face of the lens, should rest on the inner surface of the hyaloid membrane, a layer of vitreous humour intervening, the rest of that substance pressing upon its then upper and formerly posterior surface. Retained in this position for a minute, or until it would seem to be quite stationary, the iris appearing of its natural form, and without attachment to the capsule of the lens, which may or may not be displaced with it, the point of the needle is to be disentangled from the lens by the gentlest rotary motion ; the point being pressed out forwards, or if absolutely necessary, by turning the anterior edge of the depressed lens downwards, against the insensible retina at the origin of the ciliary processes, rather than backwards by its posterior edge against the more nervous and sensible part of the retina behind. If the lens should ascend after the needle has been disengaged from it, and time should be given to see whether this will take place before the point of the needle is withdrawn, it must be replaced in its situation ; but as the lens cannot be readily pierced in this its floating position, the needle must now be placed upon it and the lens must be carried a little further backwards, or more into the substance of the vitreous humour. A displaced lens will often

float, as it were, in the vitreous humour without doing any very essential mischief. It can rarely advance and rest against the back part of the iris without placing the eye in considerable jeopardy.

The operation being satisfactorily completed, the eye is to be covered and defended from the light to which it is to be gradually exposed in a darkened room at the end of three or four days ; the diet should be of the lightest kind ; quietude should be carefully enjoined, and inflammation must be prevented.

The accidents and difficulties which await and are encountered in the performance of the operation for cataract by displacement are numerous. It is an operation intended only for hard cataracts; but an inexperienced surgeon may make a mistake and attempt to displace a lens, through which the needle passes in every direction without moving it from its situation ; under these circumstances it becomes an operation of a different nature, in which the soft lens must be separated into many portions, the greater part of which should if possible be pushed into the anterior chamber of the aqueous humour in front of the iris, the pupil of which must be kept well dilated, as in the operation for soft and membranous cataracts by division to be presently described.

In other cases, and particularly where a flat needle has been used, the lens turns round upon it, or will not remain depressed, and presses forwards into the pupil in a manner which to an experienced operator indicates the certainty of inflammation of that part, great misery to the patient, and the probable loss of sight. The lens under these circumstances should be pushed through the pupil into the anterior chamber, and at once extracted through an opening in the cornea, an operation to be described as the " compound operation by displacement and extraction."

When the iris adheres in any way to the capsule of the lens, the operation to be done is no longer the simple one of displacement. These cases require great care, and will be noticed hereafter. A membranous cataract, or a siliquose or hardened capsule containing a diminished lens, is sometimes mistaken by inexperienced persons for a hard cataract, and the operation by displacement when attempted does not succeed, the opaque substance re-ascending

immediately after each trial, so as to obtain the name of an *elastic* cataract. It will be treated of under the head of "secondary or membranous cataracts."

A little ecchymosis under the conjunctiva sometimes takes place, but is of no consequence. A slight protrusion of the vitreous humour will subside, and if a small fungous spot should spring from the wound, it will disappear under the use of the nitrate of silver in solution or in substance. An effusion of blood into the chamber of the eye has been much talked of, but very rarely happens, and need not be dreaded, or scarcely thought of. If it should occur, the blood will be absorbed, and if to such extent as to fill the anterior chamber, giving rise to pain or other distressing sensations, it may be evacuated through a small opening in the cornea.

Vomiting of a continued and distressing nature is a frequent consequence of this operation, and has been generally attributed to some injury greater than is commonly committed on the retina or ciliary processes. It is always a disagreeable symptom, and should be arrested if possible by opium, given and repeated if necessary in doses sufficient to effect this object; by opiate enemata where the stomach is obnoxious to that remedy; by bleeding and such other means as are known to allay this state of irritation, which if it can be obviated early, may not be followed by any bad consequences; when it is of longer continuance, it is usually accompanied by amaurosis, or an acute attack of inflammation of the internal parts of the eye; or if this immediate accident should not occur, chronic inflammation frequently follows at a later period, and destroys that vision which has been partially recovered.

When acute inflammation supervenes, pain comes on generally during the night in the eye, around the orbit, over the brow, and even extends to the temple and side of the head; the pink colour of the vessels of the sclerotica marks the internal inflammation; the pupil contracts, the iris changes colour, vision becomes indistinct if it had been restored, and is soon lost; lymph is thrown out, the pupil becomes closed, and suppuration of the ball may ensue, unless active measures are resorted to for the suppression of the

inflammation, which can rarely be entirely removed until an almost irrecoverable mischief has occurred. The means to be adopted in such cases are bleeding both general and local, opium and mercury in repeated doses until some ease is obtained, and the mouth becomes sore; and as soon as the subsidence of the inflammation will permit, belladonna or atropine should be applied to dilate the pupil.

Chronic inflammation it is to be regretted is a too frequent consequence of displacement of the lens. It affects the retina, the hyaloid membrane, the choroid coat, and the iris; the cornea even becomes hazy, and the sclerotica is filled with yellowish pink vessels, which become more and more distinct, tortuous, and dark-coloured. The iris changes colour, the pupil contracts, and vision is eventually lost, whilst the patient is distressed by the recurrence of pain, and frequently by a constant although irregular watering of the eye, accompanied oftentimes by great intolerance of light.

In other instances the progress of disease is slower, and amaurosis may occur without vomiting, and with little pain. The retina has been injured and altered in its structure, the vitreous humour loses its consistence, the eye becomes soft, and the sclerotic coat is pervaded by a slight yellowish blush of inflammation; the pupil is irregularly dilated and hazy, the blood vessels become more distended, tortuous, and at last varicose. Sometimes the cornea shrinks and flattens; with the general diminution of the eye the iris becomes corrugated and convex or thin and immoveable, or it retains a vibratory motion dependent on the dissolution of the vitreous humour, when the pupil has not closed.

In all these cases the only hope of relief depends upon the possibility of removing the lens or irritating cause, from the position in which it has been left, and the sooner it is done the better, after the first inflammatory symptoms have in part subsided, for it is useless to wait for their entire removal. Mr. Guthrie was led to this treatment by the following case, which occurred to him more than twenty years ago, and is related in the second edition of his work, published in 1827.

" Michael Moody, 64 years old, applied for a well-formed hard cataract of the right eye, and a commencing opacity of the lens of the left. The eyes being sunken, I decided on operating by depression which was accomplished apparently with success. The subsequent inflammation did not subside at the usual period, but increased and was accompanied by pain around the orbit in the forehead and side of the head: the sclerotic coat showed signs of low irritative inflammation, the iris slightly changed its colour, the pupil gradually contracted, and vision was again lost. I took a favourable opportunity of freedom from pain, to perform the operation for artificial pupil by division, which succeeded; the pupil under the influence of the belladonna became a large one, and I could see the depressed lens a little behind and below it: vision was again restored in part. The pain returned however with equal violence; he suffered several attacks of irritative inflammation, the cornea became muddy, and he was again deprived of sight. I now determined on removing the lens from its situation, which operation I effected with Scarpa's needle, and depressed the lens further back, downwards and outwards, but out of sight. The pain ceased, the cornea cleared up, and he now sees very well with a cataract glass. In these and similar cases of pain, opium and belladonna applied round the orbit and on the side of the head give great relief: and whenever an operation is followed by pain, warm fomentations containing these narcotics in considerable quantity should always be had recourse to in combination with the treatment already described."

He has performed the same operation in several other cases with and without success, the lens having been removed without sight being restored. It is indeed very difficult to fish up the lens as it were from its abode when the pupil is small and it cannot be seen. It is also an acknowledged fact, that the removal of the offending cause in so delicate a part as the retina cannot be sufficient to enable the injured part to recover itself, and more particularly if any considerable time has been allowed to elapse after the nature of the evil has become manifest.

It often happens, after the operation of displacement, that sight

is impaired by an apparently oscillatory motion of the lens, which seems to be continually moving in its position without actually re-ascending so as to be observed. This may continue and gradually impair the sight until it becomes nearly useless. In other instances the vitreous humour becomes dissolved without any other material change taking place in the eye, and the lens is seen floating about in it, with every motion of the head, and if the pupil should happen to be dilated, sometimes slipping through into the anterior chamber.

When a lens is depressed into the vitreous humour with its capsule, very little change seems to take place in it, even after a lapse of years. In many cases, however, the lens and capsule are not in their ordinary state, the capsule being thicker and the lens smaller than usual. When a hard lens is depressed without its capsule it undergoes some diminution in size, perhaps amounting to one-third, but the central nucleus is rarely removed. A hard lens of this kind has been known to re-ascend thirty years after it had been depressed, and I have known them myself do so after lying quiet for several years, requiring to be removed through an opening in the cornea, although in some instances I have seen them again depressed with success.

ON THE COMPOUND OPERATION, BY DISPLACEMENT AND EXTRACTION.

This operation consists in placing the opaque lens or cataract in the anterior chamber of the eye before the iris, by the needle introduced through the sclerotic coat, the pupil having been previously dilated to its utmost extent by belladonna or atropine, from which situation it is to be removed by a hook after a section or incision of the cornea has been made of sufficient size to admit of the passage of the lens through it.

It is an operation which has fallen into disuse, and deservedly so, being far inferior to that by extraction, when the surgeon is at liberty to select which he pleases. It is sometimes necessary when

the lens has been accidentally dislocated or depressed, and has ascended or merely passed forwards into the anterior chamber of the aqueous humour before the iris ; and owes its origin to an accident of this kind, instances of which have been recorded by St. Yves, Gleize, Gibson, &c. It is an operation which should only be done, when from some accident in the operation by depression, or from an error in attempting to divide the lens, an operation to be hereafter noticed, or from the hard lens having ascended after it had been depressed and passed into the anterior chamber, thereby causing great irritation and rendering its removal necessary.

I have lately been obliged in two cases to open the cornea to remove a lens which had been depressed, but which had re-ascended and slipped through the pupil into the anterior chamber, causing so much irritation as to endanger the safety of the eye, both of which perfectly succeeded.

When in attempting to displace or divide a lens for the purpose of its being removed by absorption, it turns round or gyrates upon the needle, it cannot be divided, and will rarely admit of depression. Under these circumstances it must be brought forwards by the flat part of the needle from behind into the anterior chamber, and removed through a section made in the side of the cornea, sufficiently large to admit of the hook used in the operation of extraction being entered, and passed on its side under the lens, when the point is to be turned upward and fixed into it with sufficient firmness, to admit of the hook and lens being drawn together through the opening. If the lens is large, it is not always easy to make this opening of sufficient size, and it should be done at once by the common cornea knife. If the lens fills the anterior chamber, so as not to leave room for the ordinary knife, a double-edged triangular one may be used instead ; it should be entered nearer the cornea than in the operation of extraction, and then carried inwards under the lens rather than above it, for I have several times seen the lens, when touched by the point of the knife, pass back through the pupil and descend into the vitreous humour, defeating thereby the attempt made for its removal. This is so much to be feared that I never, if I can avoid it, remove the needle by which the lens is placed in the

anterior chamber until after it has been extracted. In cases in which the vitreous humour is dissolved, and the lens floats about, and slips into the anterior chamber for a day or two, and passes back again, causing each time so much suffering that the patient is desirous of having it removed; I generally introduce first a very fine needle for the sole purpose of piercing and passing the lens into the anterior chamber, and of keeping it steadily there until fixed by the hook, by which it is to be removed through the opening made in the cornea. This double or compound operation is often followed by great but not uncontrollable inflammation, and mischief is only done when the incision in the cornea is not made sufficiently large in the first instance, and the opening requires to be enlarged by the introduction of blunt-pointed knives, which usually cut with difficulty. It is the repeated introduction of knives and hooks that do the mischief, by bruising the parts, and giving rise to iritis or to inflammation of the cornea, which passes from necessity into the ulcerative stage, and is attended sometimes by chemosis and inflammation of the sclerotic coat.

ON THE OPERATION FOR SOFT CATARACT.

The removal of a soft cataract should be effected by gradual absorption, under exposure to the influence of the aqueous humour. To do this the capsule of the lens must be opened, so that this humour may have access to the soft but opaque lens; and to enable it to act quickly, the lens must be divided into small pieces, so that each part may be exposed to its influence. The operation for doing this sometimes causes considerable inflammation, and various methods have been adopted to obviate it, all deserving of consideration and selection under particular circumstances which experience suggests.

These operations are of two kinds: 1st, through the cornea and anterior to the iris or the keratonyxis; 2nd, through the sclerotic coat or posterior to the iris, or the operation by division, hyalonyxis.

ON THE KERATONYXIS.

The operation through the cornea is to be done in the following manner, for the purpose of making an opening into the capsule of a moderate extent, and not with the view of breaking up the surface of the lens.

The patient may be placed in any situation most agreeable to the operator. The head should be supported, the light should fall obliquely on the face. The surgeon should stand behind when operating on the right eye, and before the patient when operating on the left. He may elevate the upper lid with a wire speculum, and depress the lower with a finger, or keep the eye open with the fingers alone, which method I generally adopt, or an assistant may raise or depress the lids.

The needle should be as small as possible consistent with safety, flat, blunt at the sides, pointed at the extremity, slightly lance-shaped, sharp at the end, and round in the shaft. The pupil having been dilated, the needle should be introduced through the cornea, at the distance at least of a line from its junction with the sclerotica, so that it may readily pass as far as the centre of the lens without fear of injuring the iris. The point should then be directed to and made to enter the upper part of the capsule, penetrating the lens as little as possible, when, by a slight motion of the handle, the point should be brought perpendicularly downwards towards the under edge of the pupil, by which motion from one-third to one-half of the surface of the capsule will be opened or torn from above downwards. The lens should not be disturbed by this operation, and the needle should be immediately withdrawn in the same way as it was introduced. The pupil should be retained in a dilated state, the eyes should be covered for two or three days, and all inflammation prevented or removed. The eye should be as frequently bathed with warm water as may be agreeable to the patient. The diet should be spare, and quietude should be enjoined. The less is done the first operation the better. If the lens should have become fluid it

escapes through the opening, if merely very soft a portion may protrude, but the scratch made is at first little perceptible, or is merely a mark which may become a little ragged.

This operation requires to be repeated every five or six weeks, the dissolving process being very slow ; a change may, however, be observed in the colour and appearance of the lens, and its diminution is known by the falling back of the iris and the enlargement of the anterior chamber in front of it. The capsule becomes more opaque and striated, or marked, or scaly, and sometimes causes inconvenience, from its toughness and the difficulty of breaking it in pieces, particularly if it should have become attached to the posterior part of the iris from neglect or incapability of keeping the pupil dilated.

If too much is done and the lens is disturbed or partially dislocated, it bulges forwards and creates an inflammation which is oftentimes very troublesome and requires severe measures to subdue. It is, therefore, an important caution not to do too much, and to recollect that the essential feature of this operation is, that it requires several months for its completion. Vomiting frequently follows the operation and is sometimes severe, although it is not usually succeeded by any bad consequences.

ON THE OPERATION BY DIVISION POSTERIOR TO THE IRIS HYALONYXIS.

The operation by division for the purpose of facilitating solution may be done at once ; or where an excess of inflammation is to be feared from the size of the soft lens, it may be commenced by the operation through the cornea last stated, so as to cause its diminution, and completed by that which is now to be described.

In performing the operation for dividing or breaking up a soft lens (and it should never be attempted on a hard one), a needle should be used of the smallest possible size consistent with sufficient strength to render it safe ; it should not be more than eight-tenths of an inch long, the thirteenth part of an inch broad, and should have a slight degree of convexity through its whole

blade, in order to give it sufficient strength to penetrate the coats of the eye without bending. It should be spear-pointed, with both edges made as sharp as possible, to the extent of four-tenths of an inch.

The operator may use either hand, in which case the upper lid should be elevated by an assistant; or he may sit behind the patient as in extraction, which I prefer, and raise the lid and fix the eye himself, the speculum being necessary only in children. The needle being held in an easy manner, is now to be introduced, half a line below the centre, and at the distance of a line from the cornea, the pupil having been previously dilated by the belladonna, with one flat side backwards, the other forwards, the point being directed towards the vitreous humour rather than on a line with the iris, in order to prevent its being injured by any irregular motion of the eye. The *point* of the instrument having pierced the coats of the eye, the handle is to be depressed just so much as will direct the point of the needle into the posterior chamber of the aqueous humour, when it is to be carried on between the iris and the capsule of the lens until it passes across the dilated pupil, and the point is observed to be behind its nasal edge. The needle is now to be turned upwards between the finger and thumb a quarter of a circle, so that the *upper* edge of the needle may be placed against the lens enveloped in its capsule; when by a steady pressure, accompanied by a slight withdrawing motion of the needle, they are each to be divided into two parts, as nearly as possible in halves.

The needle is introduced a little below the central diameter, in order to avoid the long ciliary artery, and more particularly for the purpose of placing the edge of the needle on this precise line, on the surface of the capsule, which would not be done if the point of the instrument were entered at this spot externally, for half the width of the needle would be above or below the central line of the lens, according to the manner of turning it on the quarter turn being made. When the edge of the needle is in contact with the capsule in its central line or transverse diameter, a moderate pressure causes the needle to sink into the lens through the capsule, provided they be not firm or tough, and their complete

division may be effected by it alone ; but if the cataract be of a firmer consistence, pressure will have the effect of carrying the lens backwards into the vitreous humour, but not of dividing it ; a drawing motion being necessary to make the sharpest razor cut the hand : hence the necessity of the double movement of the instrument.

If the lens should yield to the needle and be completely divided by its passing through it, an important part of the operation is accomplished ; and it is to be completed by bringing the needle back in the incision it has made, in order that it may be repeated in the upper and lower portions of the lens and capsule until they appear to be divided into small pieces, when the flat side of the needle is to be turned towards the operator, and as many as possible of the smaller pieces are to be pushed into the anterior chamber through the dilated pupil. When this is accomplished the operation will be completed, and the pupil may even be nearly clear ; but as this can seldom be so perfectly attained and some portions of the lens and its capsule will remain behind the iris, the surgeon should allow any piece which he cannot divide to remain in the vitreous humour a little distant from the iris, where it will be gradually dissolved ; or it may by a second operation, be afterwards brought forward when the smaller pieces have been removed by absorption from the anterior chamber : he should then move the needle freely upwards and downwards, or in such direction as he may conceive will more effectually destroy the capsule.

When the needle is introduced and placed upon the anterior surface of the capsule of the lens, its point ought to be beyond, or at least as far as the nasal or inner edge of the lens itself ; and in some instances, will be under the inner or nasal edge of the pupil. When the needle is brought back, after the first division of the lens, care must be taken that its point is sufficiently withdrawn to be distinctly seen clear of this part or it may be injured. The temporal edge of the pupil may also be wounded at the same moment, in placing the edge of the knife on the lens for the subsequent division of it, unless the flat side of the needle be turned

towards the iris as it passes out of the first incision and over the surface of the capsule to the place where it is intended to make the second, when it is again to be turned on its edge; which precaution is the more essential as the lens may be large and pressing against the iris, or the pupil may not be completely dilated.

The degree of force necessary to divide the lens is sometimes so great that before the division takes place, the lens is seen to pass backwards into the vitreous humour, which from the pressure thus made upon it, offers a resistance which enables the cutting edge of the needle to divide the cataract, on which it again resumes its situation; and a nearly equal degree of difficulty is experienced in cutting up the remaining portions, which indeed in some cases is scarcely effected, and a half or a quarter of the lens is brought at once into the anterior, or left in or depressed in the posterior chamber of the eye. In other cases, the solidity of the lens is such as to resist the pressure made by the knife; it is consequently carried back into the vitreous humour past even its centre, when the reaction of this humour, pressing unequally against the upper or under half of the lens causes it to turn over or under the needle, whereby it is separated from its capsule and all its attachments or support, and is loose in the posterior chamber of the eye. All further attempts to divide a lens, floating as it were in the vitreous humour, will be futile, for it turns round the needle whenever pressure is made by its edge. In such a case the surgeon has a choice of two modes of proceeding, either to depress the lens, or to place it whole in the anterior chamber and then extract it. The depression is to be effected by reclination, that is, the lens is to be placed on its flat surface, in the manner already pointed out, and in this manner depressed below the level of the pupil and retained in that situation until it remains stationary. It will frequently, however, rise so much as to be seen, although it may not impede vision; and being separated from its capsule, it may gradually be removed by the absorbents. When the removal of the lens is preferred, the needle is to be carried behind it, and by means of its flat side, it may in general be readily

pushed whole through the pupil into the anterior chamber of the aqueous humour, from whence it ought to be extracted.

The great necessity which exists for placing the edge of the knife on the exact central line or diameter of the lens, in the first instance, will now be duly appreciated, as the only manner in which a sufficient resistance can be obtained from behind, by causing the pressure to be diffused over a larger surface, viz., that occupied by the whole posterior face of the lens. If the edge of the knife or needle be placed above or below the central line, the lens begins to turn over or up, almost as soon as the pressure is applied with sufficient force to carry it backwards, and in this way it often slips at once through the pupil into the anterior chamber.

If this operation has been attempted upon an eye in which the vitreous humour is not perfectly sound, and this state may not be always discoverable ; or upon one which is in a dissolved, or, as it is often termed, fluid state, the division of the lens will not always be effected, although it be sufficiently soft to cut readily if the vitreous humour were more healthy. The lens separated from its capsule, will sink as it were, or be depressed of itself ; or, if it should admit of a partial or complete division, the pieces will disappear in the same manner. In some instances the eye will remain clear, and the pupil transparent ; in others, the whole lens, or the pieces, will be observed to have risen and to be floating in the vitreous humour ; but they subsequently disappear, unless the lens has been displaced enveloped in its capsule, under which circumstances it shrinks and becomes rounder, but never disappears altogether ; and may require to be removed to a section made through the cornea.

When this operation is attempted upon a lens which is in a very soft or gelatinous state, none of the difficulties enumerated are to be met with, but others occur equally deserving of attention. The size of the lens, which causes it to press against the iris, not only renders the passage of the needle between these parts more difficult of accomplishment, but exposes the iris to greater danger of being wounded. The gelatinous state of the lens allows the needle to pass through it in every direction with the greatest facility ; but

its non-resistance renders the removal of it into the anterior chamber of the aqueous humour equally difficult. The object of the surgeon when operating in this manner, ought to be, to effect the destruction of the anterior part of the capsule, in order to expose the lens to the action of the aqueous humour, the first effect of which is to harden and render it more solid, previously to its removal by absorption ; a circumstance which whilst it facilitates any further operation, may prove immediately injurious, by irritating the posterior surface of the iris. To prevent this, and indeed to give to this operation, as in all others of the same kind, the best chance of success, the pupil should not only be fully dilated previously to the operation, but ought to be retained so for several days afterwards, or until any inflammation which may arise has subsided : pressure on or friction against the iris will be thus avoided, and, what is of as much consequence, the divided portions of the capsule cannot adhere to the posterior part of it, whilst a greater opportunity will be given for the removal of the whole by the action of the absorbents, and a repetition of the operation be perhaps obviated. In such cases a second, and sometimes even a third operation will be necessary before the pupil can be perfectly cleared, and these will be most frequently required when the capsule has not been fully divided, more especially towards its centre, and when the pupil has not been kept fully dilated. In the first operation, the attention of the surgeon must be directed towards the destruction of the centre of the capsule, as well as the breaking up of the gelatinous substance of the lens ; and after the knife has sunk through and completely across its surface in several directions, the instrument should be withdrawn, so that the point may be directed upon and a little beyond the central part of the capsule, which, by repeated motions of the edge of the needle, upwards and downwards, and backwards and forwards, is to be destroyed. In a second operation, the attention will in general be required more to the separation of the adhesions which the thickened capsule may have formed to the adjacent parts, than to protruding the portions of the lens which remain into the anterior chamber ; and as the capsule thickens and becomes tougher with delay, the sooner the

operation is repeated, where it is likely to be necessary, after the inflammation has subsided, the more easily will this part be again divided and separated from any attachments it may have formed. By a repetition of these operations, the whole of the lens will be in general removed, nevertheless a considerable portion of capsule may remain in a thickened state, demanding a different mode of proceeding, and constituting a *secondary capsular cataract.*

When in any of these cases, or indeed of cataract generally, a portion of the iris adheres to the capsule of the lens, the disease obtains the name of an *adherent*, or *partially* adherent cataract, whether hard or soft. If the adhesion be general, it must have taken place as a consequence of inflammation ; and the pupil will, in almost every case, be so much diminished in size as to render an operation for closed pupil necessary, which state of eye will be subsequently treated of ; but when only a small portion of the iris adheres to one side, whilst the remaining part of the pupil is dilated by the application of belladonna, the operation must be begun by introducing the two-edged cutting needle in the manner already described, and carrying it over the surface of the lens until the point reaches the part of the iris which is adhering to the capsule ; this adhesion is to be separated by a gentle insinuating motion of the needle, which when it has passed between the iris and the lens, may then be turned, so as to complete the remaining steps of the operation, either by division or by displacement, or, if under fitting circumstances, by the compound operation of displacement and extraction, provided the lens can pass through the pupil ; or the needle must be withdrawn, and after the inflammation arising from its introduction has subsided, another operation must be performed for the removal of the lens. In all cases the regular application of belladonna, or atropine, will be essentially necessary to maintain the pupil in a dilated state.

When the lens is large, the anterior operation may be done in the first instance, and some six or eight weeks afterwards the operation may be completed by the posterior, as I have already stated. It has been proposed in large cataracts, to open the capsule by a preliminary operation, and to extract the lens after it had for

some time undergone the process of solution and had diminished in size. It is a dangerous proceeding in the hands of an inexperienced surgeon, who had better have recourse in the second operation to that by displacement and extraction after the lens has been placed in the anterior chamber, as described in page 103.

ON THE OPERATION FOR CONGENITAL CATARACT.

By the term congenital cataract is understood those affections of the lens and its capsule which are coeval with, and are generally supposed to precede the birth of the infant. Schmidt, Beer, and the ophthalmologists of the German school believe that in many instances, cataracts usually considered as congenital are really only the consequence of a rupture of the capsule during the violent convulsions which sometimes occur shortly after birth, and are included among congenital cataracts from a want of due discrimination. It must not however be overlooked, that very few children have had cataracts who have suffered from violent convulsions, and that very many have had cataracts of this nature who did not suffer shortly after birth from any kind of perceptible convulsions.

The great majority of congenital cataracts are at an early period, fluid, or soft, or mixed; very few are sufficiently firm to depress; and at the end of a few years, most of them are found to be capsular.

Congenital cataracts are not usually observed at first in the eyes of an infant, nor until the child begins to notice surrounding objects, when it is observed that its eyes do not follow or turn to the light, or to the touch, or to sounds made to it, and that it has perhaps an irregular or unusual motion of the eyes. A haziness or dullness may be seen in the pupil if the child is really blind, and the intelligence of the eye is diminished from the loss of its blackness. If there should be any other defect of structure it will usually be seen, such as a preternatural smallness of the eye, or deficiency of essential parts. The introduction between the lids of

a drop of the solution of atropine or of belladonna will dilate the pupil, and enable the surgeon as in other cases to become acquainted with the nature of the complaint.

Congenital cataracts depend I believe in most instances, if not in all, on a defective nutrition or growth occurring at an early period of fœtal life, and are accompanied by more or less defect and change in the structure of the capsule and lens. In some instances a single white central spot of the size of a small pin's head can alone be perceived, and apparently situated on the capsule. In other cases it may be found, although more rarely on one side, and a haziness occasionally surrounds it. The patient sees in all these cases, although not distinctly, and an operation is not always advisable, the patient being relieved by the occasional use of belladonna or atropine, which may be continued for years without the slightest disadvantage. Vision may be better under these circumstances than after a successful operation, the lens being rarely opaque, although the capsule is spotted, striated, or otherwise marked in places. Sometimes although rarely the capsule is opaque, and the lens transparent.

The opacity of the capsule in some cases is not well marked, although it is sufficient to render vision indistinct, and the complaint is often mistaken for amaurosis at a later period of life. Mr. Guthrie first pointed out this peculiarity in one kind of congenital cataract, and which can only be perceived after the pupil is fully dilated. The child is not blind, and rarely becomes so in after life, although sight becomes more and more defective with the increase of years, so as to be comparatively useless for other than very ordinary purposes. The capsule is seldom sufficiently opaque to be observed, unless by an experienced eye until the pupil is fully dilated, when a black ring may be seen surrounding a *small* muddy-looking, perhaps slightly striated capsule, containing generally a transparent or nearly transparent lens ; the form of both being very distinct, and contrasting strongly with the black ring around them. The most reasonable conclusion is that the lens and capsule ceased to grow at a particular point of time, probably when the eye had acquired half its size, and that every other part except

the capsule, and consequently the lens continued to progress in dimensions until the full size of the eye had been attained. The ciliary processes are I should think of their proper length, although they appear to be deficient by not touching the capsule of the lens ; but as I have not had the opportunity of ascertaining any of the facts by dissection, opinions on these points are merely speculative. I assisted in operating on both eyes of a young gentleman last summer, who laboured under this kind of cataract. He now sees so well with glasses as to read the smallest print by candle-light, and intends to go into the church ; and I am satisfied from the observation of many such cases that young persons usually obtain a very good degree of sight after these cataracts have been removed.

I lately saw a Mr. Farnsworth, on whom Mr. Guthrie operated twenty years ago for cataracts of this kind, who declared that he could with the aid of his glasses do as fine work as any one else who had not suffered from this complaint.

These are cases of great interest, from the circumstance that the sufferer is never quite blind, that his defective vision is most observable as he becomes more and more developed from the state of childhood to that of puberty ; at which period, and up to that of manhood, great deterioration often takes place in a similar manner to that augmentation of short-sightedness which occurs in many young persons at this period from natural causes.

The capsule is always thicker than usual, although somewhat soft and fleshy. It becomes thinner and tougher when cut, is not easily absorbed, and causes considerable difficulty in some cases, so as not to be removed without a second or third operation. This has led me to deviate a little from the ordinary mode of operating by division through the sclerotica ; and I rarely operate through the cornea, unless under circumstances in which an attack of ordinary inflammation is to be dreaded from the state of health of the patient ; and then three or four repetitions of the operation will be necessary, accompanied by a considerable loss of time.

In fair and proper cases in healthy persons, I introduce a needle through the sclerotic coat at the distance of a line and a half from its

junction with the cornea, having a sharp curvature at the extremity, being a Scarpa's needle a little more shortly curved. The pupil having been fully dilated, the needle is to be carried across the centre of the lens to the edge of the capsule, which is very distinctly seen, and which is to be abraded or torn across from within outwards. This proceeding or manœuvre is to be repeated at equal distances from the centre, and in a similar manner from above downwards, thus tearing the capsule in every direction. The point of the needle is then to be pressed into the lens, so as to open its substance, which should be left *in situ* to dissolve, or if quite soft, it may be completely broken up. If the pupil should not fully dilate, or it is desirable to avoid the hazard of an attack of inflammation, the capsule should merely be torn in the centre, and the lens allowed to dissolve in part before the operation is completed, as it is not desirable it should fall forwards against the posterior part of the iris. These operations are eminently successful, one eye only should however be operated upon at a time when the patient can see to guide himself about.

In common cases in which the lens and capsule are of a normal size, although partially or completely opaque, the judgment of their nature must be formed according to the usual appearances of ordinary cataracts in the adult.

The proper period for operating for congenital cataract in infants may be said to be as early as it can be done after the first month to the time of teething. If the child is healthy, at two, three, four, and certainly six months, and without any signs of being about to cut its teeth, the operation ought to be performed with every hope of success; at a later period it can seldom be done, until after fourteen or sixteen months, with the same advantage; wherefore the reason some surgeons have selected from the eighteenth month to two years of age, as the time from which to three years it is presumed the child will be stronger, and up to which it is supposed little change will have taken place in the nature of the cataract. The rule to serve as a guide for selecting the period of operating must be the state of health of the infant. If the operation is delayed until the end of the third year, no further incon-

venience is found to arise from it than that the child acquires the power of retracting the eye within the orbit, which renders the operation less simple, and obtains an irregular rolling motion of the eye which it does not readily lose, and which the operation tends to diminish if not to prevent; not to include the disadvantages the child labours under in point of recreation and education, and of the greater resistance it can offer when under the operation.

Congenital cataracts appear sometimes in several infants of the same family; occasionally in a succession of pregnancies; at others only among the males or females, or alternately.

The only operations which ought to be done on children under three years of age, and even under the age of puberty, are those by solution, either through the cornea or posterior to the iris, which latter I prefer in the generality of cases. In all the pupil should be dilated previously to the operation, and kept in that state by the daily application of atropine or belladonna, until every symptom of inflammation has subsided.

In performing operations on children, it is necessary they should be completely under control, for which purpose several assistants are necessary. The child is to be laid on its back on a firm table, with a pillow under its head, which is to be securely held by one assistant in such manner as not to interfere with the position the operator may choose to place himself in. A folded sheet having been placed over the body, legs, and arms, is to be fastened under the table, and a second assistant prevents the body and legs from moving, in which he is materially aided by the sheet. The third assistant depresses the lower lid of the right eye with his fore-finger, and receives at the same time the chin of the child between his thumb and fore-finger, as in a crutch, by means of which the motion of the head on the chest is prevented, which the child attempts in order to extricate itself, and which, if not guarded against, may give rise to injury to the iris during the operation: with the other hand he prevents the extrication of the arms from beneath the sheet. The eyelids must be elevated by the wire speculum, being the most easily introduced and the most serviceable and retentive, when properly employed. When the right eye

is to be operated upon, the surgeon sits or stands behind the patient and holds the speculum with his left hand, the needle with the right, the light falling on the eye across the nose. Previously to introducing the needle, a gentle pressure is to be made upon the ball of the eye by the speculum, which, whilst it elevates the lid, at the same moment fixes the eye. If the first attempt should not be sufficient, from the irregular action of the muscles, the pressure must be taken off and again applied until the eye can be duly fixed in a central position, when the needle is to be entered, and the operation completed, according to the directions which have already been referred to, page 107. When the left eye is to be operated upon, the surgeon should stand or sit before the child, by which he will have the advantage of operating with the right hand. An assistant may elevate the lid or the operator may do it himself. In infants, both eyes may be operated on at the same time ; little preparation will be necessary, further than a dose of castor oil the day before, which ought to be repeated the morning after the operation ; one or more leeches may be required, but a troublesome degree of inflammation is a rare occurrence in children ; and although those of two and three years old will sometimes cry for a few hours afterwards, they generally seem to have lost all remembrance of the operation, as well as all inconvenience arising from it, on the third day, when a shade may in general be advantageously substituted for the bandage.

ON THE OPERATION FOR CAPSULAR OR MEMBRANOUS CATARACT.

The operation for the removal of an opaque capsule constituting a membranous or capsular contract should be done with the needle posterior to the iris, for the purpose of tearing it in pieces, so that they may shrink and retract behind the pupil ; or the capsule may be separated from its attachments and be afterwards removed through an opening made in the cornea, if it should remain in the axis of vision. The capsule of the lens when it has become thick, white, and tough, is never totally absorbed under the influ-

ence of the aqueous humour, but remains almost unaffected for years, although it may shrink when torn by the needle, becoming thicker and whiter as it diminishes in size.

When the opaque capsule is thin and delicate in its structure, an opening should be made in its centre with the straight two-edged needle. The shreds left after the operation will partially shrink and disappear, so as to leave the pupil clear under ordinary circumstances. When a portion of the opaque capsule only remains, it may be cut across, and drawn behind the iris by the needle on its withdrawal. When the capsule is more dense and is firmly connected with the membrane of the vitreous humour, it is not easily depressed, or rather it will not remain depressed, and constitutes what is called an elastic cataract. This may sometimes be removed by twisting or rolling it up on the point of the curved needle, and carrying it behind the pupil as the needle is withdrawn, by which it is extricated from its point, and having become by the twisting or rolling a denser substance it may remain out of sight. The curved pointed needle is to be introduced at the usual place in the sclerotic coat, and carried inwards and forwards until it passes through the opaque capsule at its outer edge, as seen behind the dilated pupil. It is then to be carried over the capsule to the inner edge, when the point is again to penetrate it in the opposite direction from before, backwards. The needle having thus penetrated the capsule in two places is now to be turned round between the finger and thumb, until the capsule shall be torn from its connexions and twisted round it, when it may be drawn with the needle out at the axis of vision, and separated from it as the needle is withdrawn.

If the capsule thus twisted should return into the axis of vision, or if it should be too tough to twist and cannot be retained out of it, the cornea must be opened at a subsequent period, and this arid coriaceous or siliquose part removed by the double hook or spring forceps, by one or the other of which it is pierced or grasped and brought through the opening of the cornea: an operation I have repeatedly done with perfect success.

ON THE OPERATION FOR FALSE OR SPURIOUS CATARACT.

False or spurious cataracts are secondary complaints in which the capsule, and frequently the lens, are implicated as well as the iris, in the manner I have pointed out, from pages 46 to 49. Two operations only are advisable for their removal, even under favourable circumstances ; one is the operation for artificial pupil by division of the iris, the other is the keratonyxis, or puncture through the cornea, for the purpose of drilling a hole through the capsule and lens, by several repetitions of the operation.

The operation by division is to be done in the following manner. The patient being seated as in the operation for cataract, and the eye being steadied, either by the finger of the assistant who supports the upper lid, or by the gentle pressure of a small speculum, a small iris scalpel must be introduced, with its edge turned backwards through the coats of the eye, at their external part, about a line behind the iris, and in the transverse diameter of the latter membrane. The point of the instrument should then be made to penetrate through the iris into the anterior chamber, in a line with its central diameter, and somewhat less than one-third of the width of that membrane from its ciliary margin. The iris scalpel is then to be carried cautiously through the anterior chamber, towards the inner canthus, keeping its edge in contact with the iris (in order to prevent the point from piercing the internal part of the cornea), until it has traversed more than two-thirds of the width of the iris, when it should with great care be drawn backwards, almost out of the eye, making the most delicate pressure with the edge of the instrument against the iris, lest it should be detached from the ciliary ligament. If the division of the iris is not effected to a sufficient extent during the first effort, the iris scalpel should be again carried forward, and withdrawn in a similar manner. This is to be repeated as often as may be necessary to effect a division of the iris to the extent of a third part of its diameter.

The division of the iris is by no means a certain operation, as

far as regards the quantum of pressure to be applied ; it must also be borne in mind that steady pressure does not cause a knife to cut, unless it be accompanied by a slight motion forwards or backwards. Every knife requires to be drawn along a part to effect a division ; and this saw-like action is the more necessary in proportion to the want of resistance behind. In dividing the iris, it must not be forgotten, that it is for this reason the knife is directed to be withdrawn nearly to the point, by a double motion of pressure backwards, and removal outwards ; and in doing this, attention is necessary to a third circumstance, that the back of the knife be constantly kept in contact with the sclerotica, next the cornea, which acts as a fulcrum, or point of support, and prevents the opposite part of the sclerotica from being cut, at least in any great degree. In other words, the knife is to act as much as possible without increasing the external opening.

The presence of the lens, in addition to a diminution or obliteration of the pupil, renders an operation more complicated, but not at all times more difficult. The lens may be of its natural size, transparent or opaque, hard or soft, the capsule simply opaque, or thickened, tough, slightly or strongly adherent, or remaining *in situ*, the eye soft, the vitreous humour disorganized. The iris may be discoloured, and the lens of a yellow colour, solid, and even shining through it.

In cases where the pupil is contracted, so as not to leave an opening of a line in diameter, and where there is every appearance of a firm attachment to the capsule of the lens, the operation by division may be attempted, whether the lens be opaque or transparent, soft or more solid ; but it is fortunately in most instances soft and easily divided. The operation is to be begun and continued until the iris is divided, when the lens is to be cut into, and as soon as the opening in the iris is sufficiently formed, it is to be cut in pieces in every direction, and as much of it as possible brought into the anterior chamber. The complete division of the lens into small pieces will seldom be effected at the same time as the artificial pupil is made, so that one operation may suffice for both ; a second will generally be necessary to complete the de-

struction of the lens, which may be done with the needle, as in soft cataract, provided the pupil has been made sufficiently large. The principal object of the first operation is to make an artificial pupil, and to open the texture of the lens. The iris is readily divided if the lens is hard, but the cut edges do not always separate, in consequence of an attachment behind, which must if possible be destroyed, the incision enlarged to at least two-thirds of the extent of the iris, and the edges pushed asunder by the side of the knife ; the capsule being alike the cause of the non-retraction of the fibres of the iris and of their reunion. The lens, which has been in part cut up by these different motions of the needle, is now to be more separated in its texture, and brought forwards, so that what remains behind (if in any quantity) may be more exposed to the action of the aqueous humour.

If the lens be found too hard to admit of division, the operator will do well to defer the remaining steps of the operation until a subsequent period.

When the general texture of the eye is apparently less sound and there is a greater degree of complication than a pupil of small diameter, with an opaque capsule enclosing a lens more or less transparent, this operation will not succeed, and that by drilling must be resorted to.

The cornea being punctured as in the operation for the solution of the lens, through that part described, page 106, the point of the needle is to be directed to the capsule of the lens close to the inner margin of the pupil. The capsule and lens are then to be penetrated to the depth of about the sixteenth part of an inch, when the needle is to be rotated between the finger and thumb, until a small hole is drilled into them, which cannot readily close. The instrument is then to be withdrawn, and the effect of the solvent power of the aqueous humour awaited. If this fluid should begin to escape during the operation all further efforts should be desisted from: but this will seldom occur when the operation is performed with sufficient gentleness, and the needle is well made. This operation will require repetition every five or six weeks, a fresh part of the capsule being punctured each time until at last three or

four drill holes break down into one, and after the lens has been dissolved, they form an opening large enough to admit the rays of light.

This mode of proceeding occupies a great deal of time, it is not however painful, and inflammation is rarely excited unless the operator does too much, an error which must be carefully avoided. When the lens has been in great part removed by absorption, the operation may be completed with the common straight needle introduced through the sclerotic coat, by which the pupil may also be somewhat enlarged if necessary. I never employ the scissors for this purpose, or in such cases open the cornea if it can be avoided.

ON THE PROPRIETY OF OPERATING FOR A CATARACT IN ONE EYE WHEN VISION IN BOTH IS ONLY IMPAIRED.

It is admitted that an operation for cataract should never be done in both cases at the same time, unless the sufferer is so blind as to be deprived of all useful vision. When a cataract is fully formed in one eye and the other is only slightly affected, the operation should be deferred until useful vision is lost in both, if any doubts exist as to the health of the patient, or if far advanced in life. If it should be a matter of importance or necessity that sight should not be lost in both eyes, one eye may be operated on first and the other at a subsequent period. All these operations may be done at the pleasure of the patient. It is a different question as to the propriety of operating on an eye with which the person can still see, and at an early period of time.

When a wound is accidentally inflicted in a sound eye, in an adult or middle aged person, by a thorn, which penetrates the capsule and injures the lens, a rough, yet sometimes an effective operation has been performed, which will gradually cause the absorption of the lens, although the capsule may frequently remain with the small hole or tear in it made by the thorn. The capsule thus torn and rendered opaque, will usually require to be removed by the needle. If inflammation is prevented or subdued in the first

instance, and the pupil is kept in a dilated state by the use of atropine or belladonna, the lens will be absorbed in about twelve months, with very little inconvenience to the patient, unless it should slip forwards and press against the iris, or advance into the anterior chamber in front of it, in which cases it will give rise to irritation, and may even require to be removed.

The lens being thus shewn to be soft in its natural state, and admitting of solution when exposed to the action of the aqueous humour, it became a question whether the accidental operation on a healthy lens might not be imitated on a lens which had begun to shew signs of becoming cataractous; and there can be no doubt that when the complaint is discovered at an early period, and the cataract is likely to be soft, and which may in general be known by the opacity not being central, as well as by the usual appearances of a soft cataract, the operation may be done with advantage on one eye. There are few persons however will submit to have the sight of one eye destroyed, however temporarily, until they have ascertained they are fast losing it; and they then perhaps have lost a part of the advantage they would have gained by having had the operation done earlier, inasmuch as a cataract in elderly persons, however soft it may have been in the beginning, unless it is fluid, usually hardens as it advances to the state of complete opacity.

The object to be gained is the anticipation of the blindness that would ensue in both eyes by removing the cause in one; and it has been supposed with less risk of failure, than if the operation had been deferred until it could not be avoided. This must depend however on the lens, and particularly whether it is in its ordinary state of consistency, or whether it has become harder than natural. If a lens in the early and middle period of life requires twelve or more months for its solution when retained in a capsule which has been torn so as to admit the aqueous humour, a lens which has become harder from being partly opaque may require even years, and its solution will always be accompanied by such risk of inflammation and consequent disorganization as to render an operation for solution at all times inadmissible.

When on the contrary the lens does not become opaque from

EXPLANATION OF THE PLATE.

Fig. 1. Represents a hard lenticular cataract, of a grey colour. The shadow thrown upon the lens by the iris, in consequence of the light falling upon the eye over the nose, is strongly marked. The lens is supposed to be distant from the iris.

Fig. 2. Represents a soft capsulo-lenticular cataract, of a large size, pressing into the pupil, indicated by the black ring around it formed by the posterior edge of the iris, or uvea, a little advanced in consequence of the pressure from behind. The lens being supposed to be nearly, if not quite in contact with the iris, no shadow is cast upon it. The capsule is striated.

Fig. 3. Represents a fluid cataract, in which the capsule is slightly affected; sometimes called *cataracta Morgagniana*. The opaque spots are not stationary; the thicker portions descending when the eye has been some time at rest. The dark ring round the pupillary edge is marked, showing that the cataract is nearly in contact with the iris.

Fig. 4. Represents an arid siliquose, or coriaceous capsular cataract, described page 43, and which when once seen, can afterwards scarcely be mistaken.

Fig. 5. Is intended to represent two affections of the capsule, a central opacity, which sometimes exists alone, and several opacities of the capsule commencing from the circumference, the pupil being a little dilated by the belladonna.

Fig. 6. Represents a strongly marked case of glaucoma, described page 27, the lens being scarcely affected.

Fig. 7. The other eye of the same person, in which the lens is of a mahogany colour, and divided into five parts, the iris a mere ring as perceptible through the cornea.

Fig. 8. A capsular cataract of a peculiar appearance, beginning at the circumference, the lens remaining sound.

Fig. 9. The congenital cataract, described page 115, being a small opaque capsule and lens, with a black circle of vitreous humour around it; the pupil being dilated, as seen in the eyes of Mr. Farnsworth, alluded to page 116.

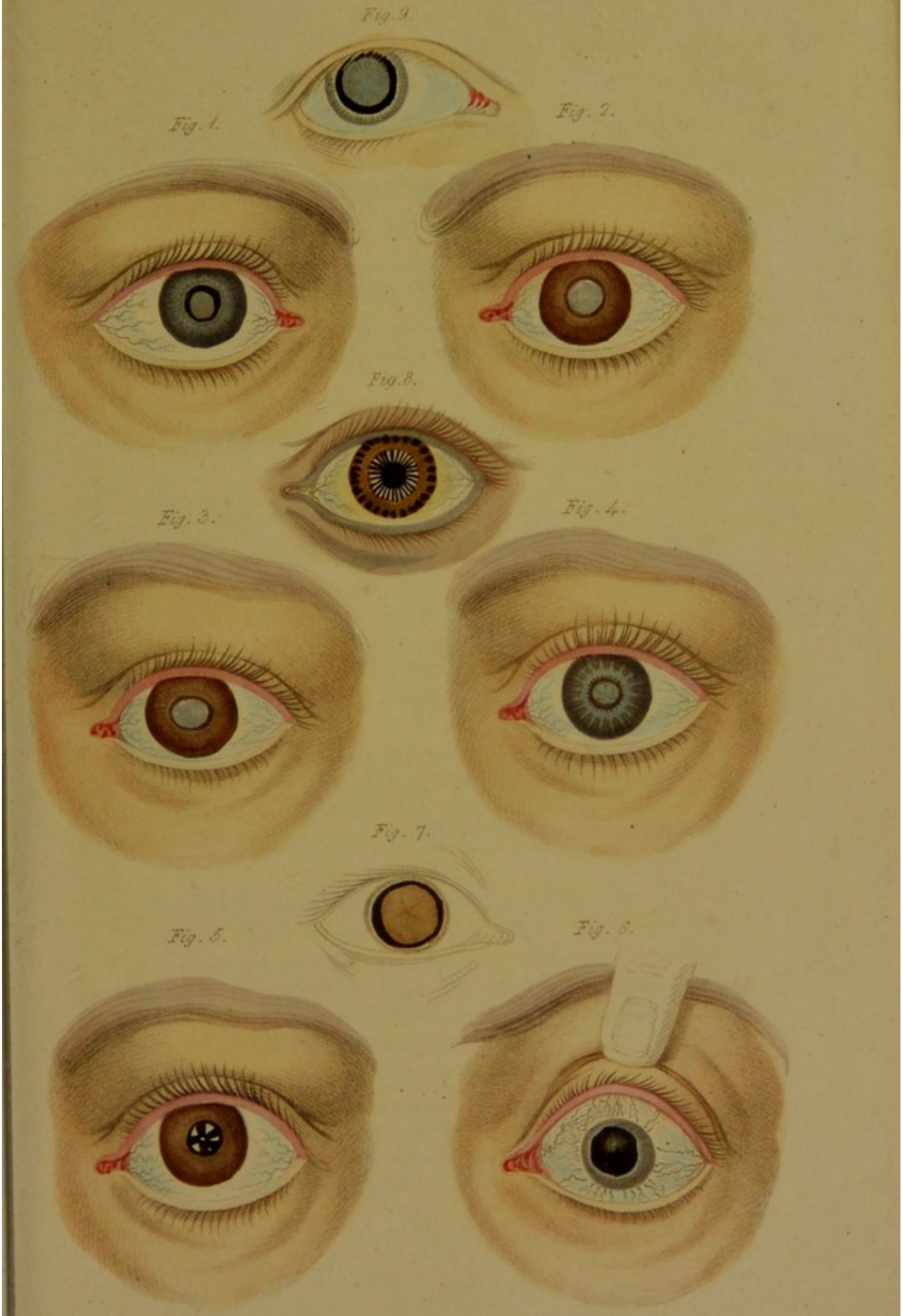


Fig. 9.
Fig. 1.
Fig. 2.
Fig. 8.
Fig. 3.
Fig. 4.
Fig. 7.
Fig. 5.
Fig. 6.

ROYAL WESTMINSTER

OPHTHALMIC HOSPITAL,

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ROYAL WESTMINSTER OPHTHALMIC HOSPITAL.

ADDRESS OF THE COMMITTEE.

Twenty-eight years have now elapsed since the formation of this Institution, and the Committee, in reviewing the progress made during that time, see with great satisfaction, that, since the year 1817 to 30th April, 1845, 57,194 persons have availed themselves of the benefit it has offered them. Of these, 1417 have been restored to sight by operations for Cataract and the formation of an Artificial Pupil. The appearance of 2064 persons has been greatly improved by the operation for the removal of Squinting ; that 3607 persons have been admitted to its benefits during the last year, of whom 146 have been in-patients, and 3461 out-patients.

During the four months of the present year, ending 30th April, the number of poor who have applied for advice has exceeded, by 357, the number in the corresponding months last year, being 1403 in all.

This Hospital forms a School of Instruction for students of every description, who are enabled to see the treatment of diseases of the eye on so large a scale, that they cannot fail, within a short time, to obtain a competent knowledge of them ; and thus the advantages which originate in this Charity are disseminated over the whole face of the earth, and there is already no quarter of the globe in which Surgeons educated at this Hospital, have not rendered the most important services to mankind ; in having restored sight, and with it health, vigour, and happiness, to thousands.

The Medical Officers of the Army, the Navy, the Ordnance, and of the East India Company's Service, are at all times admitted gratuitously, on obtaining the recommendation of the Heads of their respective Departments, to the Lectures, annually delivered there, on the Diseases of the Eye, in combination with the principles of Surgery as well as the practice of the Hospital.

The Committee feel great satisfaction in the assurance that, since the establishment of this Institution a change has taken place in those diseases which afflicted the poor ; complaints which were then prevalent and destructive, have almost ceased to exist, and chronic inflammatory affections, which rendered the strong helpless and ultimately led to blindness, have, by a better mode of treatment in their earlier stages, been prevented.

The Committee, in June, 1840, submitted to the Annual Meeting of the Governors the necessity of opening one of the four wards unoccupied for want of funds, and increasing the in-patients from ten to eighteen, which was unanimously agreed to; and they have great pleasure in saying that, after four years' trial, the experiment has fully warranted their recommendation, and they would have been enabled to have increased the number of in-patients if it had not been for the great and unprecedented mortality amongst the Subscribers during the last two years, which has been greater than in the ten preceding ones, and causing an annual loss to the Charity of Forty Guineas. The Committee, under these lamentable circumstances, trust they shall not appeal in vain to the humane and benevolent individuals of wealth and rank for their support, not only to enable them to carry on the establishment in its present efficient condition, but likewise to enable them to open another ward for the relief of cases of nervous and other blindness comparatively little understood, and which require a longer course of treatment and care than can be bestowed upon them when seen occasionally only, and increasing the number of in-patients to twenty-four.

In order to effect this great object, an Inalienable Fund has been formed in the names of Colonel Wood, M.P., Sir J. Swinburne, Bart., and L. Powell, Esq. The money from time to time contributed to this Fund is invested in the 3 per cent. Consols, and the interest only is permitted to be appropriated for the purposes of the Hospital, the Principal forming a permanent Capital. The amount at present invested is £4000 Stock, but the sum of £10,000 is required to carry the views of the Committee into full effect.

The Poor in London are received on their own application, without Letters of Recommendation, and those in the Country, requiring operation, will be received after a previous application by the Clergyman, or other duly constituted authorities of the place, to the Secretary.

The Committee anxiously solicit annual Subscriptions and Donations; and have to observe that all Donations of fifty pounds and upwards must, by the Rules of the Institution, be applied to the Inalienable Fund; so that the benevolent objects of the Donors will endure as long as the Institutions of the country. A contribution of twenty guineas constitutes a Life Governor, and annual subscriptions of any amount will be gratefully received.

May 10, 1845.