Cataract and its treatment : comprising an easy mode of dividing the cornea for its extraction and appropriate means for removing the different forms of that affection / by John Scott.

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CATARACT
& ITS TREATMENT.

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CATARACT,

350+

AND ITS TREATMENT,

COMPRISING

AN EASY MODE OF DIVIDING THE CORNEA FOR ITS EXTRACTION,

AND

APPROPRIATE MEANS FOR REMOVING THE DIFFERENT FORMS OF THAT AFFECTION.

BY JOHN SCOTT,

SENIOR SURGEON TO THE ROYAL LONDON OPHTHALMIC HOSPITAL,

SURGEON TO THE LONDON HOSPITAL, &c.

LONDON:

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I HAVE long considered that the chief difficulty and the chief danger attending the extraction of Cataract has arisen from the force that is necessary to transfix the cornea with the instruments commonly employed for that purpose; and that spasm of the recti muscles, induced by that force, compressing the iris between the hard lens and the side of the knife, and occasioning inflammation of that membrane, has been the most frequent cause of an unfavourable result of the operation. It therefore occurred to me, that if these inconveniences could be obviated, the facility of performing the operation would be greatly increased, and its success proportionately augmented. With this view I have constructed the knife described in the following pages, and having now tested its utility in a great number of cases, I am anxious to afford to others the opportunity of using it with the advantage that I have derived from its employment.

JOHN SCOTT.

10 *New Broad Street*, 1843.

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CATARACT,

AND ITS TREATMENT.

General Description of Cataract.

THE term cataract is applied to any opacity of the lens or capsule that obstructs the aperture of the pupil, and thus prevents the admission of light to the retina. It is derived from the Greek word *καταράκτης*, which signifies a gate or portcullis (Herodotus, book 5. ch. 6.), from *καταῤῥάσσω* or *καταῤῥήγνυμι, cum impetu decidere facio*; so also Livy, book 27. ch. 28, "cataracta dejecta clausa erat." It is manifest that there is no analogy between an opake lens and a waterfall, while that between a cataract shutting up the aperture of the pupil and a gate or portcullis is sufficiently obvious.

Cataracts have been divided into those that are genuine, which the foregoing definition comprises, and those that are spurious, which consist of a false membrane deposited in the pupil, in consequence of inflammation of the iris, and are hence termed cataractæ grumosæ, purulentæ, lymphaticæ, &c. These however may more properly be referred to the head of Closed Pupil. Cataracts may be divided into lenticular, capsular, and capsulo-lenticular; they may be imperfect, and confined to a portion of the lens or capsule, or complete, and involve the whole of either of them.

By a lenticular cataract is understood an opacity confined to the lens itself, and not involving its capsule. Of this form there are three varieties, distinguished by their consistence and their

colour—the hard, the soft, and the fluid cataract; and these divisions, which are sufficient for all practical purposes, approximate each other by imperceptible gradations.

Different Forms of Cataract.

The hard lenticular cataract is of the consistence of softened bees'-wax, and of an amber colour, more or less deep in proportion to its firmness. I have removed a cataract nearly as dark as pitch, and it was of very firm consistence; when of this deep colour they have been termed black cataracts. There is, however, the same relative difference in consistence between the circumference, the surface, and the centre of the opake, as of the transparent lens; so that the nucleus is usually much more firm and of a much deeper colour, the cataract becoming gradually lighter and more of a greyish hue, as it recedes from the centre. This form is the cataract of old age, and is the one most frequently met with, but it is rarely seen under forty years of age. The opacity too usually commences in the centre of the lens, and thence it gradually and slowly extends to the surface and to the circumference, presenting the appearance of a regular and uniform opacity. The rapidity of its progress will vary very much in different instances; usually several months will elapse before it will become complete, and sometimes its completion will occupy as many years. The comparative slowness of its formation is also a very good indication of its consistence, its firmness being usually in proportion to the length of time occupied in its completion; a very hard cataract is often rather smaller than the natural lens. Traumatic cataract, and that form which arises from inflammation independently of wound, may be confined to one eye, and the ordinary cataract of old age may also, in some rare instances, be confined to one eye; but in a very large majority of cases the disease commences in one eye, and by the time that the opacity is complete in it, the second eye also begins to be similarly affected, and sometimes at an earlier period.

Sometimes the opacity will commence at the circumference of the lens, and then it assumes a striated appearance, the intervals between the striæ retaining their transparency for a short time, and then also becoming opake; but even after that they present

a different shade of colour, so that the striated aspect is still preserved. In this form of cataract, in its early stage, the opacity may not be visible in the natural state of the pupil, but when it is dilated by belladonna, the opake lines are distinctly recognised, and account for the defective vision the patient complains of. The striæ here spoken of are generally of a dullish amber colour, deeply seated in the lens itself, and must not be confounded with the striated appearance the capsule often presents when opake, which is superficial, presenting a shining brilliant surface, that has been aptly compared to the fracture of spermaceti. When these opake striæ have extended over about one-third of the space from the margin of the lens towards its centre, the centre also begins to become opake, this opacity presenting a uniform, not a striated appearance, and gradually extending, until it meets the external opacity that is already formed; and it is a remarkable circumstance, that the cohesion between the nucleus of the lens and its opake margin is in these cases so slight that the latter is generally separated from the former more or less completely in its passage through the pupil when the cataract is extracted. This kind of cataract is usually very slow in its formation, often occupying a year or more in its completion. Sometimes too the opacity will commence at the junction of the three lines that divide the lens into three portions, extending in the direction of those lines and rendering them opake before the rest of the body loses its transparency; and this may occur either in hard or soft cataract.

The soft cataract is usually of the consistence of jelly, and it is of a white colour, more like that of skim-milk than anything else I can compare it to. Instead of being smaller, it is usually rather larger than the natural lens, so that it often occupies the whole of the posterior chamber, and is in contact with the iris, impeding its movements in some degree. Its colour is nearly uniform throughout, presenting no traces of an amber hue, and scarcely more opake in the centre than towards the margin of the lens. In this form of cataract the opacity also usually commences in the centre, and gradually extends to the circumference and the surface of the lens; it is more rapid of formation, and occurs at an earlier period of life than the hard cataract. Sometimes, how-

ever, it commences in distinct spots of a whitish aspect, with intervals of transparent lens between them; these spots gradually extend and approach each other until the whole of the lens becomes opake. I have seen a soft traumatic cataract complete in eighteen hours after the infliction of the wound, and the idiopathic form has occurred in nearly as short a time, but it usually requires many weeks for its completion.

Cases are described by Wenzel and also by Beer, in which the external part of the lens has been converted into an opake whitish fluid, the centre retaining its firmness and its transparency as well as the capsule. This fact is stated to have been proved in Baron Wenzel's cases, by the escape of the opake fluid when the capsule was lacerated in making the section of the cornea for the purpose of extracting the lens; the patient immediately perceived small objects distinctly without the aid of a convex glass, the use of which greatly confused vision, and the next day the transparent lens escaped from the eye and was found in the dressings.

In a similar case mentioned by Beer, he extracted a firm transparent lens. These are supposed to be instances of opacity commencing in the *humor Morgagni*, and are called Morgagnian cataracts. Fluid cataract is said to be more opake at the lower part than in the centre when the eye is at rest; and it is observed that by rubbing or moving the eye, the opacity becomes for a moment equally diffused over the whole pupil; it also projects more at the lower part than at the centre of the lens, as may be seen if the eye be examined in a dilated state of the pupil and viewed laterally. It is usually met with in young persons, and when found in advancing years, it is the surface and circumference of the lens only that is fluid, the centre being generally of firm consistence and of an amber colour.

Capsular cataract may be seated either in the anterior or posterior capsule, or both of these parts may be the seat of opacity, when it is termed a complete capsular cataract. Although the anterior capsule may become opake to a limited extent from diseased action, which being arrested does not proceed to destroy the transparency of the lens, and although opacity may commence in the anterior or in the posterior capsule, before the lens

becomes affected, it cannot proceed to any great extent in either, much less can it involve them both without the transparency of the lens being also destroyed, so that complete capsular cataract not involving the lens, is not met with.

Capsular opacity does not usually commence in the centre, but at the margin of the membrane; sometimes it proceeds in regular striæ towards the centre, presenting a shining satin-like appearance, much resembling the fracture of spermaceti, and leaving intervals of transparent membrane, which soon become opake also, but still retain the striated appearance.

In other cases it will be a dull white opacity, unequal in density, and extending irregularly over the surface of the membrane, presenting the appearance of dense, firm, chalk-like opacity, almost in a line with the margin of the iris, distinctly visible when viewed laterally; but if the lens only be opake, the capsule still retaining its transparency, there is an apparent interval between the iris and the opacity, the surface of the lens not being so densely opake as abruptly to reflect the rays of light, but allowing them to penetrate it to a limited extent.

Partial opacity of the anterior capsule is not unfrequently met with; sometimes it results from inflammation which has been arrested before it has destroyed the transparency of the whole membrane; very frequently it is owing to purulent ophthalmia in infancy, which seems to extend to the aqueous membrane and deposit a spot of lymph in the centre of the capsule, which is permanently opake, occasionally in an elevated form (*cataracta pyramidata*), although the iris itself presents no traces of adhesion or opacity; sometimes too a limited opacity of the capsule is a congenital defect; and in all these cases it may remain stationary for years, if not for life, without involving either the rest of the membrane or the lens itself.

The opacities of the anterior capsule have been differently designated according to their supposed resemblance to different objects, but these are varieties it is useless to dwell upon, and when not involving the whole of the capsule, they are generally abruptly defined and circumscribed.

The posterior capsule may also be the primary seat of opacity, the lens still retaining its transparency; when this is the case

the opacity commences in the centre of the capsule, whence it extends towards the circumference in the form of distinct radii, somewhat resembling the figure of the star fish; it is concave on its surface, and presents a yellowish hue from being seen through the substance of the lens. This opacity is very slow of increase, and will remain nearly stationary often for a year or more; ultimately, however, the lens becomes opake before the intervals between the opake radii in the capsule have lost their transparency.

I have recently operated in two cases of this affection after watching their progress; and in both of them the lens was extracted entire, but there remained afterwards a capsular cataract that required to be pierced with a needle.

This concave radiated appearance of the opake capsule must not be confounded with that species of lenticular cataract in which the opacity commences at the circumference of the lens in a striated form with transparent intervals, and which, although it appears to be deeply seated in the lens, does not present the concave appearance here spoken of.

Complete capsular cataract, if it exist, cannot be detected; for if the anterior capsule be opake, it necessarily precludes our view of the posterior. We have seen, however, that neither the anterior nor the posterior capsule can become opake throughout its whole extent without the lens also losing its transparency; and it therefore follows, *à fortiori,* that both of them cannot be so affected without a similar result.

The only examples of complete capsular cataract that occur are those in which the lens has become absorbed, as in the instance of traumatic cataract, when the wound in the capsule has been large enough to expose the substance of the lens to the solvent power of the aqueous humour; and cases of congenital cataract, in which it has become spontaneously absorbed, which used often to occur at this early period of life, constituting the *cataracta arida siliquosa,* when its removal was delayed until the age at which it could be extracted.

Complete capsular cataract, the lens being removed, presents a dense white aspect, irregular in thickness, and varying in the degree of its opacity at different parts.

The anterior chamber is always considerably enlarged, and the margin of the pupil often adherent to the opake capsule, which is sometimes lacerated to a greater or less extent, presenting an aperture of various size, and allowing of a proportionate degree of vision.

Sometimes, after the extraction of the cataract, a portion of opake capsule may obstruct the pupil so as to impede vision considerably, and yet, not presenting that white aspect, it can only be recognised on a close inspection of the eye.

Capsulo-lenticular cataract is a very common form of the affection, and you can usually recognise not only the superficial, dense, shining opacity of the capsule, which is nearly on a line with the margin of the pupil, or the dull white, chalk-like aspect it sometimes assumes; but it is also sufficiently transparent to allow you to see through it the opake lens itself, and to recognise distinctly either the deep amber colour of the hard cataract, or the milk-white aspect it assumes when the cataract is soft.

The lens, when opake, usually retains its natural position, but sometimes it becomes dislocated from accidental violence, or it may be separated by disease from its natural attachments, floating backwards and forwards in the vitreous humour (which under these circumstances becomes fluid), or passing forward into the anterior chamber.

Sometimes the lens will become converted into a chalky concretion, which seems to occur chiefly in scrofulous or gouty subjects; and I have three specimens in which it is composed entirely of ossific matter. These cases are always the consequence of disorganizing inflammation of the globe. When the capsule becomes opake, black spots of various size and shape are often observed on it: they arise from previous adhesions of the uveal margin of the iris, but could not be detected while the black aspect of the pupil failed to form a contrast with them; now, however, they are readily distinguished, the capsule having lost its transparency.

Symptoms of Cataract.

Dimness of vision is the first symptom that arrests the atten-

tion of the patient; he sees all objects that are presented to him, but they appear to a certain extent clouded and obscured by a mist, in which they seem to be enveloped; he perceives distant objects more clearly than those that are close, but this he attributes to advancing years; he can see in a lateral direction usually better than directly forward, and in a weak light, as in twilight, or with the eye shaded, or with his back to the window, he can see much better than when the eye is exposed to a strong glare of light. This arises from the opacity usually commencing in the centre of the lens, so that when the pupil is contracted, it is obscured by the opake body; whereas if dilated, as in a weak light, the rays of light can pass through the still transparent and thinner circumference of the lens to the retina; and, for the same reason, vision is greatly improved by dilating the pupil with belladonna.

Muscæ volitantes are an occasional, but by no means an invariable, attendant on the formation of cataract; they would seem not to depend on any opacity of the lens, or they would be a constant instead of an occasional symptom, but they appear to arise from the same state of congestion of the internal tunics as that which induces this appearance when there is no opacity of the lens at all, an opinion that is confirmed by the fact that they often continue after the removal of the cataract.

Usually, however, cataract forms without any other appearance of disease in the eye, or any unpleasant symptom to arrest the attention, so that the patient is not aware of its presence until he accidentally discovers that his sight is impaired.

As the opacity of the lens increases in density and in extent, in the same proportion does the vision become more and more imperfect, until at length he is unable to distinguish the defined outline of any object that may be placed before him. Even in a dilated state of the pupil, the utmost he can ultimately do is to distinguish the passing of the hand before the eyes when they are exposed to a strong light.

Inability to judge of distance is also another symptom that is frequently complained of when one eye only is affected to the extent of greatly interfering with vision; the patient having been accustomed to estimate the distance of objects by the combined

aid of both eyes, he is unable to do so when thus deprived of the use of one.

There is always a uniform ratio between the degree of visible opacity and the loss of vision. Cataract, however dense or dark it may be, can never so completely obstruct the rays of light as to occasion total blindness; the patient can always distinguish light from darkness, and is sensible of the hand being passed between the eye and the light from a window or a candle, so that whenever the perception of light is completely lost, it is an evidence that the eye is amaurotic, even if there be opacity of the lens also.

The pupil is usually uninfluenced by cataract, retaining its natural diameter and mobility except in the case of soft cataract already alluded to, in which the lens, bulging forward in consequence of its increased size, presses against the iris and mechanically interferes with its movements. Of course it is necessary in cataract, as in all other cases, when examining the mobility of the pupil, to exclude the light from the other eye, as the sympathetic action of the two irides will often remain when the isolated motion is lost from an amaurotic condition of the retina.

Diagnosis of the different Forms of Cataract.

In the striated form of cataract, the patient's vision is not improved by dilating the pupil either by belladonna or by shading the eye and excluding the light: this is owing to the fact that this form of cataract commences at the circumference instead of beginning at the centre of the lens, and therefore its margin is the most opake part of the lens throughout the whole progress of the case, and consequently it cannot transmit the rays of light better than the centre. In this form, objects are not only obscured by a mist, but they also sometimes appear twisted out of their natural direction, so that their figure is apparently distorted and irregular. Luminous bodies, too, will often seem to be multiplied; this is owing to the interruption and division of the rays of light by the opake striæ that partially intercept their transit to the retina.

In the early stage of the hard lenticular cataract, the opacity is

confined to a spot in the centre of the lens of a greyish colour, and which on a superficial examination appears to be deeper than it really is, owing to the surface of the lens still retaining its transparency, and on this account it is liable to be mistaken for glaucoma; but a more attentive examination in a dilated state of the pupil will show that the opacity is not deep enough to be seated in the vitreous humour, although in this early stage, when confined to the centre of the lens, the opacity will appear to be seated on the opposite side of the eye to that on which the light falls upon it, and to change its position if that of the patient be changed, so as to alter the direction in which the rays of light are admitted into the eye.

It is of a deeper colour in proportion to the firmness of its consistence, varying from a light amber colour to that of a dark mahogany; it is more slow of formation, vision is longer preserved in a dilated state of the pupil than in the other forms, and you can generally distinguish the difference in colour between the centre and the circumference of the lens commensurate with the proportionate diminution of its firmness towards the margin. The surface also being less opake than the centre of the lens, it does not reflect the rays of light abruptly, but allows them to penetrate somewhat so that the opacity appears to be at a little distance behind the iris, and not in a line with it, as in the case of capsular cataract.

Soft cataract is of a more uniform and of a lighter colour, becomes complete in a much shorter time, occurs at an earlier period of life than hard cataract, and the margin of the lens is usually more opake, so that vision is more obscured even in a dilated state of the pupil.

When the capsule is opake as well as the lens, the superficial seat of the opacity, abruptly reflecting the rays of light from the surface, is a marked and characteristic symptom; it is either shining satin-like and often striated, or dull and irregularly opake, presenting a somewhat chalk-like appearance, but usually it is sufficiently transparent to allow the colour of the lens to be distinguished through it. This opacity of the capsule is nearly on a line with the margin of the pupil, sometimes even projecting somewhat forward through the aperture; whereas, when seated

in the lens itself, it is at a little distance behind the iris, and appears deeper than it really is, from the opacity being so inconsiderable on the surface of the lens, and becoming more dense as it approaches the centre.

Diagnosis of Cataract from other Affections.

In glaucoma the mobility of the pupil is much impaired, if it be not altogether lost. The opacity is deeply seated, and in the early stage, being limited to a spot of small size, it appears to change its position, according to the direction in which the rays of light are admitted into the eye; it is apparently of a greenish hue, the loss of vision is much greater than the visible opacity will account for, and the opacity is not perceptible if the eye be examined sideways, instead of looking deeply into it. Although the opacity is deeply seated in cataract commencing in the posterior capsule, it is then always striated, with transparent intervals between the striæ, whereas in glaucoma it is uniform in appearance. The patient sees better in a strong than in a weak light, and his vision is impaired instead of being improved by the use of belladonna. In cataract a candle appears to be simply obscured by a mist, whereas in glaucoma its rays are often scattered and dispersed, so that it appears to be surrounded by a halo, and the prismatic colours are often visible.

As the disease advances in glaucoma the pupil becomes irregular, motionless and dilated; the lens is also opake, but it is then of a greenish dirty hue, and at the same time it often becomes thrust forward, pressing the iris before it, and thus lessening the capacity of the anterior chamber, the veins returning the blood from the sclerotic coat being also injected and of a purplish hue.

In amaurosis the patient sees better in a strong light, and with his face towards a window, than in the opposite direction, and his vision is further impaired instead of being improved by the use of belladonna. The symptoms too of cerebral congestion, pain in the head and eye, that attend both glaucoma and amaurosis, are not observed in cataract, while the blackness of the pupil in the latter shows that the loss of vision does not depend on me-

chanical obstruction. The pupil is often dilated, generally very sluggish if not altogether motionless, but it is almost invariably irregular. Sometimes in artisans, in whom the disease has been induced by intense application of the organ to minute objects, it is remarkably contracted. In cataract with adherent iris its motions may be impeded and the pupil irregular, but in these cases it is obviously dependent on the synechia posterior which the eye cannot fail to detect. This remarkably contracted state of the pupil may be induced without any defect in the retina; and if cataract be superadded it will be very difficult of detection, and liable to be mistaken for amaurosis. An old gentleman, who had all his life been of very studious habits, and had latterly been reading a small Greek Testament a great deal, found his sight rapidly failing, and at length could not see to read at all, which was to him so great a privation that he consulted several gentlemen, who, from the state of the pupil and his previous habits, at once inferred that it was a case of amaurosis. Finding, however, that his sight had become impaired without any other symptom of amaurosis than the state of the pupil, I declined to give any opinion on his case until it had been subjected to the influence of belladonna, and dropped a solution of it into the eye for that purpose. The pupil very shortly became dilated, and he hurried back to me overjoyed at finding that he could see to read as well as ever he could in his life, and by continuing the use of belladonna his vision was perfectly preserved as long as he lived. It is therefore a necessary rule never to decide on any case in a contracted state of the pupil, without first attempting to effect its dilatation. If the pupil be not contracted, a case of amaurosis may be readily distinguished from cataract by the absence of any visible opacity to account for the loss of vision that is complained of. The deeply seated opake spot that is sometimes seen in amaurosis, whether it depend on deficiency of pigment or on the transparency of the retina being destroyed, is not liable to be mistaken for the more superficial opacity of the lens; and there is a marked contrast between the vacant stare of an amaurotic eye, and the attempt to obtain lateral vision by the side of the cataract, indicated by the lateral movement of the

head, and prompted by the consciousness on the part of the patient that he still retains the power of seeing, however much its exercise may be obscured.

Causes of Cataract.

Opacity of the lens and capsule may result from inflammation, of which the most common example is that arising from wounds of these parts, when their transparency will sometimes be completely lost in a few hours. Independently of any wound or injury, inflammation of the lens and its capsule may occur, rendering them opake; and this opacity may be either partial or complete. General congestion of the cerebral vessels, and of those of the globe of the eye in particular, may also give rise to cataract; and purulent inflammation in infancy is by no means an unfrequent cause of central capsular opacity, which is sometimes attended with general dullness of the capsule; in all these cases the cataract is of a soft consistence and of a white colour. In advancing years, however, we find that the lens becomes somewhat flattened on its surface, and at the same time often loses its transparency, without any assignable cause; in these cases it assumes a dark amber colour, and this is the ordinary form of cataract which occurs in old people. As this appearance is quite different from that which arises when symptoms of inflammation are present, it follows that this change cannot be referred to any inflammatory process; but at the same time it seems that a state of cerebral congestion very much favours the occurrence of hard cataract and expedites its completion, although it very frequently arises independently of such predisposing cause.

Prognosis.

When the lens has once lost its transparency, no power can restore it. If there be only partial opacity, depending on lentitis, the inflammation may be subdued by suitable treatment, and the further increase of the opacity prevented. If the cataract be incomplete, confined to one eye, and dependent on cerebral congestion, depleting measures may retard its progress and pre-

vent the occurrence of cataract in the second eye; but if it has arisen in one eye, independently of this cause, the second will almost invariably become affected. I am disposed to attribute the non-occurrence of a cataract in the one eye, which has been ascribed to the removal of an opake lens from the other, rather to the depleting measures necessarily attending the operation in persons of a full habit, than to the removal of any specific influence which an opake lens in one eye can exert over a transparent lens in the other. Were it otherwise, we should expect a cataract in one eye always to be followed by one in the other, and that the removal of the former would invariably prevent the occurrence of the latter; whereas experience abundantly proves that the contrary is usually the case, and that the operation, except under peculiar circumstances, is very rarely followed by any such result, while traumatic cataract often remains in one eye for years without the other becoming similarly affected.

If the cataract be confined to the centre of the lens and capsule, the constant use of belladonna may preserve perfect vision for many years, and it is a remarkable fact, that the influence of this agent on the pupil does not become impaired, however long its use may be continued. The prognosis, as regards the operation for removing the cataract, is favourable when it is not complicated with any other disease in the organ, and occurs in a healthy state of constitution. It is less favourable when complicated with synechia posterior, with synchysis oculi, and if the other eye be either glaucomatous or amaurotic; if it occur in a plethoric person, or in one of a debilitated habit, or who is of a gouty or rheumatic diathesis.

The operation is not justifiable unless the patient has a decided perception of light, and unless the globe is free from any organic disease. It is exceedingly desirable to ascertain, if possible, before operating, whether the loss of vision depends exclusively on the obstruction of the cataract, and whether it is not in any degree dependent also on a defective condition of the retina, as if that be the case, although a very valuable amount of vision will be restored by the operation, it will not be so complete as if the eye were otherwise in a perfectly healthy state, and the patient may be disappointed at not receiving so much

benefit as he may have been led to expect; and perhaps reflections may be cast upon the surgeon unless this condition has been previously ascertained and its consequences pointed out. The extent to which the outline of objects can be perceived, and the mobility of the pupil, are the chief signs on which a correct prognosis of the case may be formed.

Congenital Cataract.

Congenital cataract may be either partial or complete, it may be lenticular or capsulo-lenticular, but it is always either soft or fluid, therefore of a white colour, and more or less densely white in proportion to the degree in which the capsule is rendered opake. The lens is usually rather smaller than natural, and the anterior chamber consequently somewhat larger.

If the cataract remain for some years undisturbed, the substance of the lens will usually have been absorbed, the opake capsule only remaining; these cases are not now so frequently met with as they formerly were, when the mode of removing the disease was not so generally known as it now is.

The infant is remarked not to take notice of objects that are presented to him, and to roll the eyes about as it were involuntarily. This leads to an examination of them, when the white opacity in the pupil is readily detected, but its extent can be accurately ascertained only when the eye is under the influence of belladonna.

The only affection with which this is liable to be confounded in the infant is that of disease of the internal textures of the eye, in consequence of which the lens becomes opake. Here, however, it is also observed to be at the same time thrust forward, causing the iris to project into the anterior chamber, and the pupil is fixed and motionless, the iris being likewise altered in colour.

In the opinion of Professor Walther, congenital cataract is not to be regarded as a consequence of disease taking place in fœtal life, but that a turbid state of the lens being natural to the fœtus and the further development of this structure being suspended, it does not acquire the transparency to which it would have at-

tained but for this arrest of its development. To this idea, however, it may be objected, that although congenital cataract is often smaller than the natural lens, such is by no means invariably the case, as it very frequently attains its full size; but the more valid objection to this opinion is derived from the cases of partial congenital cataract so often met with, the centre of the lens only being opake, its circumference perfectly transparent, fully developed, and the patient being able to read a small print without glasses and with perfect ease.

Congenital cataract has been by some considered to be an improper term, as they ascribe the opacity of the lens or capsule met with in infants, not to a congenital defect, but to rupture of the capsule, which they suppose to have occurred during the violent convulsions that sometimes take place shortly after birth. This supposition is confuted by the constant occurrence of cataract where no convulsions have taken place, by the frequency with which convulsions occur in infants unattended by this effect, and also by the cases of partial congenital cataract which cannot have arisen in this manner.

That there is an hereditary tendency to this affection is fully established, several members of the same family being frequently the subjects of it. A few days since I saw a young gentleman with partial congenital cataract, whose two brothers I had operated on some years before for the same disease.

The prognosis of this affection is decidedly favourable; the operation scarcely ever fails of success, if it be performed with the requisite care and nicety, and under favourable circumstances as regards the constitutional state of the patient.

Partial opacity of the lens or capsule is a very frequent congenital defect. It may be confined to a minute spot or extend to within a line of the circumference of the lens, but most frequently it is of the size of the ordinary pupil, and is abruptly defined and circumscribed, so that the patient enjoys good vision in a weak light, when the pupil is dilated somewhat beyond its usual limits. Sometimes you will have an opake spot in the centre of the capsule, surrounded by a more extensive opacity seated in the lens alone, and occasionally the capsule will be dotted with minute opake points.

These cases of partial cataract will usually remain stationary for years. If the opacity be smaller than the natural pupil, the patient will see tolerably well, but if larger than this he will only see in a weak light; and objects that are directly before him he will be unable to distinguish, so that he soon acquires a lateral movement of the head and eyes to enable him to see obliquely sideways, a movement that is very peculiar, and quite characteristic of this affection.

About the period of puberty, if not before, the opacity begins to increase, and opake striæ are observed to shoot from the margin of the opacity to that of the transparent circumference of the lens, and this opacity gradually increases and extends until the whole circumference loses its transparency.

Opacity confined to a limited extent, and consisting either of lens or capsule, or both, is also sometimes met with as a congenital defect, wherein the opake spot is surrounded by a black ring, through which the patient retains some degree of vision, but which does not consist of the transparent circumference of the lens.

In these instances the lens has either never been fully developed, or it has become subsequently absorbed, and together with the capsule, which is usually exceedingly tough, shrunk up and diminished in bulk.

These cases are readily distinguished from those that have been just detailed by the improved vision the patient enjoys with the aid of convex glasses, whereas they of course altogether confuse his sight when the opacity is surrounded by a transparent circumference of the lens.

Treatment of Cataract.

Since all other means are unavailing for the removal of cataract, I proceed in the next place to consider the circumstances that preclude the propriety of its being removed by operation, those under which the operation should be performed, and the different modes of operating that are adapted to the various forms of cataract.

I consider that the operation ought rarely to be performed on an eye that retains a useful degree of vision, for should it unfortunately fail of success, the patient will complain that he has been deprived

by it of the vision he previously enjoyed, and probably he will be slow to believe that he would at all events have lost his sight even had he not submitted to the operation.

This observation applies with even greater force to cases of congenital cataract in which the centre of the lens only is opake, its circumference still remaining transparent, and through which the patient still retains good vision. By the aid of belladonna, he may retain very useful vision for years under these circumstances, of which he will be deprived if the operation fail, and it seems that it is very liable to be followed by inflammation in these cases, probably from the morbid change that is still slowly going on in the lens; but even if it succeed, the vision he will enjoy by the aid of convex glasses is so inferior to that through the margin of the natural lens, that he will see worse than he did before the operation.

In the early stage of cataract I am aware that the lens still retains its natural consistence, and that the operation by solution will then effect its removal. I cannot, however, advise the adoption of this practice, for the reason already stated; but if an intelligent patient, fully aware of the nature and circumstances of his situation, desires the removal of the cataract in the manner just mentioned, to avoid delay, I know of no good reason for refusing to comply with his wishes; but I do not consider it prudent for the surgeon to take upon himself the responsibility of making any such recommendation. Indeed the operation by solution can scarcely be more successful than that by extraction, when performed in the way detailed in the following pages, so that I do not see any practical advantage that will accrue to the patient, under ordinary circumstances, from removing the cataract in its early stage by that method—a method necessarily occupying a considerable time in its accomplishment. If, however, the circulation be so feeble that there is not sufficient power to heal the section of the cornea, if there be extensive synechia posterior, or any other reason to forbid the extraction of the cataract, its early removal in the manner just alluded to may be had recourse to with advantage.

Neither is it advisable to operate until the sight of the second eye is already so much impaired as to satisfy the patient that it

must inevitably be totally lost, for if not, he will be very likely to attribute the loss of the second eye to the operation having been performed on the other, because he could previously see very well with it.

When however the cataract is considerably advanced in the second eye, I know of no good reason for delay. The patient will certainly appreciate more highly the blessing of his sight, and will more highly value the service of him, who is the instrument of restoring to him so invaluable a possession, if he has been totally blind, than if he still retains useful vision in one eye when the operation is performed on the other. But as regards the advantage of the patient himself, which should be the only subject of our consideration, I cannot see what benefit he is to derive from being doomed to complete darkness for any time, however short. Experience fully proves that in old people, whose powers are failing, warm weather is so very much more favourable for the healing of the section in the cornea than cold, that it is exceedingly desirable not to operate in winter, and that the doing so will very much lessen the probability of success; by waiting for total blindness, we may be subjecting the patient to the most distressing of all privations for many months, whereby his system may be rendered irritable, his health impaired from want of exercise, and the eventual success of the operation may consequently become more doubtful. Besides, if the patient still retains useful vision in one eye, he will be less anxious to employ a glass for the other that has been operated upon until a sufficient length of time has elapsed to allow him to do so without risk of injury. It may also be inferred, from the preceding observations, that I do not think it desirable to operate on both eyes at the same time. Should there be any unhealthy state of system causing inflammation to succeed the operation, it will equally influence both eyes, and vision may be irrecoverably lost; or if, from accidental local circumstances, inflammation be set up in one eye, the second may very probably be sympathetically affected; whereas if one only be operated on, and any unfavourable result should occur, we may hope to operate on the other under more favourable circumstances and with good prospect of success. I am fully aware, that if one eye be lost in consequence of

the operation, the second eye will rarely be confided to the same operator, and another surgeon will thus have the opportunity of acquiring considerable credit at the expense of his neighbour; but this consideration does not invalidate the arguments that have been used in favour of the single operation in regard to the welfare of the patient, in comparison with which the advantage of the surgeon deserves not a moment's consideration.

It has been suggested that the formation of a cataract in the second eye is owing to the sympathetic influence of that already formed in the other, and not to the continued operation of the cause to which its origin is to be ascribed; and therefore it has been advised that the one eye should be immediately operated on, with the view of preventing the other from becoming similarly affected. There seems, however, to be no good reason for entertaining this opinion, nor for adopting the treatment founded upon it. The cataract of old people appears to depend upon constitutional causes that exert an equal influence over both eyes, and therefore both are usually affected within a short period of each other: but we constantly meet with instances in which a cataract has formed in one eye from accidental causes in young persons, and in whom it continues for many years without inducing a similar affection in the other eye; and these instances are so numerous, as to show that the occurrence of a cataract in one eye is not to be regarded as the cause of its production in the other.

I scarcely ever operate when one eye only is affected, because the sight of the eye when deprived of its lens, is so inferior to that of the one which remains in its normal condition, as to be comparatively useless to the patient. The only exception to this rule is in the case of young persons in whom the cataract is soft, and consequently white and very remarkable, and they are usually very desirous of getting rid of the appearance, notwithstanding they are fully given to understand, that the operation will not be followed by any advantage in regard to their vision.

I have never found any confusion of vision to arise from the want of correspondence between the focus of the two eyes, when one has been operated upon. Indeed the power of the eye when deprived of its lens is so inferior to that of the other, that the

impression it receives appears to be altogether disregarded, the patient actually using only the sound eye.

There are three modes of operating for the removal of cataract :—

1st. The making a section of the cornea, through which it is removed altogether from the eye, and which is called the operation of extraction.

2nd. The depressing the lens below the axis of vision, and leaving it imbedded in the vitreous humour, which is called the operation of depression or reclination.

3rd. The opening out of the texture of the lens and exposing it to the solvent power of the aqueous humour, which is called the operation by solution or absorption.

The treatment of cataract depends upon its nature. The hard amber-coloured cataract is most frequently met with in practice, and extraction is undoubtedly the operation that is best adapted for that form, unless it be contra-indicated either by the local condition of the eye or by the constitutional state of the patient. The hard lens is unfavourable for the operation by solution ; and that by depression, notwithstanding the apparent ease with which it may be performed, is by no means so generally successful as the operation by extraction : in the latter the danger attends the operation, while in the former it is rather to be looked for subsequently to its performance.

The presence of extensive synechia posterior is a circumstance that forbids the operation by extraction, for although the section of the cornea be accurately completed, the fibres of the iris are so firmly agglutinated that the pupil cannot dilate to allow the escape of the lens, and the division of the iris therefore becomes necessary ; as this membrane has been previously inflamed, of which its adhesion is an evidence, this division of its fibres is very liable to reproduce inflammation in it to a serious extent.

It should therefore be an invariable rule to examine the eye when under the influence of belladonna, before determining on the propriety of operating by extraction, and this is more especially necessary as these adhesions cannot always be detected in the natural state of the pupil.

Small size of the anterior chamber from enlargement of the

lens, which together with the iris projects somewhat forward, so that the section of the cornea cannot be completed without danger of wounding the iris, is considered an objection to extraction; but I have found that if the pupil be fully dilated, there is usually room to pass the knife in the way I am about to propose without wounding the iris. It is only the centre of the lens that bulges forward to any considerable extent, and the wound of the capsule at this part is a necessary step in the operation; the surface of the lens recedes so much towards its margin, that there is generally room to pass the knife between the margin of the cornea and the surface of the iris in this situation, provided it can be done without using so much pressure, as to evacuate the small quantity of aqueous humour that the anterior chamber contains.

In these cases it has been considered necessary to diminish the volume of the lens by performing the operation of solution, which is applicable only to the soft surface of the cataract, before extracting the firm nucleus. This proceeding has been required, because the pressure occasioned by the introduction of Beer's knife often causes the escape of the aqueous humour, and then the iris is necessarily placed in contact with the knife. This operation by solution, however, being also generally attended with the escape of the aqueous humour, the iris becomes compressed against the cornea by the lens already in contact with it, and thus it has produced inflammation of the iris and synechia posterior. The separation of this adhesion, and of the fibres of the iris which are also somewhat agglutinated, in the subsequent escape of the lens through the pupil when extracted, has been productive of inflammation of the iris, which has led to serious consequences; on this account, the mode of performing the operation detailed in the following pages is particularly applicable to this form of cataract, the pupil being at the same time fully dilated.

The presence of an extensive *arcus senilis* has been regarded by some as an objection to the operation of extraction, from their supposing that when divided by the knife it will not heal; such however is not the fact, for I have repeatedly divided it in the operation, and it heals as readily as the transparent part of the cornea.

A sunken eye, a very prominent brow, and a small palpebral

fissure are objections to the ordinary mode of performing the operation, on account of the pressure that attends the introduction of the knife, which turns the eye inwards to the nasal canthus of the orbit, and occasions great difficulty in completing the section in the usual way; but they will not be found to offer the same objection to the mode I am about to propose. With regard to any impediment that may arise from unsteadiness on the part of the patient or of the eye, I will only observe, that I have operated with perfect success on a patient affected *with shaking palsy*; and so little pressure attended the passing of the knife across the anterior chamber that the aqueous humour did not escape, nor was the iris wounded in the slightest degree, notwithstanding that the agitation of the patient was extreme. Not only was the head in constant motion, but every muscle of the body in a state of spasmodic action, so that any attempt to perform the operation in the usual way would have been considered altogether hopeless.

A fluid state of the vitreous humour is also regarded as an objection to the operation of extraction, and undoubtedly it lessens the probability of success, not only on account of the difficulty of performing it, but also on account of the danger of reproducing the inflammation of which the fluid state of this humour is the consequence. If, however, the operation is performed without producing any pressure on the globe in the way I am about to describe, and in the recumbent posture, the lens being extracted by a hook, and not squeezed out of the eye in the usual manner, it may be performed with perfect safety; and I may add, that *synchysis oculi* is still more unfavourable for depression than it is for extraction, because it is impossible to fix the lens in the fluid vitreous humour, where it floats about and is very liable to produce destructive inflammation of the internal tunics, in an eye that has been previously the seat of disease.

If the cornea have suffered much from previous inflammation, whereby it has been rendered extensively opake, and its texture softened, so that it is incapable of setting up adhesive inflammation, to close a wound in it by the first intention, the operation of extraction cannot be performed, as the eye would probably be lost from the suppuration of the section of the cornea.

The presence of trichiasis or entropium of course forbids this operation, not only on account of the inflammation of the globe that necessarily attends these affections, but also by reason of the irritation to which they would subject the section of the cornea; and any other disease of the eyelids, as tinea or lippitudo, must be, for the same reason, removed before the operation of extraction can be performed with propriety. Again, a violent cough is a very serious objection, as the edges of the wound in the cornea may be thereby separated, and the vitreous humour forced out of the globe.

Independently of the condition of the eye itself, that of the patient may also be such as to preclude the propriety of extracting the cataract. Thus, if the patient have any symptoms of gout or rheumatism, the operation must not be performed until they are removed; if the digestive organs be in an unhealthy condition, they must first be restored to a natural state. If a plethoric state of system prevail, it must be reduced; and this will be done much more safely and effectually by abstinence, at the same time that the bowels are freely acted upon, than by suddenly reducing the volume of circulating fluid by the abstraction of blood.

On the other hand, the circulation may be so feeble that there may not be strength in the system to institute the healing process in a structure of so weak vital power as the cornea, and then suppuration will occur and the eye will be lost. In this state of constitution the operation must not be performed unless the patient's power can be restored to a healthy standard, this can generally be effected by suitable treatment, even in the old and debilitated persons, who are often the subjects of cataract, provided they are not at the same time labouring under any visceral disease, particularly in the chest, which would alone probably preclude its performance.

The season of the year is also a circumstance of great importance, for as this operation is performed on a texture of very limited organization, and generally upon persons in the decline of life, the section of the cornea will not heal so readily if the system be subjected to the chilling effects of cold and damp weather. A certain degree of fever is often thus produced that interferes with the healing process, and if there be any gouty or

rheumatic diathesis, inflammation of that character will almost certainly arise, which is very troublesome to get rid of, if it do not prevent the success of the operation. I therefore consider it very desirable, as we can select the most suitable time for operating, to do it only in the summer months, and to avoid any particularly damp or rainy season.

If the patient's constitution be in a healthy state, with sufficient power to heal the section of the cornea, the eye being free from any other disease, the iris active and unadherent, the cataract hard, the anterior chamber of sufficient dimensions, and the patient retaining a strong perception of light, the operation of extraction may be performed with every prospect of success.

In those cases of hard cataract in which their extraction cannot be performed with propriety for any of the foregoing reasons, the operation of depression must be employed; but if we expect that its success will be commensurate with the facility of its performance, we shall be greatly disappointed.

The operation by solution should be confined to cases of soft or fluid cataract, for if we attempt to treat hard cataract in this manner, the length of time that will be consumed in getting rid of it by absorption is of itself a valid objection in old people. Again, in the attempt to open out the texture of the lens, and thus expose it to the solvent power of the aqueous humour, there is great danger of its being dislocated, and then the pressure it occasions on the iris will probably induce destructive inflammation of the globe, unless the lens be immediately extracted; so that we are not justified in performing this operation for hard cataract.

On the Extraction of Cataract.

Some have advised that the pupil should be dilated by belladonna before proceeding to the extraction of a cataract, but I see no advantage from doing so in ordinary cases, for as soon as the aqueous humour escapes, the influence of the belladonna on the iris is lost, the pupil contracts and falls against the edge of the knife, but the irritability of the iris is lessened, and it does not so readily recede behind it on pressure; and the pupillary margin is

more liable to be divided by its edge in the dilated than in the contracted state. If the pupil be naturally very much contracted, or if the anterior chamber be very small, it may be necessary to dilate the pupil, to allow of the ready transit of the lens in the former case, and in the latter to take the iris out of the way of the knife.

The operation of extraction consists of three parts—the making a section of one half of the circumference of the cornea, the laceration of the anterior capsule, and the removal of the lens. In order to accomplish these objects with safety and success, various circumstances require particular attention. In the first place, a good light is indispensable; at the same time it should not be too powerful, and it should fall obliquely on the eye in such a direction that the luminous point of the cornea is not interposed between the operator and the eye, so as to prevent him from commanding a full view of the whole anterior chamber.

The recumbent posture is so conducive to the success of the operation that it should never be dispensed with; not only does it obviate the most effectually any unsteadiness on the part of the patient, but it also allows the surgeon to rest his hand in a much more easy and convenient position, and enables him to perform the section with greater precision; at the same time that it prevents the escape of the vitreous humour to any deleterious extent, for it cannot gravitate out of the eye in this position, and the muscles of the globe will not contract sufficiently to evacuate more than one-third of its contents.

The section of the cornea may be made either transversely downwards or upwards, or obliquely downwards and outwards. To the transverse section downwards there are great objections: in the first place, the operator must confide the holding of the upper lid and the steadying of the globe to an assistant, unless he cut in a direction from himself, which I always consider to be objectionable, for if the iris should fall before the edge of the knife he has no power to liberate it. When operating in this manner, the moment the cornea is punctured the patient involuntarily turns the eye upwards, and there is great danger, unless the operator is aware of this circumstance, and instantly follows the motion of the globe, that the cornea may be divided too extensively downwards and the aqueous humour allowed to

escape. The margin of the lower lid interferes with the edge of the corneal flap, which is thus liable to be separated, interrupting the union of the wound, favouring the prolapse of the iris, and thus occasioning an unsightly appearance, if it should not lead to more serious consequences.

In making the section downwards and outwards, the operator must also either divide the cornea by cutting in a direction from himself, or he must confide the upper lid to the care of an assistant; and if prolapse of the iris occur, it occasions considerable deformity, which is not compensated for by the increase in the sphere of vision that is thereby acquired.

I always prefer the transverse upper section, being then able to steady the globe and command the upper lid myself, and by pressing with the back of the knife, to prevent the eye from being turned upwards. The flap of the cornea is not liable to be disturbed, and consequently prolapse of the iris is less likely to occur; if it should take place, it does not proceed to so great an extent as to draw the pupil sufficiently upward to interfere with vision, and the disfigurement it occasions is completely concealed by the upper eyelid. I never make the lower section unless the brow is so prominent as to forbid the making the upper section, which is very rarely the case. It is usually advised to cover the eye that is not the subject of the operation, but I do not see any advantage in doing so, and generally prefer requesting the patient to keep it fixed at the light before him, which tends to steady the other eye on which I am about to operate.

The instruments required for the operation consist of a cornea-knife, for making the section of the cornea.

A blunt-pointed curved knife for enlarging the section, if necessary.

A curette for lacerating the capsule, and for removing any portion of the margin of the lens that may remain in the pupil after the nucleus has escaped.

A sharp-pointed hook for removing the lens, if a fluid state of the vitreous humour should prevent its being removed by pressure.

A pair of Maunoir's scissors, in case the iris should be wounded in the section of the cornea, to divide the intermediate fibres be-

tween such aperture and the pupil, as in that case it will not dilate for the passage of the lens.

The cornea-knife must increase both in width and thickness from the point to the heel, in order that it may completely fill up the section it makes in the cornea, and thus prevent the escape of the aqueous humour; it must be of such a width as will divide one-half of the circumference of the cornea, as the lens nearly equals the cornea in diameter. The knives most commonly employed have been that of De Wenzel, which is lancet-shaped, and that of Beer, which is triangular, having a straight back. These knives being necessarily wedge-shaped, require some force to effect their transit through the cornea, and that of Beer has been generally preferred, on account of its introduction being accomplished with less pressure than the knife of De Wenzel.

In making the transverse upper section on the right eye, the surgeon must sit behind the patient, whose head should be on a level with his breast; he then places the fore-finger of the left hand against the margin of the upper eyelid, pressing it against the edge of the orbit, and not against the globe of the eye, because the eyelid must be kept fixed in this position until the operation is concluded, and during this time any pressure on the ball of the eye may possibly be highly injurious. The point of the middle finger of the left hand is then to be placed somewhat firmly on the upper and inner part of the sclerotic coat, whereby the globe is fixed, its involuntary movement upwards and inwards prevented, and the eye is rendered steady for making the section of the cornea; an assistant must now depress the lower lid, so far only as shall uncover the lower edge of the cornea, by drawing down the skin and resting his finger on the lower edge of the orbit, but not making the slightest pressure on the globe of the eye.

The knife is held firmly between the thumb and the two fore-fingers of the right hand, the other two fingers being bent and resting on the patient's temple; the surgeon, by a movement of the thumb and two fore-fingers only (and not by a motion of the whole hand), carries the knife in front of the cornea to the nasal canthus of the orbit, in order to be sure that he can do so without

altering the position of his hand: this is necessary, to enable him to execute the section of the cornea with the requisite precision and steadiness. He then punctures the cornea in the centre of its ciliary margin on the temporal side, carrying the point of the knife in a direction perpendicular to the surface of the cornea and not parallel to the margin of the orbit, or he will pass it between the layers of the cornea, instead of penetrating directly through them into the anterior chamber. As soon as the point of the knife has pierced the cornea, the handle must be carried somewhat backward, so as to place the blade parallel to the plane of the iris, and it must then be pushed rapidly across the anterior chamber to the nasal side of the cornea, which must be pierced close to the iris; in doing this the operator must take care to press somewhat downwards against the back of the knife, instead of towards its cutting edge, which will obviate the tendency of the eye to turn upwards, and will prevent the section of the cornea from being extended too rapidly upwards, whereby the escape of the aqueous humour would be endangered.

As soon as the point of the knife has pierced the nasal side of the cornea, the surgeon must be careful immediately to remit all pressure on the globe, or serious consequences will probably ensue; and as he can now command the movements of the eye with the knife, pressure on the globe is no longer necessary. The knife must be carried transversely inwards until it reaches the nasal canthus of the orbit, unless the cornea is previously divided. If the section be not then completed, it must be finished with a sawing motion of the knife, withdrawing it a little, and again carrying it forwards until it cuts its way through the margin of the cornea. Great care must be taken to carry the section of the cornea close to its margin, so that it may be circular in shape, and of sufficient dimensions to allow of the ready transit of the lens.

In operating on the left eye the same directions are applicable, but the hands by which they are executed must be reversed; and I think it will be found, that the practice which is indispensable to the safe performance of the operation with the right hand, will be equally effectual in enabling the surgeon to do it successfully

with the left, whereby he will also secure the advantages of making the upper section, and of commanding the upper eyelid himself, advantages that must be experienced to be duly appreciated.

The section of the cornea being thus completed, the next point is to lacerate the capsule, and if the eye be irritable it is advisable to pause a moment before doing this, but if not it may be done immediately. For this purpose, the eyelid being elevated by pressing it against the brow, and carefully avoiding any pressure on the globe, the curette is to be introduced under the flap of the cornea into the anterior chamber, with its convex side forwards, until it reaches the pupil; the point is then to be turned against the centre of the capsule, which is to be lacerated by a slight transverse movement of it, and the curette is then to be withdrawn with its convex side forwards. If from any accident the capsule be not thus freely lacerated, when pressure is made on the globe for the extraction of the lens, it will be thrust forward together with the iris, but will not be tilted through the pupil: that this arises from its confinement within the capsule, and not from adhesion of the fibres of the iris, is obvious from the fact that the pupil becomes at the same time considerably dilated. Any spasm that may have been produced by the introduction of the curette being allowed to subside, and the eye being shaded to allow the pupil to dilate, the eyelids are to be again unclosed, the silver end of the curette is to be placed transversely across the surface of the lower eyelid, and the globe compressed with it just at the margin of the sclerotic coat, the fore-finger of the other hand making pressure at the same time on the upper margin of the sclerotic coat; in this manner the lens is tilted edgeways forward against the iris, it mechanically stretches open the pupil, and passing through it, escapes at the section of the cornea.

In this part of the operation it is necessary to take care that the pressure is confined to the anterior part of the eye, which is to be compressed just behind the margin of the lens so as to dislodge it from the capsule and to tilt it forward through the pupil; if the whole globe of the eye be pressed backwards into the orbit, the escape of the vitreous humour will be endangered instead of the protrusion of the lens taking place.

Sometimes, when pressure is made upon the globe for the purpose of extracting the lens, the hyaloid membrane will be observed to protrude through the pupil instead of the lens. When this is the case the pressure must be remitted, and the cataract removed by means of a sharp hook introduced into the pupil and inserted into the lens, a proceeding that must also be adopted should the vitreous humour itself escape. Sometimes, too, the escape of the lens may be prevented by the firm adhesion of the fibres of the iris to each other. When this is the case, pressure on the globe, instead of tilting forward the lens through the dilated pupil, thrusts forward the iris as well as the lens, the dilatation of the pupil being prevented by the adhesions; they then require to be divided by Maunoir's scissors; or if the iris be but slightly adherent to the capsule, it may often be detached by the curette.

As soon as the lens is observed to protrude through the pupil, the pressure must be remitted altogether, or continued only in a very slight degree; indeed in general the spasmodic action of the muscles, induced by the irritation of the displaced lens, is sufficient to cause its expulsion through the wound in the cornea. If any of the soft circumference of the lens remains in the pupil, it may be removed with the silver spoon at the end of the curette, which should be introduced very cautiously for that purpose, taking care that it does not pass so deeply into the pupil as to rupture the hyaloid membrane, and also avoiding any injury to the iris at the same time. Should a portion of opake capsule be visible in the pupil after the operation, it is not prudent to attempt its removal, because this cannot be done without risk of injuring the iris and rupturing the hyaloid membrane. Nor is it necessary to extract it, because the aperture that has been made in it by the escape of the lens is usually large enough for the purposes of vision; and even if it should become adherent to the iris and obstruct the pupil, it can with greater safety be detached by the needle at a subsequent time.

The eyelids should then be allowed to close for a few moments, after which they must be again opened for the purpose of examining the eye, when sometimes the iris will be found to have become entangled in the flap of the cornea, and it may re-

quire to be replaced by again introducing the silver end of the curette; or probably slight friction on the globe of the eye, with the finger placed outside the eyelid, may produce sufficient contraction of the fibres of the iris to restore it to its natural position.

As soon as the surgeon is satisfied that the flap of the cornea is properly adjusted, and that the iris and pupil are in their natural state, the eyelids should be immediately closed, and covered with a piece of fine linen, confined on by a circular bandage carried round the head and securely pinned to the night-cap, but very lightly applied, so as not to compress the globe in the slightest degree.

It was formerly the custom at the Ophthalmic Hospital to moisten with warm water the linen thus applied over the eye, except in rheumatic patients, but we soon found that those cases in which it was not moistened were the most free from inflammation, and this led to the practice of applying only dry linen in every instance.

The patient should be very carefully undressed, and put to bed without stooping or using any exertion whatever; he should be placed upon his back, with the head slightly elevated, and directed to abstain from talking, blowing his nose, or even masticating; any exercise of the muscles of the face being very likely to induce *prolapsus iridis*, if it do not still more seriously interfere with the healing of the section of the cornea: the room should be also darkened, and kept of an agreeable temperature.

However easy the operation may appear from description, its performance is attended with great difficulties. Thus, if the point of the knife be inserted into the cornea parallel to the surface of the iris, instead of in a direction perpendicular to that of the cornea, it will pass between the layers of the membrane instead of penetrating directly the anterior chamber, and consequently the section will not be equal in extent to its apparent diameter, and will be too small for the extraction of the lens. Sometimes the aqueous humour will escape the moment the cornea is punctured: this may arise from great irritability on the part of the patient, inducing violent spasm of the muscles of the globe, or it may be owing to some unsteadiness on the part

of the operator, to his not firmly fixing the globe of the eye, or to his not instantly adapting his fingers to its movements; but to whatever cause it is attributable, the knife must be instantly withdrawn, and the operation deferred for a few days until the puncture of the cornea has healed.

The aqueous humour may also escape when the knife has punctured both sides of the cornea, and before the section of it is completed, and then the iris falls forward over the edge of the knife, and is in danger of being wounded in its further progress. This, however, may be obviated by making gentle pressure on the cornea with the middle finger, when the iris will recede into its natural place behind the knife; but if the pressure be remitted, it will immediately fall forward again, so that the finger must be kept pressing on the cornea, while the knife is carried forward to complete the section.

It may occur, in an accident of this kind, that a small portion of the iris may be excised; and this may not include its pupillary margin, making in it a circular aperture, and then the pupil will not dilate readily when the lens is pressed against it, so that it becomes necessary to divide with Maunoir's scissors the intervening fibres between such aperture and the natural pupil, before the cataract can be extracted.

When the aqueous humour thus escapes, the operator sometimes turns forward the edge of the knife to avoid wounding the iris, and thus completes the section of the cornea anterior to its margin; or he may not puncture the cornea close to its nasal edge; in either case the aperture in it is too small to allow of the ready extraction of the lens, and when so, it has been usually recommended that the section should be enlarged by Maunoir's scissors. This is an objectionable mode of proceeding, not only because it makes a contused wound of the cornea, which will not heal so readily as an incised one, but also because the membrane cannot be readily divided in this manner close to its margin. It is therefore better to extend the incision, under these circumstances, by means of the curved knife with a blunt extremity, and that which cuts on its concave edge will be found to be the most convenient. In using this instrument it is necessary to be careful that you cut obliquely against the margin of the

incision, and that the edge of the knife be not placed against the inner surface of the cornea, as by so doing, instead of dividing it, you will only pull the eye outwards. The edge of the knife should also be carried in a direction parallel to the surface of the cornea, and not to that of the iris, as in that case there would be danger of the cornea not being divided close to its margin, the eye always yielding a little to the pressure of the knife. In all cases it is indispensable that the section of the cornea should embrace one half of its circumference, or the lens will be forced through an aperture too small to allow of its ready transit, and the pressure employed in its forcible expulsion will endanger the escape of the vitreous humour, injury of the iris, and serious inflammation of that structure.

It will be observed that the cornea-knives usually employed, not only increase in thickness and in width from point to heel, to fill up the aperture they make in the cornea, as they traverse the anterior chamber, and thus prevent the escape of the aqueous humour, but their width is also equal to the radius of the cornea, so as to make a section of that size in the membrane; and this is done by thrusting this wedge-shaped instrument through the cornea, the cutting edge of the knife effecting its division by means of the force with which the back of the instrument is pressed against the opposite margin of the wound. This forcible thrusting of a wedge-shaped instrument of such dimensions through the anterior chamber appears to me to be productive of many of the difficulties as well as the dangers that attend the operation. Thus the force employed tends to turn the eye inwards to the nasal canthus of the orbit, whereby the inner side of the cornea is obscured from the view of the operator, he is unable to puncture it close to its sclerotic margin, and consequently the section is too small for the escape of the cataract.

If this inversion of the eye is prevented by pressure on the nasal side of the globe, the aqueous humour is liable to escape before the knife has traversed the anterior chamber far enough to prevent the iris from being wounded in completing the section; and even if the knife be so far advanced that the iris cannot escape beneath its edge, the pressure necessarily exerted on the globe often induces such violent spasm of the muscles as to

endanger the escape of the vitreous humour, and to subject the iris and the internal tunics to so much pressure as to lay the foundation of serious inflammation.

Sometimes the spasm thus induced will not subside after the extraction of the cataract, and then the iris may be pressed forward and prevent the closing of the flap of the cornea; under these circumstances it is necessary to puncture the hyaloid membrane and allow a small quantity of the vitreous humour to escape, which will relieve the spasm, unless it should subside spontaneously, after waiting a reasonable time for that purpose. This proceeding may be adopted with perfect safety if it be conducted with great care, the patient being in the recumbent posture. Sometimes, when the vitreous humour escapes, in consequence of the spasm of the muscles of the globe, a portion of the hyaloid membrane may be left protruding through the section of the cornea, when it must be returned by the silver end of the curette.

The introduction of a needle into the anterior chamber can always be effected without the slightest difficulty, and it can generally be retained there for a sufficient length of time to break up the texture of the lens without the escape of the aqueous humour, notwithstanding the repeated movements of it that are necessary for performing this operation. From reflecting on this circumstance, it occurred to me, that if a knife could be constructed that might be introduced into the eye with as little force as is necessary for the introduction of the needle, and could be formed of such a shape as would complete the section of the cornea without danger of wounding the iris, the difficulties and the danger attending the operation would be most materially lessened. Let it be remembered, that in the usual way of operating the knife cuts its way *into* the cornea, which requires considerable force; whereas, upon the plan I propose, it is introduced into the anterior chamber without any further division of the cornea than is necessary for the purpose of its introduction, the section of the membrane not being commenced until both sides of the cornea have been punctured; and the knife is of such a shape and is then so situated that there is little danger of the iris falling forward before its edge.

Those who have ever performed the operation of lithotomy with the gorget, and afterwards with the small beaked knife first used by the late Mr. Blizard, and have contrasted the force necessary to make the section of the prostate gland from without inwards by means of the former instrument, with the facility with which, the latter being introduced into the bladder, the section can be made from within outwards, will readily understand the advantages that attend the mode of operating I now propose, as well as the reasoning that has led to its adoption.

The objects I propose to attain in the construction of the knife are—

1st. That it shall be of sufficient length to traverse completely the anterior chamber, and divide the nasal margin of the cornea.

2nd. That it shall increase in width and in thickness from point to heel enough only to prevent the escape of the aqueous humour in its transit across the anterior chamber, but that its width shall have no reference to the dimensions of the section that is to be made, as that circumstance, I conceive, has occasioned all the difficulty of its introduction, and the chief danger of the operation.

3rd. That it shall be of such a shape and figure, that when introduced in the middle of the temporal margin of the cornea and carried across the anterior chamber it shall readily puncture the nasal side of that membrane, and when placed in this situation the cutting edge shall be so far beyond the pupillary margin of the iris, and opposed to so large a portion of its anterior surface, as will prevent its escape beneath the edge of the knife to endanger its division in making the section of the cornea.

4th. That when the section of the cornea is thus about to be made, the edge of the knife shall be opposed only to the margin of the section on either side, and not to any extensive portion of its internal surface, whereby its division would be attended with difficulty, as is the case in using Beer's knife.

In order to attain these objects, the knife must describe a portion of a circle of larger diameter than that of the cornea; and after having tried a vast variety of shapes and sizes, the one I now propose seems to me to fulfil the foregoing indications the

most effectually. At first I used a much narrower and finer knife, but I found that in introducing a cutting instrument of such a length, the aqueous humour was liable to escape unless it increased more rapidly both in width and in thickness. I have also tried one wider at the heel, but in that case greater force is required for its introduction, which is not counterbalanced by any commensurate advantage in completing the section, unless the cornea be of unusually large dimensions.

The back of the knife describes a sixth part of the circumference of a circle, the radius of which is ten lines. The chord of the arc formed by the back of the knife is, of course, also ten lines in length, being equal to the radius of that circle; it is therefore greater by four lines than the diameter of the cornea, and the blade is consequently quite long enough to complete the section of that membrane without difficulty. The knife is two lines in width at the heel, whence it gradually tapers to the point; it also increases uniformly in thickness, as well as in width, from point to heel, so as to occupy completely the aperture it makes in the cornea, for the purpose of preventing the escape of the aqueous humour. See Plate I. fig. 1.

Plate III. represents the position of the instrument in the hand of the operator when it has just punctured the temporal margin of the cornea.

Plate IV. represents the position of the instrument when it has transfixed the cornea.

The dotted line A is six lines in length, equal to that of the diameter of the cornea; it extends between the two points at which the back of the knife is placed in that membrane when it is transfixed by the instrument. From the centre of this line, which is also the centre of the cornea, to the cutting edge of the knife, is rather more than two lines; and since the radius of the cornea is scarcely three lines, when the knife is so placed there can be but little danger of the iris falling forward before its edge, as the aqueous humour escapes in completing the section of that membrane.

Explanation of the Plates.

Plate I.

Fig. 1. The construction of the new knife.
Fig. 2. The shape and dimensions of the new knife.
Fig. 3. Wenzel's knife.
Fig. 4. Beer's knife.
Fig. 5. Curette.
Fig. 6. Sharp hook for extracting the lens.

Plate II.

Fig. 1. Maunoir's scissors.
Fig. 2. Curved knife, cutting on its convex edge.
Fig. 3. Curved knife, cutting on its concave edge.
Fig. 4. Curved needle.
Fig. 5. Saunders's needle.
Fig. 6. Broad needle.

These instruments can be procured either at Messrs. Philp and Whicker's, St. James's Street, or at Messrs. Weiss, in the Strand.

Plate III.

Position of the instrument when it has just punctured the temporal margin of the cornea.

Plate IV.

Position of the instrument when it has transfixed the cornea.

Plate I.

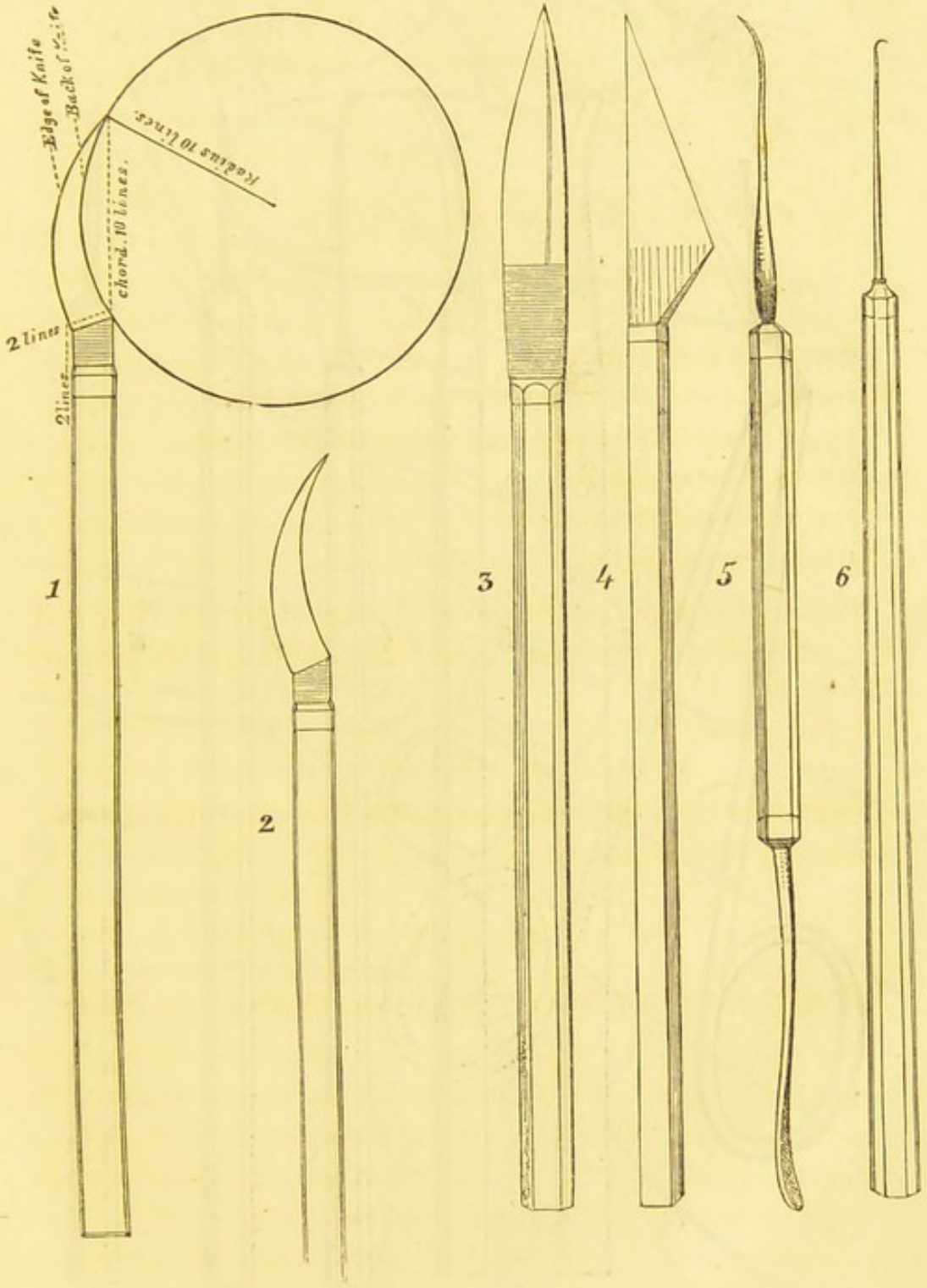

Edge of Knife
Back of Knife
Radius 10 lines.
chord. 10 lines.
2 lines
2 lines
1
2
3
4
5
6

Plate II.

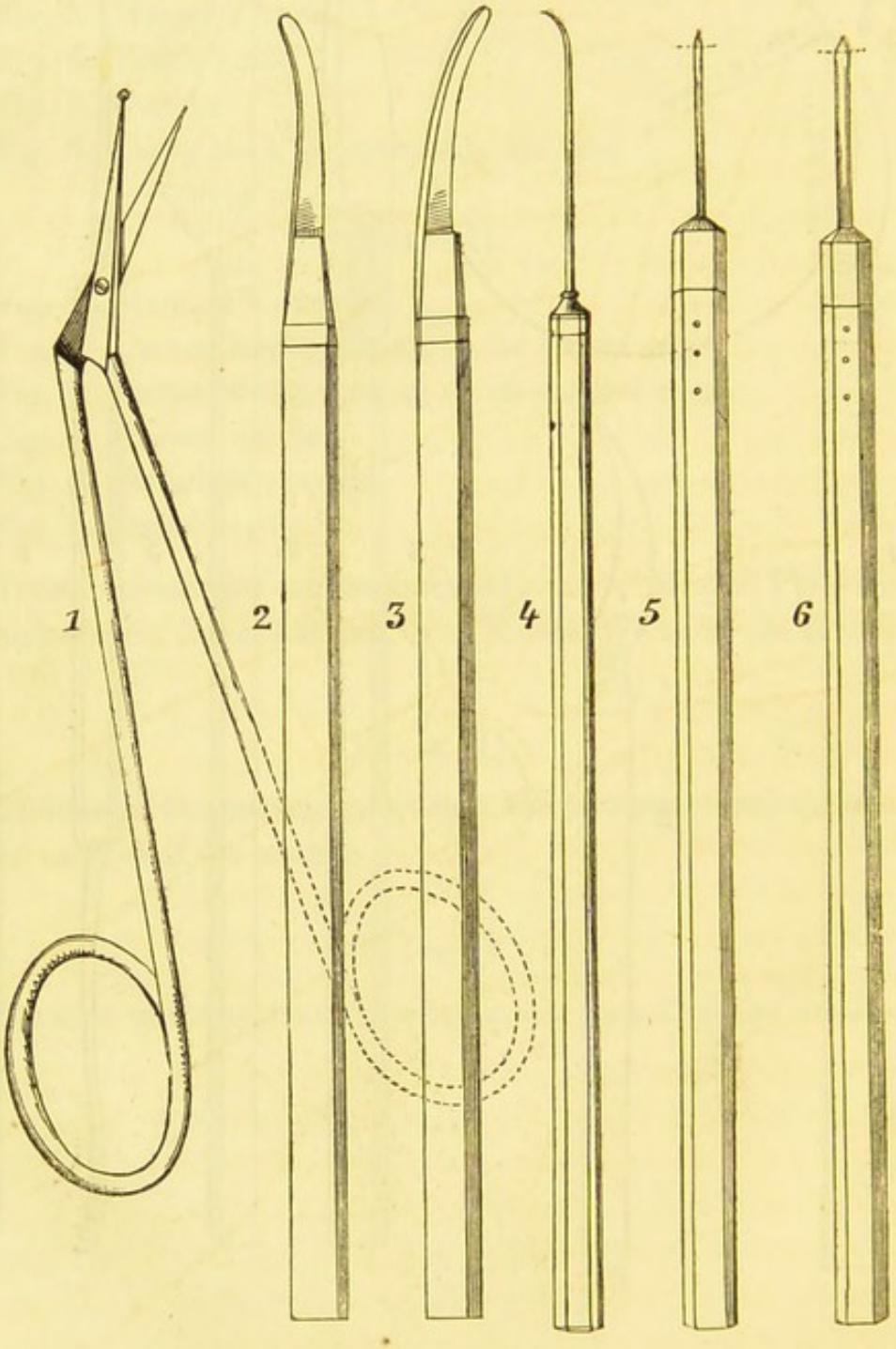


Plate III.

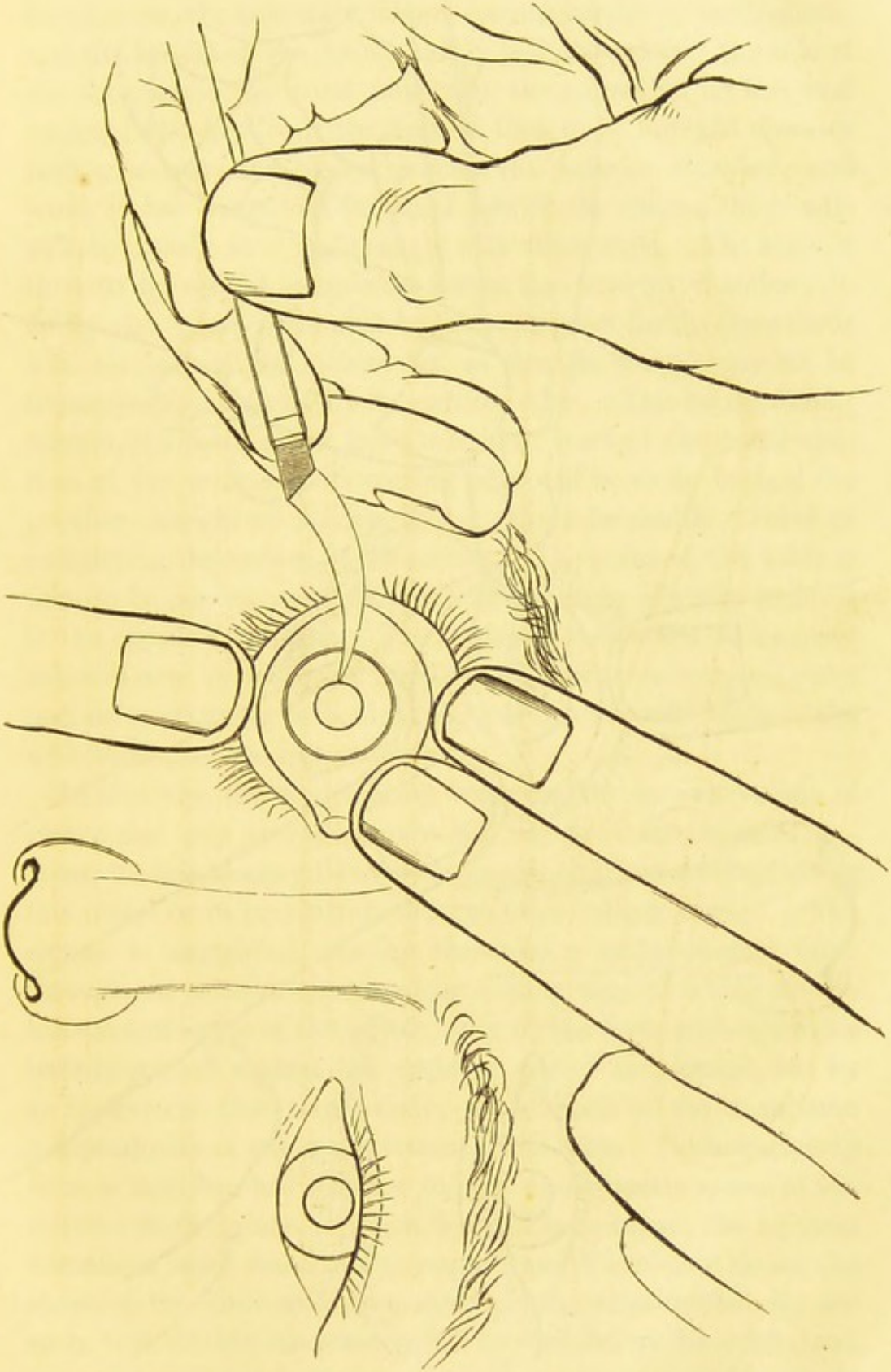
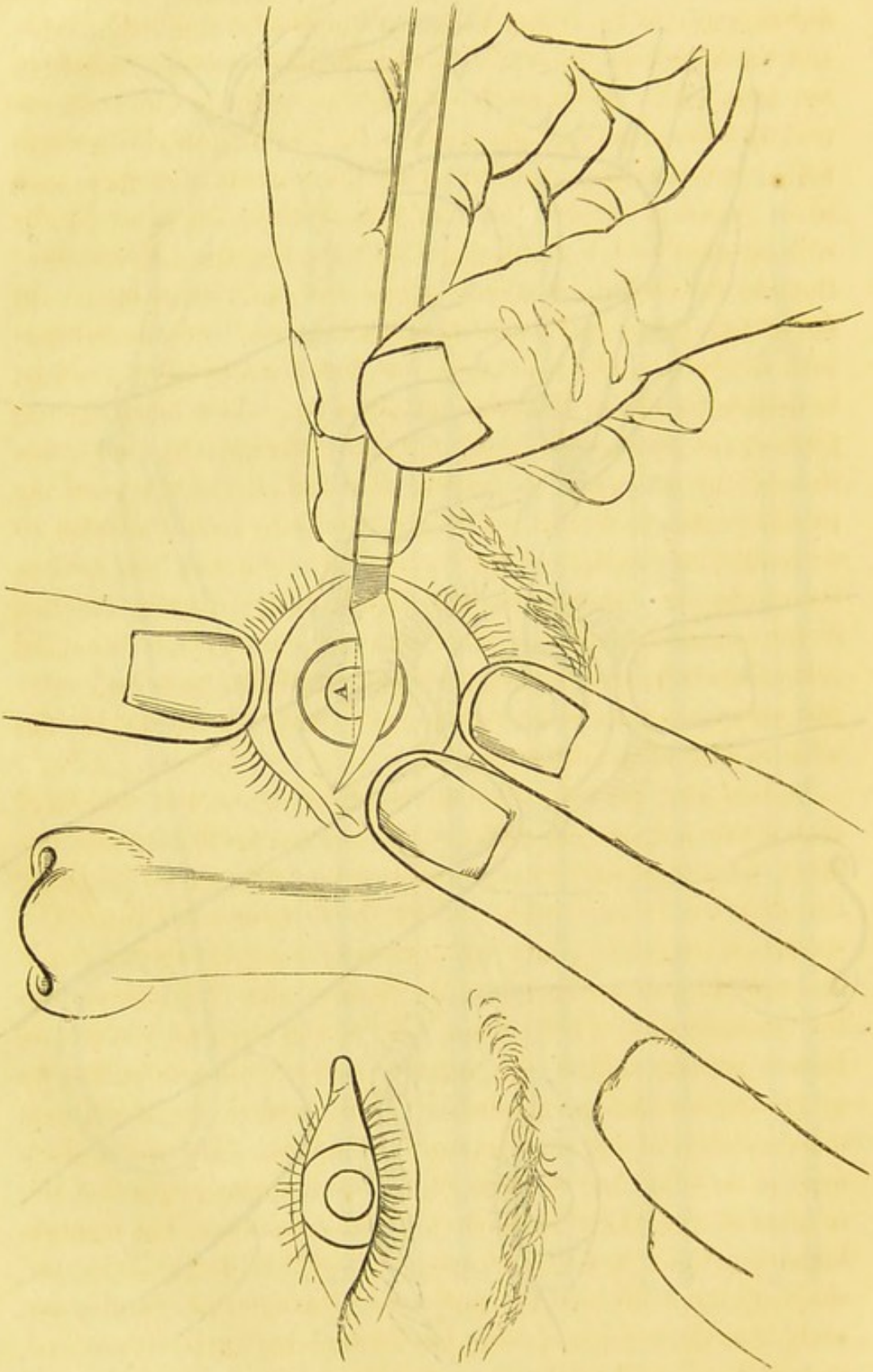


PLATE IV.



In making the upper section of the cornea with this knife, it is to be held in the usual manner, between the thumb and two fore-fingers, the two other fingers resting on the patient's cheek, and the handle of the knife slightly inclined towards the side of the face, while the point punctures the cornea on its temporal margin; the handle of the knife is then to be brought upwards with a sweep as the blade traverses the anterior chamber; and when it has punctured the nasal side of the cornea, the handle will be nearly at a right angle with the temple. The knife is then to be carried completely across the anterior chamber: in doing this great care must be taken to press firmly downwards with the back of the instrument, so that the wound may not be unnecessarily enlarged by its cutting edge. This being accomplished, the point of the knife will have reached the nasal canthus of the orbit, and its cutting edge will be so far beyond the pupillary margin of the iris that it cannot be readily divided in completing the section of the cornea. The point of the knife is then to be carried upwards, the handle being slightly inclined in the opposite direction. The section of the cornea on its nasal side will now be complete, a small portion at the upper and outer part only remaining to be divided; and this is readily done in the withdrawing of the instrument.

In this way, the cornea being transfixed by an instrument of such a size only as will prevent the escape of the aqueous humour, no unnecessary force is employed, either in accomplishing this object or in preventing the eye from rolling inward. The section is completed, not by thrusting a wedge-shaped knife through the anterior chamber, the cutting edge of which divides the circumference of the cornea, only by the force with which its back is pressed against the opposite side of the section, but by an instrument that accomplishes the division of the membrane independently of any such pressure on its back. No unnecessary force is therefore had recourse to, and consequently spasm of the muscles of the globe is much less liable to occur; the aqueous humour is much less likely to escape; and if it should do so, the shape of the knife and its position in the anterior chamber are such, that the iris can scarcely fall forward before its edge; and even if this should be the case, it will much more readily recede

behind it, under the slightest pressure of the finger on the cornea.

In addition to these advantages it may be observed, that the danger of bruising the iris, by the forcible compression of it against the knife, when spasmodic action of the muscles of the globe occurs, is also avoided, and the consequent chronic inflammation of that structure, that is so liable to be produced from this cause, is likewise obviated.

There is no difficulty in introducing the knife in the direction here pointed out; on the contrary, its passage through the anterior chamber will be accomplished with greater ease than is the case with the ordinary straight knife, for in this stage of the operation the pressure will necessarily be made against the back of the knife, and thus the danger of dividing the cornea to too great an extent before it is punctured on the nasal side will be avoided. The pressure thus made with the back of the knife also tends to prevent the involuntary turning of the eye upwards and inwards, and the section is completed without doing any violence to the iris, or to the internal tunics of the globe.

The bowels having been cleared on the morning of the operation, it is generally desirable to allow the succeeding day to pass without any evacuation, lest the union of the cornea should be disturbed by the efforts of the patient. His diet should also be confined to the use of fluids, unless such limitation be contra-indicated by his feeble powers, as the act of mastication is liable to displace the flap of the cornea.

If the case go on favourably after the operation, the patient will scarcely complain of any pain; a certain degree of soreness will be felt for some hours, as if the eye had been bruised, and some uneasiness will in some cases arise, which will be relieved by a discharge of tears, and this may recur repeatedly. It is necessary very carefully to cleanse the margins of the lids with a rag and warm water occasionally, as they are liable to become agglutinated by mucous secretion which dries upon their edges, and bathing the lids freely with warm water will often alleviate any pain that occurs subsequently to the operation; but sometimes an attack of severe pain will come on that will not be thus relieved, and if unattended with any febrile excitement of the cir-

culation, it will be at once removed by a decided dose of opium, which will usually prevent any further bad consequences.

It has been very generally considered necessary to reduce the force of the circulation by the abstraction of blood from the arm prior to the operation, with the view of lessening the inflammation that must be necessarily set up for the healing of the section of the cornea; and it has also been usually deemed advisable to draw blood in the same way in the evening after its performance, from a belief that the inflammation produced by the wound would almost invariably exceed the degree that was conducive to its union. To show, however, how little occasion there really is for this practice, I will just observe, that *of the last fifty cases of extraction, taken in succession*, which I have performed at the Ophthalmic Hospital, where an accurate record of the treatment is kept, I have not had occasion to draw blood from the arm in a single instance, either before or after the operation. This result has only been obtained by using every precaution before-hand to bring the patients into the most favourable condition for the operation, and by taking great care to avoid any unnecessary violence in its performance. I need scarcely observe, that the indiscriminate abstraction of blood from the feeble and aged persons who are so frequently the subjects of cataract, instead of obviating the occurrence of inflammation, will rather tend, by reducing the patient's powers, to prevent the closing of the section by the first intention, and thus induce the suppurative process, which will be very liable to be attended with violent inflammation of an asthenic character, that it will be very difficult, if not impossible, to control in this reduced state of system.

I generally think it advisable to keep the eyelids closed for four days after the operation, in order that the union of the wound may acquire sufficient firmness to obviate the risk of its separation; the eye may then be shaded, the patient may be allowed to leave his bed and to begin to move about, and in the course of a week or ten days he may quit his room. The patient's feelings are the best guide as to the extent to which the eye may be used and exposed to light, great care being taken never to subject the organ to the slightest inconvenience, and not allow the use of glasses for two or three months after the operation.

The most frequent accident we meet with after the operation, is the separation of the wound in the cornea, and consequent prolapse of the iris. This may arise from the slightest touch of the globe, though not sufficiently violent of itself to press out the iris, but giving rise to spasm of the muscles of the eye, which thus occasions its protrusion, and this may arise even from coughing or sneezing. Its occurrence is usually attended with considerable pain, suddenly produced, which soon subsides under the use of fomentation, but leaves the eye more tender than before. The iris is always under these circumstances protruded to such an extent as completely to fill up the wound in the cornea, and thus it obstructs the continued escape of the aqueous humour. The protruded portion of iris being thus firmly embraced by the inelastic aperture in the cornea, inflames and swells, and the constriction to which it is thus subjected seems to keep up the inflammation; on this account, it would appear to be, that the application of a strong stimulant to the protruded iris itself is of more service in subduing the inflammation than any other treatment. The touching of the iris with a pointed piece of nitrate of silver should be had recourse to; it occasions considerable smarting for a time, attended with copious discharge of tears; this is followed by a diminution of the protruded portion of the iris, and a proportionate subsidence of the inflammation. This application sometimes requires to be repeated twice or thrice before the iris recedes sufficiently to be covered with a cicatrix, and great care is necessary to avoid any pressure on the globe at the time of applying the caustic, lest the protrusion should be thereby increased. It is seldom that any other bad consequence arises from *prolapsus iridis* than alteration in the figure and the seat of the pupil.

Prolapse of the iris may also occur independently of any accidental injury, from ulceration of the cicatrix consequent on inflammation; it then takes place gradually, and not suddenly, being preceded by a certain degree of swelling and separation of the edges of the wound, and the ordinary symptoms of inflammation. Protrusion of the iris from this cause does not usually proceed to any great extent, and the inflammation attending it is not of any serious character; it is in general readily subdued by

suitable treatment, the iris adheres to the cicatrix, and a certain degree of opacity of the cornea at its margin and slight displacement of the pupil are the usual consequences.

The inflammation consequent on the operation, and necessary for the healing of the wound, may proceed to a deleterious extent. This may arise from local or from constitutional causes: it may depend on the performance of the operation being attended with undue violence, or on the eye having suffered from inflammation previously, whereby the disposition to its recurrence is greatly increased. It may depend on the constitutional powers of the patient being below the healthy standard, whereby the irritability is proportionately augmented, and the tendency of inflammation to exceed its due bounds at the same time increased, and then of course it assumes the asthenic character. It may also depend on a plethoric habit, which causes the inflammation produced by the operation to assume an acute phlegmonous character. If the inflammation arise from undue violence in the operation, it will be characterized by increased vascularity in the sclerotic coat, as well as in the conjunctiva, with partial elevation of the latter from the effusion of lymph beneath it. Haziness of the cornea and dullness of the iris, with more or less pain in proportion to the activity of the inflammation, will also be attendant symptoms. It must be subdued by the abstraction of such a quantity of blood from the part as will be effectual for this object; but this can only be attained by daily unloading the vessels, either by leeches or cupping; it is not in general to be accomplished at once by sudden abstraction of a large quantity of blood. The iris has suffered a degree of violence which has set up an inflammation that cannot be cut short, but may be gradually mitigated and subdued, and conducted to a successful termination. Leeches should be daily applied in these cases in such numbers as will be productive of a gradual abatement of the symptoms. The bowels should be regulated; but if there be no constitutional excitement, general depletion is not usually required; indeed, on the contrary, it is often necessary to administer tonic medicines, and allow a nutritious, and perhaps a stimulating diet in the old people who are the subjects of this operation, when the abstraction of blood, on which you must mainly depend for subduing the inflamma-

tion, requires to be carried to the extent of reducing considerably the force of the circulation. Fomentations are also more serviceable than cold applications, and belladonna should be applied as soon as the inflammation begins to subside, to prevent the closure of the pupil. I have sometimes thought that the too early use of this application has tended to keep up the inflammation by its influence on the inflamed texture of the iris, dilating the pupil, and thus separating the adhesions too rapidly.

If the eye has been previously the seat of inflammation, as may be evidenced by synechia posterior, or by a fluid state of the vitreous humour, inflammation to a serious extent may succeed the operation, notwithstanding that it has been performed with the smallest possible degree of violence. The disease will not usually assume an active character, but it will be tedious, indisposed to subside, and difficult to control. In these cases blood must be sparingly drawn, a nutritious diet must be allowed; but the morbid disposition of the eye, on which the inflammation depends, will only be effectually corrected by a mild administration of mercury;—of course this must not be carried to such an extent as to irritate the system.

I am well aware that this remedy is objected to under these circumstances, on the ground of its being supposed to prevent the healing of the wound in the cornea, because it checks the deposit of lymph under inflammation; and further, it is feared that by exciting the action of the absorbent vessels it may occasion the absorption of the adhesive matter that has united the edges of the wound, and thus occasion its separation. It would be foreign to the object of this paper to enter into a critical examination of this question, but I could not recommend the practice without alluding to the objection that will be urged against it. I may also observe, that the fact of mercury controlling the morbid action of vessels which deposit lymph, is no proof that it will interrupt their restorative action, which depends on quite a different condition of parts; and I cannot understand how this opinion can be entertained by those who are in the daily habit of seeing chancres heal under the influence of mercury, who cannot fail of having witnessed numerous cases of phagedæna in which the sores have rapidly filled up and healed under the application of

the black-wash, notwithstanding that the system has been thereby placed fully under the influence of mercury, while the checking of the ulcerative process in both these instances is a sufficient answer to any objection that may be urged, on the score of the effect which this remedy is capable of exerting over the absorbent vessels. But the easiest way of testing the value of this opinion is in cases of phymosis dependent upon chancres, in which, if the prepuce be divided, the patient being at the time fully under the influence of mercury, the wound will heal quite as readily as if that remedy had not been employed, as I have repeatedly pointed out to the students at the London Hospital. The fact, too, of ulceration of the cornea being arrested, and the cavity of the ulcer filled with lymph during the influence of mercury on the system, may be seen every day.

The most frequent cause of inflammation after the operation is a morbid irritability of system consequent on want of power in the constitution, so frequently attendant on advancing years; this occasions the inflammation thus set up to exceed the degree necessary to heal the wound, renders it difficult to be controlled, and at the same time causes it to assume an asthenic character. This form of inflammation most frequently comes on about two or three days after the operation, with intense pain of a throbbing aching character, often sudden in its access, extending deeply into the orbit, affecting the temple and the side of the head. This will be very shortly succeeded by great tumefaction of the eyelids, which assume a livid hue, and on unclosing them, as far as that can be done with safety, the conjunctiva scleroticæ will be seen to be excessively elevated by serum effused beneath it, causing it to assume a yellowish reddish hue, and the cornea will be somewhat dull and deprived of its lustre.

The sudden occurrence of the inflammation, the intensity of the pain, the rapid and extensive tumefaction of the eyelids, and swelling of the surface of the globe from the serous effusion, are symptoms of a very alarming character, and are very liable to mislead the surgeon by inducing him to suppose that the disease is of an acute phlegmonous character. The rapidity and extent of the swelling, however, show that it depends on the effusion of serum, and not of lymph, which is

itself indicative of inflammation of the opposite kind; and if active depletion be employed, and the force of the circulation thereby reduced, the irritability of the system will be proportionately increased, and the inflammation which depends upon it will be aggravated in the like degree, so that sloughing of the cornea and suppuration of the globe will probably be the consequence. The distinguishing characteristics of this form of inflammation are, that the swelling is rapid and extensive, depending on the effusion of serum and not of lymph, that the palpebræ are of a livid colour, and the conjunctiva yellowish-red; the discharge is thin and trifling, the pulse quick, weak and small, and the surface and extremities usually pale and cold.

The cornea is often hazy, and the edges of the wound look tumid and of a dirty yellowish hue; but I do not think it advisable to irritate the eye by examining the state of the wound when the upper section has been made if the other characters of the inflammation are clearly developed.

In the treatment of this form of inflammation, the first thing to be done is to allay the sufferings of the patient by the application of warmth; and it is surprising what immediate relief will often be afforded by the use of fomentations, which should be continued until this object is attained, and resumed as soon as the pain recurs. This usually constitutes the only local treatment that is required, although counter-irritation by means of a blister may also be sometimes advisable.

The inflammation essentially depends on a weak and irritable state of system, and this must be immediately obviated by a decided dose of opium combined with æther or ammonia, which must be repeated as frequently as may be required to keep the patient free from irritability and restlessness, at the same time that warmth is applied to the surface of the body and to the extremities; and by the combined use of these means, the inflammation will often subside as rapidly as it supervened. Its occurrence, however, is an indication of a feeble state of the circulation, which is often induced by keeping a patient on too low a diet after the operation; and this state must be remedied by the judicious use of cordials and stimuli, both medicinal and dietetic, with the view of sustaining the powers of the system without

exciting the circulation. Thus it is sometimes necessary not only to allow a nutritious diet, but also to give porter, wine or spirits shortly after an operation, according to the previous habits of the patient, regulating their quantity by the state of the circulation.

Acute phlegmonous inflammation of the globe is the form that is most rarely met with; indeed it scarcely ever occurs if proper precaution has been used to place the patient in a fit state for the operation prior to its performance. It commences usually within a very short time, a few hours after the operation, with pain of an acute kind and throbbing character, the eye is exquisitely sensitive to the touch, the pain extends deeply into the orbit as well as to the side of the head, and gradually increases in severity without intermission or abatement.

The eyelids very shortly assume a bright florid red colour, not a livid hue, they become somewhat swelled, and the surface of the globe somewhat prominent from phlegmonous chemosis, but not so rapidly and to the same extent as in the last form of inflammation. Ultimately, however, if the disease go on unchecked, enormous tumefaction of the eye will occur, and sloughing of the cornea will probably take place, followed by suppuration of the globe. This state of acute inflammation is necessarily attended with great excitement of the vascular system, a hard full throbbing pulse, hot and dry skin, and dry tongue with thirst, high-coloured urine, scanty in quantity, and the usual symptoms that characterize febrile excitement.

The chief diagnostic symptoms between the sthenic and the asthenic form of inflammation consist in the period of its occurrence, the colour and extent of the tumefaction of the eyelids, the rapidity with which the swelling takes place, the character of the chemosis, and the state of the general circulation.

In this form of inflammation, active antiphlogistic treatment is as imperatively called for as in the preceding it would have been injurious, and it must be carried to such an extent as will at once cut short the inflammation, or the eye will be lost.

Bleeding from the arm must be had recourse to without a moment's delay, as much blood must be taken as will at once relieve the symptoms and obviate the necessity for its repetition;

and the recurrence of the congestion must be rather anticipated than relieved by the application of leeches to the eyelids, in such numbers and with such frequency as any indication of returning pain or redness may point out. Some object to the applying leeches to the eyelids on account of the extensive inflammation of the skin they sometimes produce, but I have never seen any bad effect result from this; on the contrary, the setting up of this contiguous inflammation has often appeared to be conducive to the subsidence of the original disease, independently of the influence occasioned by the loss of blood. Fomentation will also be of service, but the abstraction of blood is the remedy on which alone you can depend for subduing the inflammation with such rapidity as will prevent the destruction of the eye.

The general excitement of the system is produced by the local disturbance, and will subside on its removal, and therefore the internal use of medicines is of less importance; indeed that of tartar emetic is forbidden, because the act of vomiting might endanger the eye; and mercury is by no means so serviceable in this very acute form of traumatic as in idiopathic inflammation, which latter generally depends in some degree at least on a morbid disposition of the system. In this case, too, every moment is of importance, and unless the disease is arrested by the timely abstraction of blood, the eye will be lost before the system can be placed under the influence of mercury. Calomel, with saline aperients, should of course be administered; the patient should be restricted to mild slops, in regard to diet, and confined to bed with the head slightly elevated; care should be taken to keep up the warmth of the surface and extremities, and to avoid any excitement of the circulation.

In those who are of a gouty or rheumatic diathesis, although the section of the cornea heal as readily as usual, after it is united the inflammation may not subside, but extend to the sclerotic coat and iris, attended with the usual symptoms and appearances of rheumatic iritis, and producing closure of the pupil if it be not arrested.

This form of inflammation usually does not occur until about a week after the operation, it is often occasioned by too great a reduction of the patient's powers, from his being restricted to a low

diet for too long a time; in this state the prevailing constitutional diathesis keeps up and modifies the subsiding inflammation, at the same time that it renders him susceptible of the influence of atmospheric causes. This state of things is usually connected with considerable congestion of the sclerotic coat, a debilitated state of the circulation, and a disordered condition of the mucous membrane of the alimentary canal, as well as of the rest of the digestive organs.

Cupping on the temple is usually advisable, followed by a blister at the back of the neck, with drastic purgatives and bark. Belladonna should also be applied to the eyebrow, with the view of preventing closure of the pupil. If these means be adopted at the outset of the disease, they will generally prove effectual, the patient being allowed a nutritious, not a stimulating diet, and defended from all exposure to vicissitudes of temperature. The eye must be kept closed, and all lotions scrupulously avoided, as well as fomentations, which, by wetting the eyelids, are apt to produce an injurious effect. Sometimes it may be necessary to repeat the abstraction of blood, but this must never be carried to the extent of reducing the force of the circulation, and occasionally the condition of the digestive organs cannot be corrected without a mild alterative mercurial course; but great care must be taken not to subject the system at large to the influence of this agent, or its irritability will probably be greatly increased, and the inflammation thereby aggravated instead of being relieved.

On the Depression of Cataract.

By the depression of a cataract is understood the depressing it downwards and backwards below the axis of vision, and leaving it imbedded in the vitreous humour.

If, on account of the reasons already stated in speaking of the operation of extraction, that operation cannot with propriety be performed, the cataract being hard, depression must be had recourse to.

Trifling as this operation may appear, it is very liable to produce inflammation of the internal tunics of the globe, which is very difficult to control, and often leads to serious consequences

It is therefore very desirable that the patient should be in a condition the least prone to inflammation; consequently, it is necessary to adopt beforehand all the precautions that were mentioned in speaking of the operation of extraction.

It is usually recommended to dilate the pupil before proceeding to depress the cataract, on account of the great facility this affords for seeing the steps of the operation; but if there be extensive synechia posterior, of course this cannot be done; and I have never found any difficulty in operating in the contracted state of the pupil, in which state you lessen the risk of the lens becoming dislocated and wedged in the aperture.

It has been recommended that the operation of depression or reclination should be performed by introducing a needle through the cornea and through the pupil, so as to avoid the other tunics of the globe. This mode of operating I cannot recommend, for I have rarely found it possible to place the lens sufficiently below the axis of vision without injuring the iris in the attempt to do so. You have not sufficient power with the needle to operate in this manner, and therefore, if depression is to be performed at all, I decidedly prefer the posterior operation for effecting it.

Although the recumbent posture is by far the best for the operation of extraction, the sitting posture presents the decided advantage for that of depression, of enabling you to see deeply into the eye, and thus to perform the operation with greater precision. It is necessary that the light should fall obliquely on the eye, to avoid the luminous point of the cornea. The patient should be seated on a low chair, resting his head against the breast of an assistant, who elevates the upper lid by putting the point of his fore-finger against the margin of the tarsus, and pressing it against the orbit, while with the middle finger he prevents the eye from being turned upwards and inwards; using his right hand if it be the left eye, and *vice versâ*, so as not to interfere with the operator.

The surgeon is seated on a high stool in front of the patient, and with the fore-finger of the one hand he depresses the lower lid, while by the middle finger the eye is prevented from turning inwards. The needle is to be held as a writing-pen between the thumb and two fore-fingers, the other two fingers resting on the

patient's cheek. Scarpa's needle is the best adapted for performing the operation in the manner in which it is usually done, because the curve at its point, embracing the nasal margin of the lens, prevents it from gliding away from the needle.

It is to be introduced through the sclerotic coat about a line behind the margin of the iris, with its point backwards, and a little lower than the transverse axis of the globe, to avoid the ciliary artery. As soon as the tunics of the eye are pierced, the point of the needle is to be turned downwards and its convex part upwards; it is to be carried forward into the posterior chamber opposite the pupil, taking great care not to displace the lens; the handle of the needle is then to be rotated, to turn the point through the pupil, in order that the capsule may be freely lacerated, should it be in front of the needle; the point is then to be turned downwards, the handle to be slightly depressed, so as to carry the needle with its convexity forwards and upwards, until it reaches the nasal margin of the lens; the point is then to be turned backwards, to embrace the nasal margin of the lens just at the distance of one-third of its space from the upper edge.

The needle is then to be carried obliquely downwards and backwards, the handle being at the same time moved in the opposite direction, using it as a lever, of which the sclerotic coat is the fulcrum; by this proceeding the lens is turned upon its axis, the superior edge being placed posteriorly and the inferior anteriorly, at the same time that it is carried downward and backward, and imbedded in the vitreous humour below the axis of vision, the anterior surface being laid horizontally upwards, the posterior downwards. The needle should be rotated, for the purpose of disengaging it from the lens; it may then be elevated, that you may see whether the lens remains depressed in the vitreous humour, and if so, it may be carefully withdrawn, in the direction in which it pierced the globe; but if the lens rises again, either from being no longer subjected to the pressure of the needle, or from not being disengaged from it, it must be again depressed, and then the needle must be withdrawn without elevating the point, great care being taken to carry the lens far enough backward to prevent it from pressing on the iris.

Beer's straight spear-pointed needle may be used, if it be pre-

ferred; it is to be introduced through the tunics of the globe at the point already mentioned, with its flat side upwards, and as soon as they are pierced it is to be turned half round, so as to place its flat surface anteriorly, in which position it will the more readily pass through the posterior chamber, and be the more available for the depression of the lens, which is to be effected in the manner just described, the subsequent steps of the operation being nearly similar to those that are to be taken when Scarpa's needle is employed. In using this needle, great care must be taken not to insert it into the margin of the lens in the attempt to pass it through the posterior chamber.

If the lens be carried perpendicularly downwards it will be scarcely covered by the vitreous humour, from the limited extent to which the dimensions of the globe will allow of its displacement in that direction; and if carried too far down and depressed with too great violence, injury of the choroid and retina will be the consequence, succeeded by violent vomiting and inflammation destructive to vision: hence the advantage of combining reclination with depression of the lens in the manner I have just detailed, whereby the danger of injuring the internal tunics is avoided, and the lens being placed horizontally, the pressure of the vitreous humour on its surface is more likely to prevent it from reascending into the axis of vision.

This operation is very liable to produce inflammation of the internal tunics of the globe, that may be destructive of vision. It may arise from the lens, when thus displaced, pressing on the iris or the retina; and it may also be produced by the very extensive laceration of the hyaloid membrane which necessarily attends this mode of operating, and which likewise favours the rising of the lens again after it has been depressed. These dangers may be in some degree obviated by operating in the following way, which I have adopted with success.

The patient and the surgeon being respectively seated, and the eye fixed as already described, a straight needle is to be introduced with its flat side upwards through the sclerotic coat, just below its transverse axis, and carried horizontally inwards and inserted into the margin of the lens as far as it can be introduced into that body without displacing it inwards. The needle will

thus become firmly fixed into the lens, which will be readily moved by it in any direction. The inferior margin of the lens is then to be turned obliquely backwards by turning the needle half round in the opposite direction, whereby the superior margin of the lens will be turned downwards and forwards; and in this way the lens is to be carried obliquely downwards and backwards far enough to prevent it from pressing on the iris, its posterior surface being placed uppermost and its anterior surface downwards; the needle is then to be freely rotated so as to disengage it from the lens, and it is to be withdrawn, great care being taken not to elevate the point in so doing, whereby the lens would be also elevated.

The advantage of this mode of operating consists in the precision with which the lens may be placed in the situation you intend it to occupy, whereby the danger of its pressing on the iris or retina is lessened; it is also attended with much less extensive laceration of the hyaloid membrane, which not only diminishes the risk of inflammation, but at the same time tends very effectually to prevent the subsequent rising of the lens by opposing an unbroken portion of the vitreous body to its upper surface.

It must, however, be obvious, that in this mode of operating the anterior capsule will probably be left entire, and if it be not previously opake, it will necessarily become so after the operation. It must, therefore, be so freely lacerated as to insure its not interfering with vision; and this may be readily done by introducing the needle for that purpose through the cornea and into the pupil, which I consider far preferable to any attempt to lacerate the capsule before the needle is withdrawn from the sclerotic coat, whereby the elevation of the lens would be endangered, or to the subsequent introduction of the needle through that tunic.

I am indebted for the first suggestion of this mode of operating to one of the gentlemen attending the Royal London Ophthalmic Hospital, who informed me that Mr. Egerton, of Calcutta, has been in the habit of operating in this manner; but as I have not seen nor heard any particular account of Mr. Egerton's operation, I have described the method in which I have

proceeded, and while I wish to ascribe to Mr. Egerton the merit of suggesting what I consider to be a great improvement upon the operation of depression, of course I cannot take upon me to say that the plan I have detailed is the one that he has adopted.

Since the above was written, I have seen an account of Mr. Egerton's operation, published by Mr. Morgan in the Guy's Hospital Reports, which varies somewhat from the method just detailed. Mr. Morgan recommends that the lens should be completely transfixed by a rotatory motion of the needle prior to its depression. I do not see the advantage of so doing; it appears to me to endanger the dislocation of the lens, and to increase the difficulty of subsequently detaching the needle from it. The only object is to pierce the lens to such a depth as will cause it to be carried backwards by the subsequent lateral movement of the needle; and this I have not found any difficulty in doing when the needle has penetrated its margin to the extent I have mentioned, as its connections are easily broken through, and the vitreous humour affords but little resistance to its progress.

As soon as the operation has been performed, the light should be immediately excluded from the eye by means of a linen bandage, as in the case of extraction. The patient should be directed to sit quietly in his chair, without altering the position of his head till the hour of rest, so as not to run any risk of disturbing the lens; and he should particularly avoid stooping and mastication, confining himself altogether to spoon diet for a few days. If there be no inflammation the bandage may then be removed, and the eye defended by a shade until it gradually becomes accustomed to the light, taking care to expose it only to such an extent as shall not be productive of the slightest pain, lachrymation, or any inconvenience: but it is not prudent to allow the use of glasses for two or three months after the operation, and then only in a moderate degree.

Sometimes obstinate and continued vomiting will succeed the operation of depression, and if so, it should be immediately stopped by such a dose of laudanum as will be effectual for that object, which occasionally will not be very readily attained; but if allowed to go on, the mechanical effect of it is likely to be very injurious to vision.

The ascension of the lens occurs more frequently during the first fortnight after its depression than at any subsequent period; should this occurrence take place, the lens must be again depressed; but if from a fluid state of the vitreous humour, or any other cause, it will not remain below the axis of vision, there is no alternative but to thrust it forward into the anterior chamber, and thence extract it, provided that the previous operations, succeeded by the floating of the lens in the vitreous humour, have not already produced consequences destructive to vision.

In making the section of the cornea for this purpose in the usual way, there is great danger of the lens being forced back again into the vitreous humour, whence there is great difficulty of extracting it. In order to avoid this contingency, I have found it expedient to introduce a fine needle through the cornea into the substance of the lens, so as to fix it until the section of the cornea is completed, and then it can be readily removed by the needle that is inserted into it. The following is the most convenient way of proceeding under these circumstances. The patient being recumbent, a fine needle is to be introduced through the cornea at its lower edge, as near to its nasal side as possible, and inserted into the lens; this is to be held steadily by the assistant, who at the same time depresses the lower eyelid. The surgeon then commences the outer and inferior section of the cornea, carrying the knife not directly across the anterior chamber, but around the inner surface of the margin of the cornea, until the knife arrives at the needle inserted into the lens, by which the latter is then removed without any pressure or difficulty. Of course there is no danger of the iris being wounded by this mode of operating, as it is effectually kept out of the way of the knife by the pressure of the dislocated lens; and as this is extracted without any pressure on the globe, the recumbent posture prevents the escape of any inordinate quantity of the vitreous humour. It is desirable that the patient should remain undisturbed on the couch on which the operation has been performed until bed-time, lest any change of position should occasion a further escape of the vitreous humour, and thus prevent the closure of the wound. Every precaution must be taken to pre-

vent the occurrence of inflammation, and suitable treatment must be adopted to remedy it if it should take place.

If the lens become dislocated in the attempt to depress it and wedged in the pupil, iritis will be a necessary consequence, and it will probably go on to destroy the organ. This result can only be prevented by immediately removing the lens from this position, either by extracting it through the cornea or depressing it into the vitreous humour.

Inflammation of the iris may occur, but this is not often met with unless extensive adhesions have been torn through in the depression of the lens, the presence of which indicates a previous severe form of iritis, and consequently a predisposition to its recurrence; or unless the iris have been injured in the operation, or be subsequently pressed upon by the displaced cataract: active antiphlogistic treatment must, under these circumstances, be immediately had recourse to, and mercury freely administered, unless the disease be of a rheumatic character, and then the loss of blood will usually be more serviceable than mercurial action.

Inflammation of the internal tunics of the globe is however the most frequent and the most serious of the unfavourable consequences resulting from the operation; for when it does occur, it very generally goes on to the destruction of vision, the lens having the effect of a foreign body in keeping up the inflammation: sometimes too the sight will be irrecoverably lost by a low degree of internal inflammation that shall not be attended with any very alarming symptoms, particularly in persons of a feeble circulation. This state of things may not only occur shortly or immediately after the operation, but it may also be produced at any subsequent period, should the position of the cataract become accidentally changed so as to press upon the retina or the iris. Whenever, then, inflammation of the internal tunics succeeds the operation of depression, it must be combated by the most active treatment that the patient's constitution will justify.

Local or general bleeding, or both, must be employed, and mercurial action speedily established; the eye must be defended from light, and the diet must be of the lightest kind. Tartar emetic must be given with great caution; indeed its administra-

tion is scarcely admissible, as the act of vomiting cannot fail of being very prejudicial.

If none of these contingencies should occur, and vision be restored by the operation of depression, still the lens may remain for years imbedded in the vitreous humour without becoming absorbed. It is therefore liable to become displaced, even at a remote period after the operation, by any sudden exertion, and it may then rise into its natural position and interfere with vision; or it may press upon the iris and produce inflammation of that structure, so that the danger of this operation is by no means at an end, although its performance may be apparently successful. If however the lens has been depressed into a fluid vitreous humour, it will probably not retain the position in which it has been placed, but will float backwards and forwards in the eye, not being restrained by the cellular structure of the tunica hyaloidea, which seems to have disappeared; and thus it keeps up considerable irritation, and interferes greatly with vision, if it be not productive of more serious consequences.

The Operation by Solution.

By the operation by solution or absorption of cataract, we understand the opening out of the texture of the lens, so as to expose it to the solvent power of the aqueous humour, whereby it becomes dissolved and subsequently absorbed. That the lens is removed in this manner is I think proved by the fact that we often see a portion protruding through an aperture in the capsule into the anterior chamber, which gradually diminishes in length and circumference at the part where it is in contact only with the aqueous humour, and not with any absorbent vessels.

The operation by solution should be confined to soft cataracts. If you attempt in this way to remove a hard cataract, several years will often elapse before its entire removal can be accomplished, and the operation will require to be so frequently repeated, that there will be great risk of its producing inflammation. When the volume of the lens has been thus diminished, there will be greater danger of the hard nucleus becoming dislocated, so as to press upon the pupillary margin of the iris and induce very serious inflammation, which sometimes will not sub-

side until the iris is relieved from pressure by extracting the lens; an operation that is, under such circumstances, attended with great danger to the organ.

The pupil may be dilated by belladonna if the surgeon prefer it, but it is immaterial whether it be so or not.

The operation may be performed through the cornea, when it is termed Keratonyxis, or the anterior operation; or through the sclerotic coat, termed Hyalonyxis, or the posterior operation. The latter I have scarcely ever performed for some years, finding that every purpose can be answered by the former, in which the cornea only is punctured instead of the other tunics of the globe, whereby inflammation is so frequently produced. The recumbent posture is to be preferred, as you can readily see into the eye to the requisite depth, and you have the advantage of commanding the upper eyelid, and of fixing the globe with the hand that is not engaged in performing the operation. The patient and the surgeon should be relatively placed, as in the operation of extraction, the upper eyelid fixed in a similar manner, and the light should fall obliquely on the eye. A fine straight needle should be used, the shaft being of equal thickness throughout, and ground flat at the point. It should be held between the thumb and two fore-fingers, the two other fingers resting on the patient's temple; it should be introduced with its flat side towards the iris, near to the temporal margin of the cornea, and perpendicular to the point of the surface that is punctured, so as not to pass between its laminæ. If it were carried onwards in the direction in which it entered the cornea, it would wound the iris; as soon therefore as it has pierced the tunic, the handle must be turned somewhat backward, so as to carry the point onward, across the anterior chamber, in a direction parallel to the surface of the iris, until it arrives at the centre of the pupil; it should then be dipped backwards, to pierce the centre of the capsule to the depth of about a line; and instead of withdrawing it in the direction in which it entered, it should be elevated in a direction towards the centre of the cornea, with its flat side upwards, so as to make a lacerated wound in the capsule of about a line in diameter, which will not be liable to close, but will expose the surface of the lens to the action of the aqueous humour.

The needle should be withdrawn the moment this object has been accomplished, to avoid the escape of the aqueous humour, and great care should be taken not to disturb the lens, and not to lacerate the capsule so extensively as to endanger its dislocation. Belladonna should be constantly applied to the eyebrow, the patient confined to a dark room, and every precaution adopted for a few days to prevent the occurrence of inflammation. If the lens be very soft, a portion of it will often protrude through the opening in the capsule, jutting out into the anterior chamber, and the contraction of the capsule will sometimes cause successive portions to protrude as the process of solution goes on. In other cases that process will continue without any such protrusion, and then the diminution of the lens must be judged of by the enlargement of the anterior chamber, which can be readily ascertained by viewing it laterally, the iris falling back, and by the perception of light on the part of the patient becoming increased; and as long as this is the case it is unnecessary to repeat the operation. As soon, however, as there is no sensible alteration in these respects, the operation should again be performed in a similar manner; but in proportion to the degree in which the volume of the lens has been diminished, may greater freedom be employed in the subsequent attempts to remove the remainder of it. The needle should be introduced as before, and should be confined to the centre of the lens, not extending to its margin, and when introduced into the body of the lens, instead of being withdrawn, it should be elevated with its flat side upwards, so as to break off small fragments of the lens not more than one line in diameter and thrust them into the anterior chamber, taking care that they do not rest upon the pupillary margin of the iris, and also that the capsule be not so extensively lacerated towards its circumference as to endanger the dislocation of the lens. In this way, by two or three operations, the whole lens may in general be removed, without any danger or difficulty, and a permanent aperture in the capsule will remain equal in size to the natural pupil.

It is a remarkable fact, that this operation is often followed by obstinate and continued vomiting, particularly if the cataract be fluid. It should be stopped at once, if possible, by a large opiate

when it occurs, as it will not spontaneously subside for some time, in many instances continuing for forty-eight hours in a very distressing degree.

The greatest care is required in performing this operation, not only to avoid dislocating the lens, but also any injury to the iris, either from the pressure of the needle or that of too large fragments of the lens, whereby inflammation would be produced, retarding the process of solution and absorption, if it do not lead to more serious consequences. The rule should be, rather to effect too little than to attempt too much.

In regard to the after-treatment, the pupil must be dilated by belladonna, and all the precautions adopted that are necessary in cases of depression; and should inflammation of the iris occur, it must be treated in the manner already detailed.

It has been advised that this operation should be performed as a preliminary measure to that of extraction, not only in those cases in which the projecting lens encroaches so much on the anterior chamber as to impede the transit of the knife across it, but also independently of this circumstance, with the view of lessening the volume of the lens so that it might be extracted through a smaller section of the cornea, which can of course be more easily effected than the division of one half of its circumference.

It must however be observed, that it is only the surface of the lens, and not its margin, that can be exposed to the solvent power of the aqueous humour by the operation of Keratonyxis, and therefore, although the thickness of the lens may be thereby diminished, I do not see how its circumference can be thus lessened so as to allow of its transit through a smaller section of the cornea; and, moreover, it is the soft portion of the lens only that can be thus removed, and this could be readily squeezed off in the passage of the lens through the aperture in the cornea, were it prudent to attempt its extraction through a smaller opening; this however I should never recommend, being convinced that it would be attended with much greater danger to the eye than the making a section of half the circumference of the cornea.

It has been recommended that the operation by solution should be performed by introducing a needle having a cutting edge

through the sclerotic coat, just below the centre of the globe, at the distance of a line behind the margin of the cornea. The needle is to pierce the sclerotic coat with its flat side forwards, and is to be carried through the centre of the posterior chamber until its point reaches the nasal margin of the lens; its cutting edge is then to be placed directly against the middle of the lens; it is to be pressed firmly backwards at the same time that it is slightly retracted, so as to enable it to divide the cataract into two equal portions.

When this has been accomplished, the needle is to be brought forward again into the posterior chamber through the section it has made, and the upper and lower halves of the lens are then to be divided by similar backward movements of the needle into small portions, which are then to be thrust forward into the anterior chamber with the flat surface of the needle.

The objections to this mode of operating consist in the injury that is done to the internal structure of the globe; the danger that the lens, instead of being divided by the knife, may be turned over on its axis, either from the needle not being placed directly across its centre, or from the lens being too firm to allow of its division, or from the vitreous humour being fluid, and not affording sufficient resistance to the pressure of the needle. Under either of these circumstances, the lens being detached from its connexions and lying loose in the vitreous humour, any further attempt at its division must necessarily prove abortive, and then its depression, which is attended with great difficulty, must be attempted, or it must be thrust into the anterior chamber and thence extracted, which cannot now be accomplished without great risk.

Even if the intentions of the operation be fulfilled, the large fragments into which the lens is divided, and the pressure they must necessarily make on the iris, when lodged in the anterior chamber, occasions so much inflammation, that I much prefer the mode of proceeding I have already detailed in cases of soft cataract, as it will be equally advantageous in point of time as well as safety; for whenever inflammation is set up, the process of absorption of the cataract is of course suspended, even if more serious consequences be not produced.

Treatment of Congenital Cataract.

When congenital cataracts were removed only by extraction, it was considered necessary to delay the operation until the patient had attained an age at which he could appreciate the advantages that were likely to be afforded by it, and exert over himself the control that was necessary for its performance with success. In consequence of this delay, the muscles of the globe, not being early subjected to volition, acquired an involuntary action that induced a constant rolling motion of the eye, which no subsequent effort on the part of the patient could prevent or control. The power of the retina also became much impaired from want of use, and from the exclusion for several years of the stimulus to which it was intended to be exposed. From these two causes, the benefits resulting from the operation performed under such disadvantageous circumstances were, comparatively, very imperfect.

Since the time of Mr. Saunders, whose method of operating may be had recourse to at any age, these serious disadvantages have been wholly removed, and if the cataract be unattended with any other affection of the eye, and the operation be performed in infancy, perfect vision may be restored with the aid of convex glasses.

If the cataract be complete, its removal is the only remedy that can be had recourse to, and as this can be effected at any age by the operation introduced by the late Mr. Saunders, the point to be considered is, what period will be the most favourable for its performance.

If the cataract be allowed to remain for several months, the eyes may acquire an involuntary rolling motion that will never afterwards be lost; sometimes it will begin even in a few weeks after birth, and it will necessarily interfere with vision in proportion to its degree. It is therefore of the last importance that the operation should be performed before this movement of the globe becomes habitual and involuntary. I have operated as early as six weeks after birth, and should certainly recommend that the operation be always had recourse to before teething commences, as the irritation attending this process is unfavourable for its per-

formance, and it cannot be delayed with safety till after its completion.

In cases of partial congenital cataract, the operation should never be had recourse to, for two reasons. In the first place, it is in them very often followed by inflammation, which endangers if it do not destroy vision; and secondly, the patient enjoys much more perfect vision through the transparent margin of the natural lens than convex glasses will ever afford after its removal. Even if the opacity of the lens or capsule be more extensive than the dimensions of the natural pupil, this affords no ground for the removal of the lens, for by the aid of belladonna the pupil may be dilated so as to enable the patient to enjoy perfect vision, and the use of this remedy may be continued for an indefinite number of years, without either losing its effect or exerting any injurious influence on the iris, which will contract again as readily as ever as soon as the belladonna has been discontinued, however long it may have been used.

Sooner or later, however, the opacity will usually involve the circumference of the lens also, and then vision becomes obscured. Under these circumstances there is no alternative but the operation, which should always be performed with the greatest care and delicacy on the eye in which the cataract has become complete; and when this is the case, according to my experience, there is much less risk of inflammation than when the lens is only partially opake, and the process is going on by which its transparency is destroyed.

I am always desirous to avoid operating just at the time of puberty, for I have thought that inflammation is then more likely to occur than either before or after that period: if before puberty, the operation will certainly be attended with less danger than afterwards; but, above all things, it is necessary not to operate during the time that the margin of the lens is becoming opake.

In cases of congenital cataract the operation by solution should be performed in the manner just described, the child being effectually secured by several assistants; but as the lens is usually of small size, and of very soft if not of fluid consistence, much greater freedom may be allowed in breaking up its texture. The substance of the lens may be opened out, and its fragments pushed

forward into the anterior chamber, to quite as great an extent as in the second operation on the adult; but it is desirable to confine the wound in the capsule to the size of the ordinary pupil, so as not to risk the dislocation of the lens; and it will become subsequently enlarged by the retraction of the capsule behind the iris, so that a single operation will often suffice for the removal of congenital cataract in the infant. The great advantage of this operation is, that the ciliary processes, hyaloid membrane and internal tunics are not interfered with in the slightest degree, a circumstance of vast importance in regard to the success of the operation.

The operation by solution may also be performed in cases of cataract resulting from iritis. In these cases you are operating on an eye that has been previously the seat of inflammation, and in which, therefore, it will be very liable to be reproduced; on this account it is necessary to be very careful not to wound the iris, which is usually completely adherent to the capsule, and the operation must be performed with the greatest delicacy. It is also necessary to ascertain that the inflammation has been completely at an end for some time prior to the performance of the operation; and if there be any traces of its presence, they must be removed by suitable treatment, and the eye restored to a tranquil state before it is interfered with: it is at the same time desirable to discover the limits of the adhesions by the use of belladonna.

The patient and surgeon being respectively placed in the manner already pointed out, the needle is to be introduced at the temporal side of the cornea, and inserted into the centre of the capsule about a line in depth; it is then to be rotated between the thumb and finger so as to drill an opening in the capsule, as Mr. Tyrrell expresses it. It is then to be immediately withdrawn, to prevent the escape of the aqueous humour if possible, and to avoid any injury to the eye. The aperture thus formed will not be readily disposed to close, and the lens will consequently be exposed to the solvent power of the aqueous humour. The eye should be shaded, and the patient should avoid any exposure likely to produce inflammation for a few days. The solution of the lens is indicated by the falling back of the iris, which causes enlargement of the anterior chamber; and

as long as this continues to increase the operation should not be repeated, but it will generally be necessary to do so about once a month until the lens is got rid of. This cannot usually be effected until the operation has been repeated eight or ten times, which forms a very serious objection, as it will occupy a period of as many months.

In young persons, however, in whom the cataract is quite soft, the lens may be removed without requiring the operation to be repeated so many times; and when this is effected, it is necessary to drill an aperture in the capsule of sufficient size to allow of distinct vision; and for this purpose a broader needle should be used, which, being inserted into the capsule and rotated freely between the thumb and finger, will leave an opening of the requisite dimensions.

In cases of this description which occur in old people, in whom the lens is usually hard, I much prefer the operation of depression, subsequently opening out the capsule in the way already pointed out; and I consider there is less risk of inflammation by that mode of proceeding where all is completed at once, than by the frequent repetition of the anterior operation. This observation applies with greater force to those cases in which the capsule is occupied by a tough, thick, false membrane consequent upon the inflammation: here the repetition of the anterior operation is almost endless.

Capsular Cataract.

From the number of cases in which portions of opake capsule have remained in the anterior chamber for years without undergoing any diminution, as well as those in which, when occupying the pupil, the capsule remains permanently unchanged for life, there seems to be no doubt that it is incapable of solution by the action of the aqueous humour. In cases of capsular cataract, then, the object of your treatment is, either to remove it from the axis of vision, or to make in it an aperture of sufficient size to allow of the transmission of the rays of light, but not to effect its solution.

When an opake capsule succeeds the operation for cataract, it is very desirable to remove it by the anterior operation, if possible, so as to avoid wounding the internal tunics of the globe; and if

it be adherent to the iris on each side, and thus stretched tense across the pupil, this may in general be readily effected by introducing a broad flat needle through the lower part of the cornea, and carrying it directly to the upper part of the pupil, and then depressing it with the flat side downwards; by this mode of proceeding, the adhesions of the capsule will give way rather than the substance of the capsule itself, which will thus become depressed and fall down behind the iris. If a fine needle be employed, the substance of the capsule will either be divided, or it will yield so much that you will not have sufficient power to detach its adhesions: the needle should be nearly a line in breadth.

In other cases it may be desirable, if the capsule cannot be thus detached from its adhesion by introducing a broad needle through the cornea, to pierce the centre of it, and then, by rotating the needle between the thumb and fingers, to make in it an a erture of the size of the natural pupil.

If however the capsule cannot be depressed, nor a central aperture made in it in the way I have just described, it may be removed by a curved needle of the figure of Scarpa's, but of equal thickness throughout, so as not to evacuate the aqueous humour. It is to be introduced into the anterior chamber through the temporal side of the cornea with its point backwards, the pupil being previously dilated. It must penetrate the capsule at its temporal margin; the point must then be turned forwards, so as to pierce the nasal side of the capsule from behind forwards. It is then to be brought forward into the anterior chamber, and twisted round the needle by rotating it until the capsule is detached; and it may be left in the anterior chamber on withdrawing the needle from the eye.

Sometimes, on rotating the needle in this manner, the capsule will give way, and thus a considerable aperture will be formed in it. Sometimes the capsule is so exceedingly tough, that it cannot be pierced by the needle, while it yields to such an extent that it may be pressed deeply into the eye without being separated from its attachments, and it consequently returns to its former position behind the pupil the moment the pressure of the needle is withdrawn. Under these circumstances it becomes necessary to extract it through a small section of the cornea, embracing about one-fourth of its circumference, by means either of

a small hook or a fine pair of forceps, twisting them round several times in the capsule, so as to facilitate its extraction.

By whatever operation the lens may have been removed, its loss must be supplied by the use of a plano-convex or double convex glass; the latter is, I think, to be preferred. By these means the loss of its refractive power, which the eye has sustained, may be restored, but not so the power of changing its focal distance, so as to adapt the organ to the view of near and distant objects. It therefore becomes necessary that the patient should be furnished with glasses of different power: those of about $4\frac{1}{2}$ inch focus, for viewing large and distant objects; while for those that are near, and of minute size, glasses of about $2\frac{1}{2}$ inch focus should be employed.

The focus of the glasses should be exactly adapted to that of the eye of the patient, and if so he will be able to see every object clearly and distinctly, without any sensation of effort or straining of the eye, and to wear them for any length of time without their producing any feeling of distress or uneasiness in the organ. As there is some variety in the focus of different glasses of the same number, I always consider it desirable that the patient should select for himself from a quantity of them those that he finds the most suitable, and through which he can see with the greatest ease and comfort, being particularly careful not to use any that magnify, the consequence of which would be to impair the power of the retina, if not to produce amaurosis.

The too early or too constant use of cataract-glasses cannot be sufficiently reprobated; they should never be employed at all for at least two months after all inflammation that may have succeeded the operation has subsided; and where that has been severe, even a longer time must elapse before they can be had recourse to without danger of inducing either inflammation of the internal tunics of the globe, or such an amount of congestion of the retina as will endanger amaurosis. It is also desirable that the patient should wear his glasses as seldom as possible, for the eye is so accommodating an organ, that the more he dispenses with their use the better will he see without them.

THE END.

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