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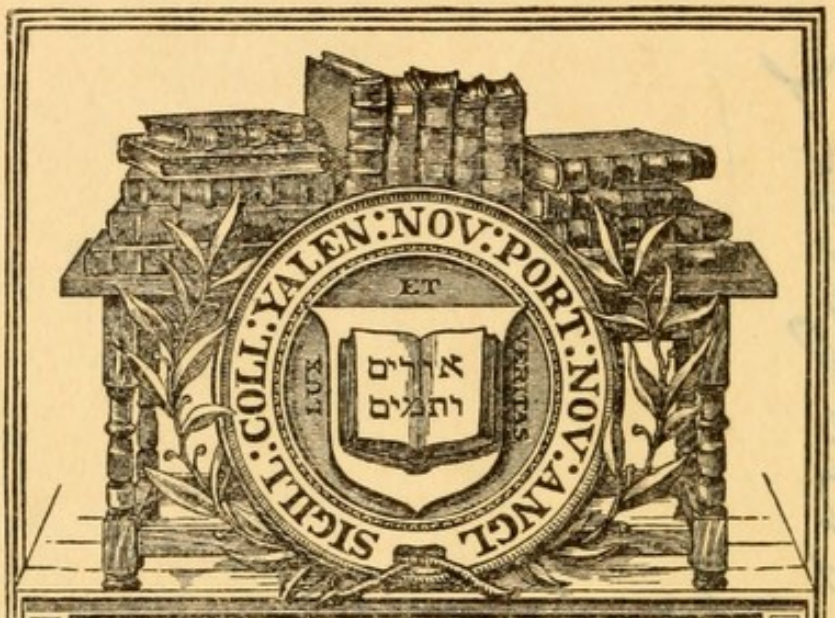

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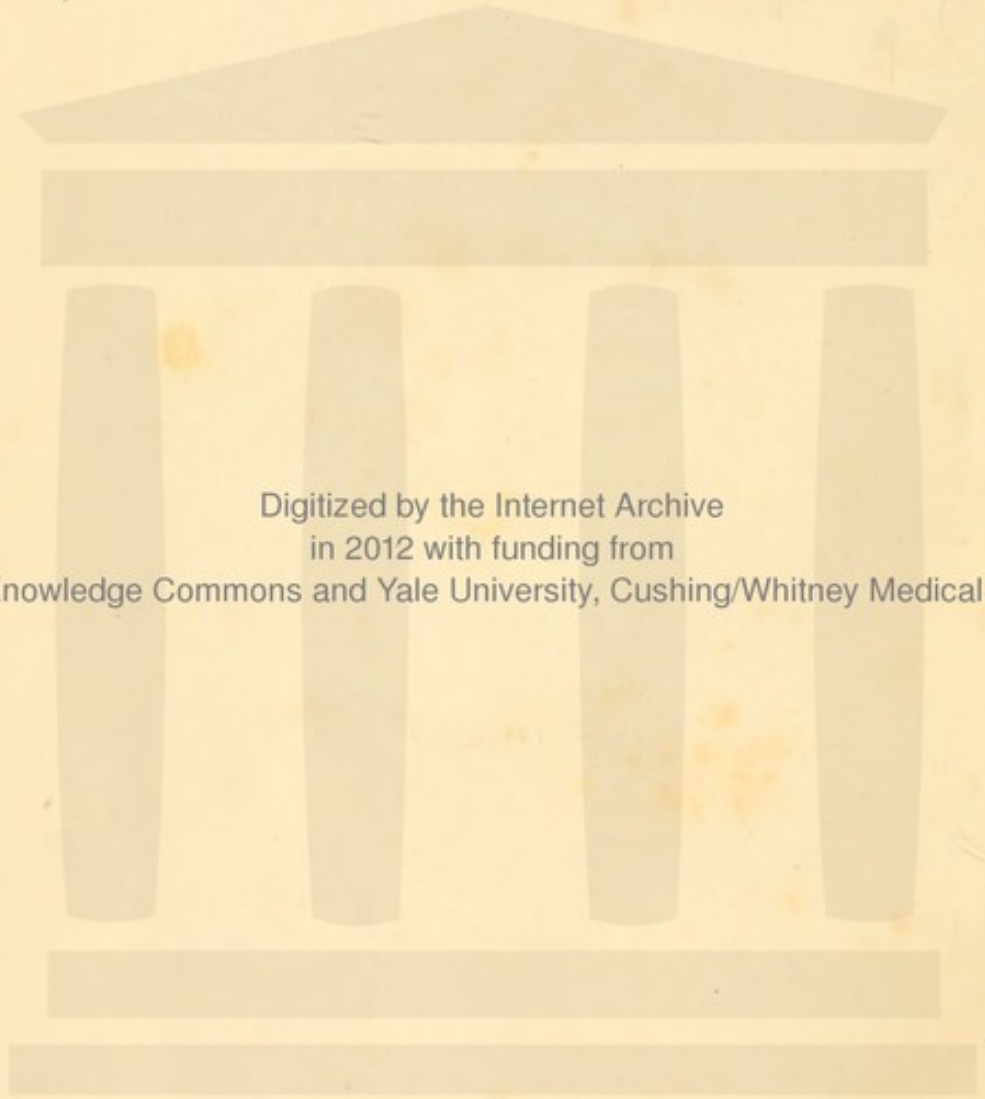

A

GUIDE

TO THE PRACTICAL STUDY OF

DISEASES OF THE EYE:

WITH AN OUTLINE

OF THEIR MEDICAL AND OPERATIVE TREATMENT.

BY

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FROM THE SECOND LONDON EDITION.

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PREFACE TO THE SECOND EDITION.

In preparing for the press a new edition of this work, I have steadily kept in view my original plan, and endeavored to correct and improve, rather than to amplify. The number of pages, however, will show that the present volume contains considerably more than the former one. Some of the chapters have been re-arranged; and the section on the opthalmoscopic appearances of the retina and choroid has been re-written.

The study of these appearances is at first attended with so much difficulty, that I would gladly have called in the skill of the artist, to aid my necessarily imperfect descriptions of what the student is to look for when he first begins to use the ophthalmoscope. But a series of drawings, executed in such a style of art as the subject requires, would have wholly altered the scope and character of my book.

The two works of Sichel and Ruete, to which, in

my first edition, I directed the reader's attention, are still unfinished; but the concluding part of the *Iconographie*, which is to contain the ophthalmoscopic illustrations, is on the eve of publication. I am not acquainted with any complete series of such illustrations which can be said to afford really trustworthy guides to the student. RUETE'S plates are so hard in form, and so glaring and false in color, as rather to mislead than instruct. As examples of want of truthfulness, I may instance the figures in which the retina illuminated by artificial light, and the surface of the globe and eyelids under ordinary daylight, are presented to the spectator at one view.

Within the last two years a French translation of MACKENZIE'S *Treatise* has appeared, which, unlike most translations, is an improvement on the original. The student who is familiar with the French language may feel assured that the sense of the author has been most faithfully rendered, and he will find such a large amount of additional matter as places the work in the very first rank of books of reference.*

* As the translators have very flatteringly mentioned my name in their preface, I may appear, in praising their labors, to praise myself. But my aid was strictly limited to verifying the correctness of the translation; and, so far as my experience goes, I know of no medical work which has been so skillfully reproduced in another language as this *Treatise* of MACKENZIE'S by MM. TESTELIN and WARLOMONT.

I cannot but regret that the learned author, in preparing his new addition, did not expunge many of the older cases reported. They but too often record violent and unscientific modes of treatment, which the better knowledge of the present day has condemned; and it is to be feared that the readers of the *Treatise* will not always discriminate between that which is merely to be regarded as matter of history, and that which is to be imitated as sound practice. The abuse of bleeding and mercury, and general over-drugging and depletion, are not so wholly things of the past, as to make it superfluous in a writer on ophthalmic medicine to warn his readers against their disastrous consequences both to sight and health.

Portman Square, *April*, 1859.

PREFACE TO THE FIRST EDITION.

So great an amount of talent and industry has of late years been devoted to the investigation of Diseases of the Eye, that a new volume on the subject appears to require a few words of introduction.

Notwithstanding all the assistance the student may derive from systematic treatises and pictorial illustrations, close personal examination of a large number of patients can alone enable him to recognize those delicate changes which the tissues of the Eye present under various morbid conditions. Specially to direct his attention to these changes, and to explain the best methods of observing them for himself, is the primary object of the following pages.

I have, therefore, chiefly dwelt on the description of *outward* phenomena; for, inasmuch as the peculiar susceptibility of a patient must cause endless modifications of his *subjective* symptoms, a full consideration of these would have expanded my volume, from its present moderate dimensions, into a System of Ophthalmic Pathology.

I have endeavored to describe accurately and simply the appearances of the various tissues of the Eye, both

in health and in diseases; and after twelve years of official duty at the most numerously attended Ophthalmic Hospital in existence, I need hardly add that every description has been drawn from Nature.

The reader will find that many terms which are to be met with in established works on Opthalmology, have been omitted from the present volume; for, while attempting to sketch all the principal diseases of the Eye, I have purposely avoided adopting every uncouth and involved expression which has descended to us from barbarous ages, or been contrived by the ingenious etymologists of more recent times.

Technical terms are of course as indispensable in medicine as in any other science; they avoid circumlocution, and, if well chosen, carry with them their own definition; but to attempt expressing by single words every process of disease, and every surgical manipulation, imparts a dry and pedantic character to subjects which would be attractive and interesting if described in a simple and natural way. It requires a more intimate knowledge of Greek than one has a right to expect from every student of medicine, to recognize in *Iridoperiphakitis* an inflamed iris and capsule; or at once to detect the operation for closing a lachrymal fistula under such a disguise as that of *Dacryocystosyringokatakleisis*.

As it is my object to speak of diseases as I have

seen them, without entering upon theoretical or controversial matters, I have, as much as possible avoided encumbering my text with literary references. Those which it appeared necessary to make are, for the most part, taken from works easily attainable by English students.

In respect of Treatment, I have endeavored to limit myself to general rules, and briefly and plainly to record what my own experience has led me to prefer. Most gladly would I have avoided all criticisms on the opinions of others; but this, in some few instances, where particular methods of treatment have acquired celebrity, was impossible; for, under such circumstances, it seems as much the duty of a writer to offer warnings against practice which he believes to be dangerous, as to inculcate that which his own experience has taught him to consider safe and beneficial.

In relating cases, I have restricted myself to such as seemed requisite to illustrate my subject. Occasionally it happens that to detail a well-marked case affords the best, and eventually the shortest, method of describing the phenomena of a disease; and I have, therefore, in some instances, entered even minutely into such details. Those cases, however, which involve many technical points of operative surgery, I have placed separately in an Appendix. Some of them have at different times appeared in the *Lancet*, as have

also considerable portions of the Chapters on Iritis and Cataract.

We already possess valuable systematic works, which the advanced student may always refer to with advantage, as soon as he has familiarized himself with the outward appearances of Ophthalmic diseases. Among them the *Treatise* of Dr. MACKENZIE indisputably holds the first place, and forms, in respect of learning and research, an Encyclopædia unequalled in extent by any other work of the kind, either English or Foreign.

The two volumes of my early friend and teacher, the late FREDERICK TYRRELL, embody the experience gathered by a thoroughly independent observer during five and twenty years of hospital and private practice; and, although wholly different in kind from the learned treatise of MACKENZIE, they will always prove useful to the advanced student and the practitioner, by their eminently clininical and practical character.

DR. JACOB'S *Treatise on the Inflammations of the Eye-ball* is well adapted to impart large and comprehensive views of the diseases of the organ, and thus to counteract a habit of regarding them in an isolated manner, as if morbid processes in the eye were essentially different from those in other tissues of the body.

With regard to colored Illustrations, it is evident that their introduction would have totally altered the character of the present volume, and at once have

placed it beyond the reach of those for whom it is intended. Morbid changes affecting merely the *form* of a part can, in most instances, be perfectly shown in a mere sketch; often, indeed, more effectively than by the most finished painting; but to exhibit the more delicate alterations in the tissues of the eye, not only is *color* absolutely necessary, but an elaborateness of finish, which, if properly directed, and based on correct drawing, cannot be carried too far.

Four illustrated works of great extent and labor have appeared within the present century;—the *Traité des Maladies des Yeux* of DEMOURS; VON AMMON'S *Klinische Darstellungen der Krankheiten und Bildungsfehler des menschlichen Auges;* DALRYMPLE'S *Pathology of the Human Eye;* and SICHEL'S *Iconographie Ophthalmologique.* Instead of giving general references to these works, I have examined the individual representations, so as to ascertain which of them I might recommend as really useful to the student.

The plates of DEMOURS are sure to please at first sight, being neatly engraved, and showily colored; but they are to the last degree stiff, hard, and formal; and any one practically familiar with Eye Diseases can detect many of the figures to be mere plans and diagrams, not authentic portraits of real cases.

The numerous figures in VON AMMON'S work, al-

though evidently the result of immense industry on the part of that eminent surgeon, are so coarsely and heavily executed, as to convey no idea whatever of the more delicate changes they are intended to portray.

DALRYMPLE'S and SICHEL'S figures possess the all-important advantage of being actual portraits; and the value of the latter author's *Iconographie* is still farther increased by the circumstance of the drawings having been taken from patients who were under his own immediate care. This beautiful work is still in course of publication, and I have, therefore, been unable to refer to it as often as I could have wished.

RUETE'S *Bildliche Darstellungen der Krankheiten des menschlichen Auges*, has, as yet, reached to one number only.

In conclusion, I would most earnestly impress upon the student the absolute necessity of closely and patiently studying the phenomena of Eye Diseases on the living subject, if he hopes to acquire any real skill in their diagnosis. Beautiful as are many of the illustrations I have alluded to, they are useful only as indicating what he is to observe. Neither books nor drawings can do more than teach him how to learn.

GREEN STREET, GROSVENOR SQUARE,
April, 1855.

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CHAPTER I.

EXAMINATION OF THE EYE.

The Conjunctiva and Cornea.—For examining the former of these structures, when attacked with the slighter forms of Ophthalmia, no special manipulations are required. The ocular portion is open to the surgeon's observation, and, to explore the lining of the lower lid, it is only necessary to depress the tarsus with the point of the finger. But it is often difficult to obtain a satisfactory view of the cornea in a child suffering from that irritable form of inflammation known as *Scrofulous Ophthalmia.* The surgeon does but waste his time who attempts to coax or parley with such a patient. Light causes so much pain, that the child makes every effort to exclude it, by keeping the eyelids firmly pressed together, and even, in severe cases, thrusting his face against the pillow, or the dress of the attendant.

The surgeon should sit, and spread a folded towel across his knees. Opposite to him sits the attendant, who secures the child's hands, and lowers him backwards until his head is received between the surgeon's knees, and there held as in a vice. Thoroughly to expose the cornea without everting the lids requires tact, which practice alone can give. The extreme tip of the forefinger, with a bit of rag twisted over it to prevent slip-

ping, having been laid upon the middle of the upper tarsus, at the very edge,—between the roots of the eyelashes and the globe,—the lid, without any dragging of the skin, is to be steadily pushed in a direction which, in the erect position of the body, would be upwards and backwards. In this way the greater part of the cornea is at once exposed; but if the finger is allowed to drag the skin of the lid, the tarsal cartilege becomes instantly tilted over, and the conjunctiva, bulging forwards, hides the eyeball from view. The lower lid may be depressed by a similar manœuvre; but this is not necessary in examining the cornea, for that part is always rolled upwards under cover of the upper lid.

If a more prolonged examination of the eyeball be required, as in a case *Ophthalmia neonatorum*, a spring speculum must be employed, adapted, as regards width and strength of spring, to the size of the palpebral fissure.

To expose the conjunctiva of the upper lid, the part must be everted, as if the surgeon were in search of a foreign body; and, indeed, it is with such an object that the eversion is most frequently performed. Whenever a patient complains of having had a fragment of anything blown into the eye, and a careful scrutiny of the edges of the tarsi, the fold of the lower lid, and the surface of the globe, has failed to reveal the cause of irritation, the upper lid should be treated in the following manner:—A pen, the extreme feather end of which is cut off, so as to leave a stem just thick enough to resist bending, is laid across the upper lid, about half an inch from its free margin; then, while the finger and thumb

of the other hand grasp the eyelashes growing from the middle of the lid, the pen is pressed a little downwards, at the same moment that the lid is drawn first a little forwards, and then upwards; the tarsus will suddenly tilt and fold over, so as to expose its conjunctival surface.

This manœuvre, simple as from description it seems to be, requires a good deal of *knack*. Both hands must act together, and if at the moment the turn is being given to the lid, the patient is told to look downwards, the eversion is much more readily accomplished. Minute foreign bodies, which have fixed themselves beneath the upper lid, are almost invariably found very near its tarsal margin; they should be lightly picked off with the feather or nib of the pen used for effecting the eversion. A pen is not only more convenient than a probe, but it has the advantage of appearing less formidable to a timid patient.

To those who are almost daily in the habit of thus everting the upper lid, and removing foreign bodies from its conjunctival surface, it is quite ludicrous to see what varied contrivances are from time to time suggested for superseding this simple feat. A bent probe covered with lint, or a wire twisted into the form of a hoe, and passed from side to side between the lid and the eyeball, are as unnecessary as the crabs' eyes that were introduced by the old oculists beneath the upper lid, in the hope that, by rolling about there, they might catch and expel the foreign body.*

* It seems almost absurd to speak of the *inventor* of a manipulation which, one would think, must naturally have suggested itself to any

Parts behind the Pupil.—Great care is required in examing a patient in whom we have reason to suspect that Cataract is commencing. The first faint streaks of opacity in a lens will often escape detection, unless light be concentrated on the part by means of a convex glass of about an inch focus. I need hardly say that, in all examinations of the eye, bright daylight, not sunlight, is to be employed. The observer must also take care that light does not fall upon the cornea from more than one window; and that reflections from mirrors and other polished surfaces do not interfere with the single ray of direct light which should fall on the part to be examined. No lens can be fully seen until the pupil has been widely dilated with atropine; but, inasmuch as this dilatation alters the visual focus of the eye, all particulars as to the patient's range and distinctness of vision should be noted before the atropine is applied.

When the surgeon is satisfied that a patient's defect of sight is not due to any opacity of the cornea or lens, he at once proceeds to test the power of the retina; in doing which, each eye must be examined separately. The contractility of the iris is tested by placing the hand close to the eye for a second or two, and then

person engaged in the practice of surgery; but, as far as I can discover, WARE was the first to describe the method of everting the upper lid. (*Remarks on the Ophthalmy, &c.*, second edition, 1787, p. 23.) BEER, who was so long regarded, not only in Germany but in this country, as almost infallible in ophthalmic matters, while he devotes a whole chapter of elaborate trifling to the subject of foreign bodies, never once alludes to this simple plan of removing them, although he gives numerous rules for hunting after them with hair pins, brushes dipped in butter, and similar droll contrivances.

quickly withdrawing it, so as to allow the light to fall suddenly upon the pupil. The sympathy between the two eyes should next be examined, by observing how far light admitted to one eye influences the iris of the other.

It should ever be borne in mind that a dilated and inactive pupil by no means necessarily implies that the retina is diseased; nor an active pupil that the retina is sound. If one pupil be large and immovable, and the sight of that eye dim, the patient should be made to look at type through a large pinhole in a card held close to the cornea. The object of this will be explained under the head "Mydriasis."

Concave and convex glasses of different foci should be tried, if mere shortness of sight or deficiency of adjusting power be suspected.

We must never be satisfied with a patient's vaguely telling us that he can or cannot *read;* we must have a precise and definite standard, such as is afforded by his reading to us aloud from type of several sizes. In hospital practice, those who have not learned their letters,—who, as they express it, "are no scholars,"—may be told to count small dots, point out a single and a double line, or select an asterisk from other typographical marks.

The simple modes of examination hitherto mentioned have at all times been at the surgeon's command; I come now to consider the use of an apparatus—the *Ophthalmoscope*—the invention of which has enabled us to investigate those deeply-seated structures previously altogether beyond the range of observation.

The living retina was formerly assumed to be a transparent sheet of nervous matter, spread over a black ground—the choroid—and incapable of reflecting rays of light to the eye of an observer. CUMMING* was the first to demonstrate how readily the color of the living retina might be seen, if the observer did but look for it in the right way,—namely, by so placing himself that his eye should be, as nearly as possible, in the line of the rays of light falling on the retina of the patient. The investigations of CUMMING proved that the fundus of the living eye was not a dull black, but a light-colored, reflecting surface, and he was at once enabled to class among healthy phenomena certain colored appearances of the depths of the organ which from time to time had been noticed by different observers, and by them described as diseased conditions, under the various terms of "Cats'-eye amaurosis," "want of pigment," &c. CUMMING never obtained a view of the optic nerve, or the vessels of the retina; but his experiments prepared the way for the ophthalmoscope and all its invaluable revelations.

In 1851, HELMHOLTZ published an account of an ingenious polarizing apparatus which would enable the observer to avail himself of artificial light in examining the retina, without intercepting with his own head any of the illuminating rays. Several modifications of his apparatus were suggested by different observers. In the following year, RUETE invented an ophthalmoscope on a principle wholly different from that of HELMHOLTZ; the light being thrown upon the patient's retina by means of

* *Medico-Chirurgical Transactions* for 1846.

a concave mirror, and the observer looking through a small hole in its centre. This leading principle of RUETE'S apparatus was adopted by COCCIUS, ANAGNOSTAKIS, and others, in their less complicated ophthalmoscopes.

The simplest form of the instrument consists of a single mirror, slightly concave, perforated in the centre, and fixed in a handle; the mirror being either used alone, or with the addition of a convex or concave glass, according to the kind of illumination required, or the visual focus of the observer.

The examination is made in a darkened room in the following manner:—

The patient sits sideways against the edge of a table on which a lamp is placed, or at a convenient distance from a jet of gas, the flame being close to, and on a level with, the suspected eye, but far enough back to prevent any light falling directly on the cornea. A glass shade faintly tinged with blue, by modifying the red rays, whitens the light, and imparts to the tissues of the eye a more natural appearance.

Unless the pupil have become dilated by disease, it must be fully brought under the influence of atropine before the examination is begun.

The surgeon, sitting close to and facing the patient, holds the mirror at such a distance in front of the eye to be examined, that the rays of light may be brought to a focus on the patient's retina. As this focus cannot easily be found by a beginner, it is better for him to direct the rays at first upon the patient's cheek, and as soon as a well-defined inverted image of the flame has

been formed there, a slight upward and forward movement of the mirror will bring the retina itself within the exact focus of the instrument. When the rays from the mirror are first directed through the pupil, a generally diffused, reddish glare is usually perceived, varying in different patients as to intensity of color; but in some cases the tint is orange-red, orange-yellow, or even buff. If radiating blood-vessels come clearly into view, the proper focus has been attained.

A marked increase of redness in the retina sometimes takes place after it has been exposed for a short time to the rays of light; and the observer, who is not aware of this, may attribute to a settled morbid state of the eye, that which is in truth only the temporary result of his own examination. If the patient turns the eye a little inwards, the optic nerve comes into view, as a circular patch of white, faintly tinged with pink.* From the centre of the nerve emerge the central artery and vein, both vessels dividing into several branches, which radiate towards the periphery of the retina.

To magnify the parts observed on the surface of the retina, or to increase their illumination, the surgeon—holding the ophthalmoscope steady in one hand—must

* This is frequently spoken of as the "optic papilla," or "papilla of the optic nerve." The terms, however, are ill-chosen; for although, when we dissect a healthy eye, the optic nerve appears to be a little elevated above the adjacent surface of the retina, this elevation, if it exists at all during life, is so slight as not to be then appreciable by the observer. Of course the extremity of the optic nerve is the only portion of it open to ophthalmoscopic observation, and therefore, in describing morbid appearances of the internal eye, it is sufficient if we speak simply of the "optic nerve," without adding the word "papilla."

take in the other a convex lens of about two and a half inches focus, and place it at a suitable distance in front of the patient's cornea.

So much has been written about the value of the ophthalmoscope as a means of detecting *incipient* disease of the retina, that the student must be warned against the mischief he may inflict upon an inflamed eye, in which vision is only slightly impaired, by subjecting it for too long a time to an intense glare of concentrated light.

In exploring the *Ear*, we may, indeed, concentrate the rays of light upon the tympanic cavity, or its membrane, to any amount, without injury to the parts illuminated; but the *retina*, far from being a merely passive object of examination, is just the one tissue in the body which appreciates the intensity of the rays which fall upon it: and it must be borne in mind that the eye may be irritable and intolerant of light to an extreme degree, even although there may be a considerable diminution in its power of perceiving objects.

In using the ophthalmoscope, do we see the parts behind the lens in their real position or inverted? Certainly, objects which do not fall within the focus of the lens are seen in their real position. Thus, in a case of an encephaloid deposit within the eyeball, recently under my care, where all the media of the eye had perfectly retained their transparency, the deposit was seen rising up from the floor of the vitreous chamber, just behind the ciliary processes. The patient could read small type when the page was held considerably below the level of the eye; but if the page was raised above that level, the rays fell upon the lower half of the retina, occupied

by the morbid deposit, and no image was perceived. I extirpated the globe, and found the encephaloid mass occupying the position I have mentioned on the floor of the vitreous chamber. Similar cases are of frequent occurrence in ophthalmic practice.

As regards those parts which lie in the focus of the lens,—the optic nerve and retina,—I believe they are seen inverted; so that an extravasation, or patch of pigment, really lying above the optic nerve, would seem to be below it; or if really on the nasal side of the nerve, would appear to be on its temporal side.

The invention of the ophthalmoscope was perhaps too enthusiastically hailed as a means of clearing up all the obscurity which had surrounded the pathology of the choroid and retina; nevertheless, there are many limits to the powers of the instrument.

It can afford us a clear view of retina only when the lens is transparent; and we know how commonly this body becomes opaque where disease has for a long time existed in the deeper tissues.

Unless the pupil be of good size, or dilatable by means of atropine, only a very small extent of the retina can be brought into view; and Chronic Iritis—so frequent an accompaniment of changes in the choroid and retina—never exists without giving rise to such an adhesion between the iris and capsule of the lens as must limit both the size and dilatibility of the pupil.

Although various alterations in the retina—loosening of its attachment to the choroid, thickening, extravasation of blood, &c.—are so readily seen by the aid of the instrument, the earlier stages of disease produce changes slight and delicate as to elude observation.

CHAPTER II.

THE CONJUNCTIVA.

APPEARANCE OF THE CONJUNCTIVA IN HEALTH.

THIS varies greatly according to age, occupation, and climate. In infancy and childhood the vessels are so small and few that, except at the inner and the outer canthus, there are hardly any visible to a casual observer; and the sclerotic has, in consequence, a uniformly white and glistening aspect. As age advances, the conjunctival vessels become larger and more noticeable, especially in persons much exposed to the weather; so that a considerable degree of redness of the conjunctiva may exist without constituting a disease.

In most people, after the middle period of life, a yellow deposit occurs beneath the conjunctiva, and in anxious persons it often gives rise to a good deal of needless alarm. The situation in which this little growth appears, is on the equator of the eyeball, and close to, but never quite on, the inner and outer margins of the cornea, in the form of small yellowish-white elevations, around which there is usually a fine plexus of vessels. It is rare to meet with an old person in whom some slight deposit of this kind may not be discovered. If the surgeon be consulted on the subject, he may always reassure the patient as to the innocent nature of the growths. They never overstep the margin of the

cornea, and need not in any way be interfered with. The term "Pinguecula" has been applied to them.

DISEASES OF THE CONJUNCTIVA.

PTERYGIUM.*

This growth consists of a thickening of the conjunctiva and subjacent areolar tissue, with enlargement of the vessels of the part, and, probably, the formation of new fibrous tissue; it is hardly ever met with except at the inner side of the globe, where it assumes the form of a triangular reddish patch on the white of the eye; the base corresponding to the *plica semilunaris*, and the apex reaching to the edge of the cornea, or even a little way beyond it.

In a large pterygium, the sclerotic portion, when closely examined, resembles a delicate, thinly-expanded layer of muscle, intermixed with a few glistening aponeurotic fibres. The apex is obtusely rounded off, opaque and whitish in texture, and so firmly attached to the cornea as to look almost like an elevated, thickened cicatrix of that structure. It is this encroachment on the cornea that usually first alarms the patient; and he applies to the surgeon, under the apprehension of "a skin growing over the sight." There is, however, little danger of this taking place, for the apex very rarely extends so far over the cornea as to obstruct the area of the pupil.

Pterygium is of very slow formation, and gives rise to

* The best representation of a pterygium I am acquainted with, is that by SICHEL, pl. xxvi. fig. 1. It is, however, rather exaggerated. DALRYMPLE'S figures (figs. 2 and 3, pl. iii.) are very indifferent.

no pain or inconvenience. It is seldom met with, except in persons who have passed the middle period of life; but I have now and then seen it in younger men, sailors and others, who have spent much of their time in tropical climates.

It is useless to attempt the dispersion of the growth by any local application. Should the patient be very anxious to get rid of it, the surgeon may easily accomplish its removal by nipping it up with a forceps, about midway between the *plica semilunaris* and the edge of the cornea, and then dissecting this external portion from the sclerotic with a fine scalpel or cataract knife; taking special care, when removing the corneal part of the growth, not to injure the cornea itself. It is desirable not to cut away from the sclerotic more of the conjunctiva than has really become degenerated and unsightly; and it is seldom necessary to remove it quite up to the *plica semilunaris*. The operation is much facilitated by holding the lids apart with a spring speculum.

The varieties of pterygium, described by authors as *sarcomatous*, *fungous*, *malignant*, and *cancerous*, appear, for the most part, to have been growths of the ordinary kind, irritated and excited to overgrowth by repeated scarifications and the use of escharotics.

INFLAMMATION (*Ophthalmia*).

Although, according to strict etymology, the word *Ophthalmia* might be applied to any disease of the eye, it has, by common consent, been restricted to mean an *Inflammation of the Conjunctiva*.

This membrane, which in the healthy state allows the white sclerotic to be so distinctly seen through it that the two structures seem to form but one, exhibits, when inflamed, a red or "blood-shot" appearance.

According to the intensity of the inflammation, the redness may be either very faint in color, or of a uniformly deep tint. It may occupy the whole surface of the eyeball and lids, or may be limited to a small patch on the white of the eye; or, again, it may be confined to the lining of the lids, the eyeball retaining almost a healthy aspect. The student should familiarize himself with the different appearances which the injection of the vessels imparts to the eyeball, according as the conjunctiva or the sclerotic is chiefly affected. In a severe case of the former kind, an attentive observer will notice the redness is occasioned by an exceedingly close interlacement of vessels, which become finer, and anastomose more closely, as they approach the cornea. Large trunks may be traced from the inner and outer canthi, and indeed from every point on the line of junction between the lids and eyeball; and these trunks, as they converge towards the cornea, divide and subdivide until the naked eye can no longer follow their branchings. The injection, if purely conjunctival, is in the form of a fine network, and of a vermilion tint, resembling the delicate work of the pencil's point; whereas, if the sclerotic be inflamed, a very different appearance is produced. It is often said that the enlarged vessels of the conjunctiva are tortuous, and those of the sclerotic straight; but, in reality, the latter are too fine and too much embedded in fibrous tissue to be recognized at all

as distinct vessels; and their general effect is that of a *wash* of color, in contradistinction to the finely-penciled *network* of the inflamed conjunctiva. Again, the conjunctival injection is most strongly marked along the line where the membrane is reflected from the lids on to the globe; while the sclerotic injection assumes the form of a zone surrounding the cornea, gradually shaded off at a distance of about two lines from its margin.

The color of the conjunctival injection, especially in the finer vessels, is, as I have said, that of *vermilion;* while the sclerotic zone is *pink*, as if washed in with carmine.*

In very high states of inflammation, the conjunctiva is so thickened that the sclerotic zone is altogether hidden, and the whole surface of the eyeball has the uniform vermilion color up to the very edge of the cornea.

The student should make himself thoroughly familiar with the distinctive character of sclerotic and conjunctival inflammation, as these two forms of disease require different modes of treatment.

Writers on Eye diseases have subdivided the Ophthalmiæ according to their supposed constitutional or external causes, the arrangement of blood-vessels in the conjunctiva, or the nature of its secretion. Thus we read of *Scrofulous* (or Strumous) Ophthalmia; *Pustular* Ophthalmia; *Purulent* Ophthalmia; and many others. The abundance of names adopted by some of the systematic German writers would appear incredible to those who have not examined their works. Many of these

* Dalrymple; fig. 2, pl. xiv., figs. 4 and 5, pl. xv., all afford good specimens of sclerotic injection.

subdivisions are purely fanciful, and wholly inapplicable to practice. I shall endeavor to direct the student's attention to those forms only which possess marked and essential points of difference, both as to symptoms and treatment.

SIMPLE OPHTHALMIA.

(*Ophthalmia simplex—Conjunctivitis simplex.*)

Under the name of Simple Ophthalmia, some systematic writers describe an inflammation of the conjunctiva distinct from the catarrhal form, unattended with profuse purulent discharge, and not originating in rheumatism or scrofula. If, however, we exclude all these constitutional modifications, and also the irritation of foreign bodies and direct violence, nothing seems to be left which we can assign as the exciting cause of the so-called *simple* inflammation; or, rather, there will be no recognizable affection at all to which the term can be applied. Simple Ophthalmia and Catarrhal Ophthalmia, as described by TYRRELL, for instance, appear to be only different degrees of the same inflammation; and probably all cases of Ophthalmia termed *simple*, are the result of those atmospheric causes in which the various forms of catarrh originate. The term of Catarrhal, however, always suggests increased mucous discharge, and, therefore, we may naturally feel inclined to restrict the use of the word to that form of Ophthalmia which is attended with such increase and change of secretion; and to designate those slighter cases "Simple," in which there is some degree of redness of the eyeball, without other remarkable phenomena. MACKENZIE altogether discards the term *Simple* Ophthalmia.

It must be remembered, too, that true Catarrhal Ophthalmia, if seen soon after its commencement, does not present the phenomena which characterize its later stage; and thus the same case might be set down as either *simple* or *catarrhal*, according to the period at which it was seen by the surgeon.

If, then, we agree to term the less severe form of Catarrhal Ophthalmia, simple, we must remember that it presents endless varieties of appearance, according to the degree and arrangement of the conjunctival injection. A red, or "blood-shot," appearance of the eyeball, an increased flow of tears, and some amount of intolerance of light, are the symptoms that attract the surgeon's notice.

The patient sometimes complains of a pricking in the eye, as if there were a foreign body, grit or sand, beneath the lid. The latter feeling is commonly caused by the over-distension of some vein, which projects above the smooth surface of the conjunctiva. It is impossible, however, to describe with any certainty the symptoms complained of by those suffering under the slighter forms of Ophthalmia; for the patient's account will vary according to his state of health, and the greater or less sensitiveness of his nervous system. Thus, of two persons, with the same amount of conjunctival redness, one will declare he has "no pain worth talking about," while the other describes his sufferings as severe—"agonizing." The share which the condition of the nervous system has in modifying the characteristics of eye diseases, must constantly be borne in mind by the young practitioner, or he will be needlessly alarmed by the

patient's description of symptoms. Not that the sufferings of the irritable, morbidly-sensitive patient are by any means to be dismissed as "imaginary." They are as real as the visible phenomena of the Ophthalmia; but they originate in a condition of the system which must be treated by general, rather than local, means.

The *Treatment* of slight cases of Ophthalmia varies so much, according to age, habits, and constitution, that in a work like the present, I can only sketch an outline of what ought to be done. First, ascertain what is faulty in the general health, the bowels, appetite, sleep, &c. In a plethoric, over-stimulated patient, restricted diet and purgative will be as necessary as quinine and iron in a feeble and languid one, or opium and hyoscyamus in a third. A practised eye will catch at a glance the general aspect of the patient, and render but few questions necessary. Rest of the affected organ, moderate protection from light, occasionally the counter-irritation of a small blister on the temple, or, if there be much intolerance of light, the application of tincture of iodine to the skin of the upper lid, and the use of warm fomentations, simple or medicated, are the usual local means. The state of the patient's constitution, and, in some measure, his own feelings, will point out whether warm or cold applications should be preferred. In using stimulating lotions, it should be remembered that their use is not to be persevered in too long, otherwise they keep up, instead of subduing, the irritability of the conjunctiva; and it is well, after they have been used for a few days, to leave them off for a day or two, and observe the result. The application of fresh spermaceti oint-

ment to the edge of the lids at night, is a comfort in nearly all cases of Ophthalmia, whether slight or severe.

PUSTULAR OPHTHALMIA.*

(*Aphthous Ophthalmia* of MORGAN.)

TYRRELL applies the term *pustule* to the more solid and vascular elevations, and *phlyctenula* to such as have fewer vessels, or rather resemble vesicles. MACKENZIE terms all elevations arising on the conjunctiva, "*pustules*," and restricts the term *phyctenula* to those attacking the cornea in the disease commonly known as *Scrofulous Ophthalmia*, which he, therefore, also calls "Phlyctenular" Ophthalmia.

The appearances in this form of conjunctival inflammation are so peculiar, that the student who has once seen a well-marked specimen, can never afterwards fail to recognize similar cases. On the white of the eye, a line or two from the edge of the cornea, and most commonly to its inner or outer side, little elevations—the so-called "pustules"—are seen, each surrounded by a plexus of vessels. There may be only one of these elevations, or several; and they vary in diameter, from that of a fig-seed to that of a hemp-seed. They are vascular, but so much less so than the conjunctiva around their base, that, by contrast, they frequently appear as if their summits actually contained pus; and hence they have

* Figure 4, pl. xiii. of DALRYMPLE'S work shows Pustular Ophthalmia of the severer form. Such a case would probably be attended with intolerance of light, and other irritable symptoms, as the sclerotic appears to be involved in the inflammation.

obtained their name.* They are most common in children and young persons. When unattended with sclerotic inflammation, this limited form of Ophthalmia gives rise to little inconvenience; and a patient with several "pustules" dotted around the margin of the cornea, will frequently exhibit no intolerance of light.

Similar pustule-like elevations, however, sometimes accompany the irritable form of Ophthalmia denominated "Scrofulous," and in such cases the intolerance of light may be very marked; and whenever sclerotic inflammation is present, the same painful symptom is observed.

Independently of any medical means which the patient's general health may require, the true Pustular Ophthalmia commonly yields to very simple treatment. A weak tepid lotion of acetate of lead, twice or thrice a-day, and, if there be any intolerance of light, a small blister to the temple, comprise all that is usually requisite.

CATARRHAL OPHTHALMIA.

Nearly all writers agree in using this term for that early stage of the disease in which the conjunctiva only is affected. If, at a later period, it chiefly confines itself to the sclerotic, it is termed by some *Rheumatic*—and, when both conjunctiva and sclerotic suffer equally, *Catarrho-rheumatic*—Ophthalmia. Should the inflammatory thickening of the conjunctiva go so far as to

* Both LAWRENCE and MACKENZIE, while using the common word *pustular*, observe that it is not strictly applicable to elevations which contain no pus. Perhaps "papular"—literally *pimply*—would be the most suitable for this species of Ophthalmia.

produce what is termed "Chemosis," and the discharge be profuse and puriform, it is difficult, by mere inspection, to distinguish the disease from Gonorrhœal Ophthalmia, and in this stage the disease is termed "Purulent Ophthalmia." MACKENZIE gives the name "Puromucous Conjunctivitis" to a *genus*, of which the severe Catarrhal, the Purulent, the so-called Egyptian, and the Gonorrhœal Ophthalmia, are *species*. Catarrhal Ophthalmia may exist alone, or in conjunction with other catarrhal symptoms. It usually begins with a reddening and swelling of the *caruncula* and *plica semilunaris;* and if the surgeon examines the lining membrane of the lower lid, its vessels will be found increased, both in size and brightness of color. Next the ocular conjunctiva becomes inflamed, and in severe cases the fine network of vessels extends quite up to the edge of the cornea. Should the inflammation have involved the sclerotic, the characteristic pink zone will be traceable beneath that part of the conjunctival network which immediately surrounds the corneal margin.

A very characteristic sign of true Catarrhal Ophthalmia consists in minute extravasations of blood scattered over the inflamed conjunctival surface at different points. These blotches are sometimes not larger than a pin's head; at other times they run together, so as closely to resemble the effect that would be produced if a highly-finished colored drawing of conjunctival injection were slightly blotted here and there while the tint was still wet.

At this stage of the disease, there is commonly not much increase of mucous discharge from the conjunctiva,

but a slightly increased secretion of tears, and during the night the eyelashes become agglutinated. In persons of feeble circulation, some œdema of the lids commonly takes place.

Very little intolerance of light accompanies the purely conjunctival inflammation. The patient complains chiefly of a stiffness and weight in the lids, and a feeling of sand or grit between them and the globe—the effect of enlarged veins projecting above the natural level of the conjunctiva.

It is in this purely conjunctival form of Catarrhal Ophthalmia that the local application of nitrate of silver is of such remarkable utility. When the sclerotic is much injected, or there is any rheumatism present,—as evinced by the pink zone around the cornea, tenderness of the globe, pain about the orbit, and neuralgia throughout the ophthalmic branches of the fifth nerve,—the nitrate of silver is contra-indicated, at least until after the affection of the fibrous tissues has been subdued by appropriate treatment.

It is from a want of duly discriminating between the purely conjunctival form of Catarrhal Ophthalmia, and that in which the sclerotic and cornea are also affected, that many surgeons have been disappointed at the effect of the treatment by nitrate of silver. It is almost a specific in the former kind of inflammation, but commonly useless, or even injurious, in the other. The strength of the solution should be two grains to the ounce of distilled water: and two or three drops of this are to be let fall, from a large camel-hair pencil or clean quill, upon the surface of the eye-ball, twice or thrice

a-day, the eye having been well bathed with warm water, and cleansed from all secretion, before the drops are applied.

By using the nitrate of silver in this manner, an attack of Catarrhal Ophthalmia is sometimes cut short within a week. Due attention must, of course, be paid to the state of the patient's health; the bowels being kept open, and the diet regulated according to circumstances. As a rule, a moderately nourishing diet, and at least the accustomed quantity of beer or wine, are to be insisted on. But as, in a feeble and depressed subject, an additional quantity of stimulus will hasten the cure, just so must a reduced style of living be enforced upon the over-fed and intemperate. The common sense of the surgeon must teach him to keep his patients on the proper level in these matters, and not to stuff or starve them indiscriminately, in accordance with any scientific theory of disease.

In severe and obstinate cases of Catarrhal Ophthalmia, the injection of the ocular conjunctiva may gradually extend until all trace of distinct vessels is lost; the whole membrane assuming a thickened, velvety appearance, quite up to the margin of the cornea; or the sub-conjunctival areolar tissue may become infiltrated with serum, giving rise to the condition termed *Chemosis*, in which the conjunctiva is raised up from the sclerotic, and presents an uneven surface, somewhat like the watery granulations of an indolent ulcer of the skin. In this stage of Catarrhal Ophthalmia the mucous discharge from the inflamed membrane is sometimes considerable, loading the eye-lashes and gluing them together in the

morning, unless they have been well greased overnight with spermaceti or some other mild ointment.

PURULENT OPHTHALMIA.

This disease has received various names, according to the nature of its *secretion* (Ophthalmo-blennorrhœa; Conjunctivitis puro-mucosa; Suppurative Ophthalmia); its *contagiousness* (Ophthalmia contagiosa, MACKENZIE); or from the *persons who are chiefly liable to it;* (Egyptian Ophthalmia; Ophthalmia bellica; Military Ophthalmia.)*

From what I have just said respecting Catarrhal Ophthalmia, the reader will readily perceive how impossible it is to make any definite practical distinction between it and Purulent Ophthalmia, inasmuch as a severe case of the former and a mild case of the latter offer precisely the same phenomena. The difference between the two diseases appears to be one simply of degree, unless we consider contagiousness to be a distinctive mark of the purulent affection.

If seen, then, at the first onset, a case of Purulent Ophthalmia resembles one of ordinary Catarrhal Inflammation, but it proceeds so rapidly, that twenty-four hours are sometimes sufficient to furnish the peculiar

* The literature of Purulent Ophthalmia is most extensive. From its prevalence in armies, and other large bodies of men, it has specially attracted the notice of military surgeons: it has formed the subject of several prize essays: and the most celebrated Ophthalmic surgeons of Europe have, at various times, published reports on its ravages among the troops of England, France, Prussia, Austria, Russia, and Belgium.

signs of the more serious disease—the swollen lids, chemosis, and haziness of the cornea.

It is the last-named structure that should chiefly engage the surgeon's anxiety; for, unlike the common Catarrhal Ophthalmia, which limits itself to the comparatively unimportant conjunctiva, the *purulent* form rapidly endangers sight, by involving the cornea in its ravages.

In a well marked case of Purulent Ophthalmia, the patient is usually pallid, and both physically and morally depressed. The eyelashes are loaded with yellow discharge; the lids are swollen and dusky red, and so infiltrated that the patient cannot separate them sufficiently to expose the cornea. This inability naturally suggests to him the notion that he is literally *blind;* and it is sometimes important, as a means of raising his spirits, for the surgeon at once to expose the cornea, and convince him that sight is still retained. The conjunctiva is everywhere reddened, infiltrated, and elevated above the level of the cornea, producing the appearance termed *Chemosis*, but usually looking more solid, and less watery, than in common Catarrhal Ophthalmia. If this chemosis has proceeded to its fullest extent, it overlaps and completely hides the margin of the cornea, and it may even protrude a little between the lids. The cornea being overspread with thickened secretion, often appears, at first sight, to be really opaque or hazy; and the surgeon must take pains carefully to wipe away this secretion before pronouncing a positive opinion as to the state of the cornea beneath it. But even then he can only speak very guardedly; for the ulceration, which in this disease is so destructive, frequently begins at the

extreme edge of the cornea, the very part hidden, as I have said, by the overlapping of the chemosis: and it may thus escape detection until it has perforated the entire thickness of the cornea, and caused prolapsus of the iris.

In very severe cases of Purulent Ophthalmia, this ulceration rapidly advances in the form of crescentic groove, becoming deeper and wider until it has isolated the central part of the cornea, which by that time has assumed a hazy or even opake appearance. Then this central portion likewise yields to ulceration at one or more points, becomes softened, sloughy, and infiltrated with pus; it gives way, the iris bulges through the large opening thus formed, and, eventually, becoming coated with fibrous exudation, assumes the prominent appearance known as *Staphyloma*.

The ulceration may stop short of actual perforation, after destroying a large portion of the anterior surface of the cornea, and in such cases the cicatrices formed by the healing of the ulcers remain ever afterwards white and opaque; while the rest of the cornea, in consequence of inflammatory deposit and infiltration of pus, never regains its healthy transparency, but at best becomes sufficiently translucent to allow a dim view of the iris, not, however, affording the patient any useful sight. Those attending the practice of our Eye Infirmaries must be familiar with the aspect of patients whose cornea have undergone some of the changes I have been describing. Soldiers who have suffered from severe Purulent Ophthalmia, in India or some of the colonies, exhibit the most distressing ravages of this disease.

Another result of the inflammation of Purulent Ophthalmia is *slough of the cornea*. The chemosis having increased, so as to overlap not only the extreme margin, but the greater part of the anterior face of the cornea, the latter loses its transparency, becoming at first milky, then yellowish, and quite dull on the surface, and finally flabby and perfectly opaque, like a piece of wetted wash-leather. At this stage the chemosis diminishes, the profuse purulent discharge ceases, and is succeeded by a flow of tears, rendered slightly turbid by a small quantity of mucus, and the patient and those about him are often pleased at the apparent improvement, and flatter themselves with hopes of a speedy recovery, at the very moment when the surgeon knows but too well that sight is lost for ever. Still, as long as any portion of either cornea retains its vitality, the case must not be abandoned in despair; for if only a small portion, less even than a quarter of one cornea, can be saved from destruction, and its transparency retained, useful sight may eventually be gained by the operation of making an Artificial Pupil.

It was to obviate, if possible, this sloughing of the cornea, that TYRRELL devised, and so warmly advocated, the plan of making radiating incisions through the chemosed conjunctiva. He believed that the swelling of this membrane caused such tension and pressure on the vessels supplying the cornea as arrested the flow of blood, and so induced death of the part. But the operation was based on an anatomical mistake,—namely, that the cornea is wholly nourished by vessels prolonged into it from the conjunctiva. Mr. T. W. JONES, in a

letter published in the *Medical Gazette.** exposed the fallacy of this theory; and subsequent experience has, I think, decided that these radiating incisions by no means ensure the happy result the inventor of the plan so confidently anticipated. I have frequently tried them, but could never satisfy myself of their contributing towards the cure of the disease.†

Two precisely opposite modes of treatment have been adopted in Purulent Ophthalmia—the *depletory* and the *stimulating*. The first was carried to its fullest extent in the various armies of Europe during the late war, and has since been advocated by eminent authorities in civil practice.‡

The opinions of the profession on the subject of inflammation and bloodletting have of late years undergone such a total change, that I need hardly caution the reader against attempting to cure Acute Purulent, or Gonorrhœal Ophthalmia, on the principle so strongly urged, less than thirty years ago, by one of our most distinguished writers on Eye diseases, who, in reviewing a case of Gonorrhœal Ophthalmia, which *had been seen at a very early period of the complaint*, and treated by large bleedings, both local and general, records his opinion as follows:—"From the unfortunate termination of this case, ... I infer, not that anti-

* Vol. i. New series. 1839.

† For a full account of this plan, see TYRRELL, vol. i., p. 72–94.

‡ The 12th chapter of MACKENZIE'S *Treatise*, &c., gives a very ample critical account of the history of Purulent Ophthalmia, as observed on a large scale by various military surgeons of repute, and enforces the advantages to be derived from a plan of treatment the very reverse of that by depletion, which they almost uniformly pursued.

phlogistic treatment is incapable of arresting this inflammation, but that it had not been carried to a sufficient extent; and if I had to treat some of these cases again I should certainly bleed *more freely*."* "As much blood should be taken from the arm as will flow from the vein, and the evacuation should be repeated as soon as the state of the circulation will allow us to get more." This practice is enforced by the following quotation from BACOT'S *Treatise on Syphilis*:—"These are cases which defy all the usual etiquette of regular and ceremonious visits. If we wish to save our patient from the destruction of his vision, we must scarcely depart from his bedside until the inflammatory symptoms are controlled. The lancet must be hardly ever out of our reach, for if ever there was a disease in which blood may be taken away without limitation, it is this." Mr. WARDROP'S statement is still more startling:—"The only case [of Gonorrhœal Ophthalmia] he had seen, in which the eye was saved, was that of a young woman, in whom venesection was repeated as often as blood could be got

* The patient, a young man aged 24, had on the first day been bled to fainting; then vomiting was kept up by tartar emetic as long as it could be borne. In the evening "the pain in the eye had become worse." He was bled again. On the following morning the swelling of the lids was greatly increased, so that the eye could not be seen, and there was copious yellow discharge; the night had been passed in severe pain, which entirely prevented sleep. Bleeding was repeated twice more; blood was taken, by cupping, from the back of the neck and the temple, and leeches were applied round the eye in large numbers; "but *although* the free use of purgatives and antimonials, with low diet, was combined with these measures, no sensible effect was produced in diminishing the violence of the inflammation, or arresting its progress."

from the arm. She lost 170 ounces in a few days, and looked as if every drop of blood had been drained from her body; the skin having nearly the hue of a wax candle."

Can we wonder that thousands of persons, with that tendency to rush into extremes which is one of the infirmities of our nature, should seek refuge from such treatment under the milder discipline of Homœopathy?

If the treatment of Purulent Ophthalmia by excessive depletion be judged by its results—the only sure test—we shall, I think, be forced to confess that there was ample cause for trying some less violent means of cure. As far as my own experience at a large metropolitan hospital enables me to form an opinion as to the general condition of patients suffering under Purulent Ophthalmia, I should say that they are uniformly more or less depressed, with a pulse more feeble than natural, and in a state which in every way contra-indicates bleeding, and calls for the administration of tonics. There is usually a coated tongue, with loss of appetite, and a purgative is needed at the very outset of the treatment. Afterwards, either bark and ammonia, or quinine, should be given, and hyoscyamus if the patient be restless. Pure air—the best of all tonics—must, if possible, be obtained and all unnecessary confinement to bed, or to one room, avoided. Meat may be allowed daily, and a moderate quantity of beer or wine; but on this head no arbitrary rule can be laid down. The surgeon's judgment must guide him as to the cases in which he ought to forbid stimulants, recommend them in moderation, or even insist upon an extra quantity being taken.

Meantime, the local treatment should be commenced

at once. I always employ either a solution of alum (eight or ten grains to the ounce of distilled water), to be injected under the lids every quarter of an hour, or nitrate of silver (three or four grains to the ounce), to be applied three times a day. It is useful, after employing the nitrate of silver for a few days, to change it for the alum, or *vice versâ*. The application of the solid nitrate of silver to the whole surface of the inflamed conjunctiva is preferred by some surgeons, but I have not found it superior to the solution above mentioned. In those cases (chiefly occurring, however, in *Gonorrhœal* Ophthalmia) where rapid ulceration is beginning at the margin of the cornea, a fine point of nitrate of silver may be passed over the whole surface of the ulcer.

The student ought constantly to bear in mind that, although the disease termed Purulent Ophthalmia has received its name from that symptom which most readily attracts notice—namely, the profuse conjunctival discharge—the real source of danger lies in the *cornea;* and that, even if it were possible, by draining the patient of blood, materially to lessen, or even wholly arrest, the discharge, we might still fail to save the eye. It is not the flow of pus or mucus, however abundant, that should make us anxious, but the uncertainty as to whether the vitality of the cornea be sufficient to resist the changes which threaten its transparency.

These changes are twofold—*rapid ulceration*, and *sloughing*. Now, has any sound surgeon, I would ask, ever recommended excessive general bleeding and salivation as a means of averting these morbid changes from any other part of the body except the eye? And

why are all the principles which guide our treatment of disease in other organs to be thrown aside as soon as it attacks the organ of vision?

Do what we may, it must sometimes happen that, in the more acute cases of Purulent Ophthalmia, our best endeavors are in vain, and the cornea becomes irreparably damaged; still I feel convinced that, if we are unremittingly watchful to observe the changes which take place either in the eye itself or in the general health of the patient, and to modify our treatment accordingly, a tonic and stimulating plan, such as I have sketched, will do all that our present knowledge of the disease can enable us to accomplish.

GRANULAR CONJUNCTIVA.

(*Granular Lids.*)

After Purulent Ophthalmia, and long-continued Catarrhal Ophthalmia of a severe character, the palpebral conjunctiva assumes a reddened and uneven appearance, somewhat resembling, in the more strongly marked cases, the surface of a granulating ulcer. It must not be supposed, however, that the conjunctiva is really overspread with *granulations*, in the true sense of the word; otherwise we should find various portions of the membrane uniting together, like the opposed surfaces of a granulating wound. The so-called "granulations" are merely the mucous follicles and papillæ of the membrane, enlarged by inflammatory deposits.

When these "granulations" are hard, and attain considerable size, they act very much as foreign bodies would do in a similar situation, producing constant irritability and blinking of the lids; increased flow of tears

mixed with mucus; and opacity of the cornea with enlargement of its veins; and, in cases of old standing, these veins form a network overspreading the entire surface of the hazy cornea.

For removing these irregularities of the conjunctiva, various plans are in use: complete excision with the knife or scissors; destruction by means of escharotics or a more gradual wasting by the astringent effect of drops and lotions. Latterly, acetate of lead in fine powder has been recommended.

I believe that in most cases of granular lid our chief dependence must be placed in improving the patient's general health, by giving him iron and quinine, singly or in combination, regulating his diet, and, if possible, placing him in a pure and bracing air. A small seton in the skin of the temple, kept open with a single thread, and occasionally stimulated, if the discharge becomes scanty, with some caustic or other irritant, is a slow, but often very serviceable, adjunct. Tincture of iodine, painted on the skin of the lids, is also useful.

I have, at various times, tried all the most approved lotions and drops, but have never satisfied myself that any of them were of much benefit. The acetate of lead in fine powder, dusted over the everted lid, produces considerable pain at the time of its application, but afterwards gives decided relief, apparently by mechanically filling up the interstices of the "granulations," and so producing a smoother surface for the eyeball to move upon. As the salt slowly dissolves, it probably exerts an astringent effect upon the vessels supplying the enlarged follicles and papillæ, and so diminishes the size of these excrescences.

Since the first edition of this volume was published, I have seen much benefit from applying the undiluted Liquor Potassæ to the palpebral granulations. Dr. BADER first suggested this plan of local treatment, and certainly it is the most successful I have yet tried. The fluid is dabbed upon the everted lids, so as to be thoroughly brought intc contact with the whole surface, and it appears to act by saponifying and dissolving away the hypertrophied tissue. It may be applied at intervals of a few days; and in some cases I have seen the granulations removed, and much of the original clearness of the cornea restored, in the course of six weeks.

Any person who has attended the practice of our London Eye Infirmaries, must have been struck with the fact that the severer cases of Granular Lids, with the attendant deformity of Entropion and misplaced eyelashes, are met with among the more destitute Irish patients; and from competent medical testimony it appears that a very severe form of Purulent Ophthalmia is sometimes epidemic in certain districts of Ireland, where it rivals in intensity that which has been observed in Egypt and India. Mr. WILDE of Dublin published an interesting paper on this subject in the *London Journal of Medical Science* (vol. iii., 1851); but so long ago as 1803 it was remarked by POWER, in a pamphlet on the Egyptian Ophthalmia, that a species of the same disease was "frequently prevalent among the Irish peasantry, and considered by them to be infectious."

GONORRHŒAL OPHTHALMIA.

This disease presents all the phenomena of Purulent Ophthalmia, but in a more severe and rapidly destruc-

tive form. It is, in fact, Purulent Ophthalmia caused by the specific secretion of gonorrhœa coming into contact with the conjunctiva.

If seen quite at the beginning, there is nothing to distinguish this Ophthalmia from the ordinary Catarrhal form. There is similar conjunctival injection, and increased mucus discharge, and the patient complains of a feeling as if sand were under the lids.

The inflammatory symptoms, however, come on so rapidly in a truly gonorrhœal case, that a few hours sometimes suffice to develop all the more serious phenomena; such as *chemosis*, redness and swelling of the lids, profuse puriform discharge, and even general haziness of the cornea.

It is stated by some writers, that Gonorrhœal Ophthalmia usually attacks one eye only, while the non-specific purulent form attacks both eyes together. This assertion, however, is incorrect. I do not remember to have seen a well-marked case of Gonorrhœal Ophthalmia in which both eyes were not affected, although it is certainly true true that very commonly an interval of two or three days elapses before the second eye is attacked; and even then the disease is often much milder in one eye than in the other.

Among the more ignorant classes, Gonorrhœal Ophthalmia is sometimes the result of a very prevalent vulgar error,—that it is a sovereign remedy for sore eyes to bathe them in the patient's own urine. In this way the complaint originated in a patient who came under my care some years ago, at the London Ophthalmic Hospital.

I will here relate his case, as it affords a good opportu-

nity for describing the appearances presented by the acute form of the disease.

He was a bricklayer, aged twenty-four, of dissolute habits, and had squandered, in all kinds of debauchery, a small sum of money which had been left him. From Christmas, 1849, till the time I saw him, he was frequently out of work, eating little meat, but drinking immoderately whenever he could obtain the means of doing so:—"sometimes three or four quarterns of gin, and six pots of beer, in the course of a day."

At the beginning of March, 1850 he caught a gonorrhœa, for which he became an out-patient at a general hospital. While under treatment there, almost wholly abstained from liquor, taking only a pint of beer now and then; on some days none at all. During the 12th and 13th of March, after having been exposed to much dust while engaged in pulling down some old houses, his eyes for the first time "felt weak;" but there was no discharge from them. By the advice of his mother-in-law (who, naturally enough, knew nothing of his gonorrhœa), he bathed his eyes in his own urine on the morning of the 14th, and again the day following; and on the evening of the 15th a discharge from the eyes began. On going to bed he applied a poultice to the left eye: this, as might be supposed, only increased the mischief; and as the discharge became more profuse, he came on the 18th to the London Ophthalmic Hospital. There was then a slight puriform discharge from the right eye, but no chemosis; merely a moderate degree of conjunctival injection. The cornea was quite clear. In the left eye the chemosis was so great as to overlap and hide the margin of the cornea. The elevated conjunctiva had

not the rough, fleshy appearance it so often presents, but was smooth on its surface, evidently raised up by a large quantity of serum; and dotted over at various points with little patches of extravasated blood. The lids were only slightly swollen, but of a livid, dusky-red tint; and the eyelashes were loaded with profuse yellow secretion. The iris acted naturally.

On casual observation, the cornea appeared hardly affected, so nearly had it retained its natural clearness and polish: but, on a more careful view, a large deep ulcer was seen occupying its lower third. The surface of the ulcer, and its sharply-cut upper edge, were so transparent that, except when the light fell exactly on the part, the loss of substance could not be appreciated.

The patient was very pale and thin; extremely depressed in spirits at the prospect of losing his sight; and much prostrated by the sudden deprivation of the artificial stimulus to which he had so long been accustomed. His pulse was feeble, and his appetite bad; his bowels had been freely acted on. He was taken at once into the hospital, and I ordered him three grains of disulphate of quina every six hours, a mutton chop for dinner, and a pint of porter. Alum lotion (ten grains to the ounce) was to be injected under the lids every quarter of an hour.

On the 19th, the patient's pulse was unimproved, and his depression extreme. The ulcer had spread. The conjunctiva of the right eye was more injected, and the cornea looked a little hazy. I ordered him a second pint of beer, to be taken with his supper, and four ounces of port wine in the course of the day; a solution of ni-

trate of silver (five grains to the ounce) to be dropped once into the left eye, and then the alum injection to be resumed.

On the 21st, the ulceration had spread all round the margin of the left cornea, leaving only the central third of its anterior surface intact. Two days later, the right eye was considerably improved; the discharge being much less, and the cornea almost clear; but the ulceration in the left had steadily advanced, so as to have reduced the central, unbroken portion of the cornea to a very small patch, which was cloudy, and evidently in a hopeless state. The patient's general condition, however, was improving; the arrest of disease in the right eye had made him cheerful, by taking away the dread of total blindness which had previously oppressed him. His pulse was fuller, and he slept well.

24th: The small central patch of cornea still remaining unbroken, was to-day in a state of slough, as was also the thin layer of the peripheral portion—apparently the "posterior elastic lamina"—which had hitherto remained undestroyed, and still prevented the escape of the aqueous humor. The discharge from this eye had now almost ceased. That from the right was very trifling, and its cornea perfectly clear; the conjunctiva still retaining a reddened, velvety appearance. A solution of nitrate of silver (two grains to the ounce) was ordered to be dropped thrice a day into each eye, instead of the alum lotion.

26th: The dead cornea had come entirely away from the left eye, leaving the iris bare, or at least only thinly covered by a transparent glaze of apparently recent lymph. The pupil was of a clear black, and, except

that the iris was anteriorly convex, a superficial observer might have supposed the cornea to be still *in situ* and transparent. Discharge had now ceased from both eyes, and the conjunctival vascularity was rapidly diminishing.* On the 28th, the left iris began to be overspread with an opaque film, and was gradually hidden from view, as the adhesive deposit became more and more consolidated.

I have given the chief details of this case, omitting many of less importance, because, as I have said, it affords a good example of severe Gonorrhœal Ophthalmia, and especially illustrates the process by which, I believe, the destruction of the cornea is almost always effected; namely, by deep ulceration beginning along its margin, and advancing in the form of a crescentic groove, until it has isolated the central portion, which, being deprived of its supply of nutritive material, becomes opaque, dies, and is cast off as a slough.

If my object had been simply to bring forward an instance of Gonorrhœal Ophthalmia, successfully treated, I might have made my selection from a considerable number of cases in my note-books, and might have illustrated the good results which sometimes follow the early application of the solid nitrate of silver to the commencing ulcer of the cornea. But for my present purpose, a case such as I have related, seems more useful.

The advocates of excessive bleeding and depletion may point to the case as illustrating the failure of an opposite treatment, and suggest that a strictly depletory plan

* On the 26th, the right knee was attacked with rheumatism, and the day following the left one also. This disease of joints has been frequently noticed as a sequela of gonorrhœa.

might have saved the left eye. My firm belief is, that it would inevitably have caused the loss of the right one also; and that, in such a subject, exhausted by former excesses, pale, emaciated, and depressed, and with ulceration of the cornea already so far advanced, it was unreasonable to expect more than one eye should be saved from destruction.

PURULENT OPHTHALMIA OF INFANTS.

(*Ophthalmia neonatorum.*)

The student must ever bear in mind, that in this Ophthalmia, just as in the Purulent Ophthalmia of adults, it is upon the degree to which the *cornea* is involved that the whole importance of the disease depends; and his chief attention, when an infant is first examined, should be fixed on the clearness or opacity of that structure, and not on the more obvious appearances of redness, swelling, and purulent discharge which the *eyelids* present.

Various theories of the origin of this Ophthalmia have been suggested; some regarding it as a mere catarrhal affection; some as due to actual contact with the leucorrhœal discharge of the mother in parturition; while others attribute it to irritating substances applied soon after birth; or to other causes. It seems probable that the marked difference of symptoms observed in infants suffering from this disease, is due to the exciting cause not being in all instances the same; and that, as in adults, we meet with purulent discharge from the conjunctiva in Simple Catarrhal, in the "Purulent," specially so called, and in the most severe, or Gonorrhœal, Ophthalmia, just so do the milder cases of the disease

now under consideration arise from exposure to draughts of cold air and sudden changes of temperature; while contact with leucorrhœal and gonorrhœal matter may give origin to those severe cases, in which rapidly destructive ulceration of the cornea dooms the unhappy child to life-long blindness.

In a case of *Ophthalmia neonatorum*, the surgeon is so deeply interested in forming an accurate diagnosis, both to satisfy the parents and to preserve his own reputation, that he should spare no pains to ascertain the precise condition of the cornea. For this purpose, having properly secured the child's head in the manner described in Chapter I., he should endeavor carefully to separate the lids without everting them. This is often extremely difficult, especially when the palpebral opening is small, and the lids offer but a very small surface to the point of the finger. With a bit of moistened lint, the creamy matter, which oozes out as soon as the lids are drawn apart, is to be wiped away, and the surface of the cornea thoroughly examined. Occasionally it will happen, especially if a strong astringent lotion has been dropped into the eye, without any regular cleansing with the syringe or otherwise, that some of the secretion becomes coagulated, and is found overlying the cornea, like a piece of wetted wash-leather, resembling very closely the appearance of a sloughy cornea. I have sometimes had to remove with a forceps such a layer of solidified secretion (which, on hasty inspection, might have been mistaken for a slough), and have found the cornea itself sound and clear.

The conjunctiva of the lid is always red and villous.

The secretion varies much, both as to quantity and color. It has a deep yellow tinge, if the child be jaundiced. The lids are red and swollen during the acute stage of the severer form of inflammation; but they commonly become flabby, and lose their redness, when softening and ulceration of the cornea have fully set in.

The disease, as may readily be supposed, attacks both eyes, although an interval of a day or two, or even more, may elapse before the second eye suffers. I lately met with a case which at first seemed to be an exception to this rule, but was not really so. A child a few weeks old was brought to me with purulent discharge from the right eye only, said to have set in about ten days after birth. On clearing away the matter, I found the whole cornea dead, and looking like a piece of shriveled leather. From some defect of nutrition, the part had sloughed, and the suppuration had set in afterwards, as the loosening of the dead part commenced.

The best plan of local treatment seems to consist in using, very frequently, a weak astringent lotion, so as to wash away the secretion before it has time to collect in any quantity, and thus to ensure the lotion coming into direct contact with the inflamed conjunctiva. If the smooth point of a syringe be carefully placed just within the inner commissure of the lids, the wash will be propelled over the whole surface of the affected membrane.

The surgeon must strongly impress upon the nurse how much the great question of the preservation of the child's sight depends upon her regular and unremitting use of the injection. In applying it, care must be

taken not to chill the child by allowing its clothes to get wetted.

But if the attack be a severe one, all local means may prove unavailing, unless the child be well nourished: the health of the mother, therefore, and her ability effectually to suckle the child, are most important points for the surgeon's consideration. For, the real danger of the disease consists, not in the profuse discharge, which so much alarms the uninformed, but in the liability of the cornea to undergo extensive *ulceration*. This morbid process it is which destroys those eyes which are said to have been lost by Purulent *Ophthalmia*. The cornea, in such cases, first becomes dull and hazy; then opaque towards the centre, with softening of its tissue; and, finally, an ulcer forms, which soon perforates the whole thickness of the cornea: the iris prolapses; perhaps, if the ulcer be very large, even the lens and part of the vitreous humor escape; and the eye ultimately shrivels to a mere nodule. It depends upon the severity of the disease, but even more, I believe, upon the general vital power of the child, whether Purulent Ophthalmia prove merely a troublesome complaint, or a calamity which impairs or even wholly destroys sight. During that early period of life at which the disease shows itself,—commonly three or four days, almost always within the first week, after birth,—the interchange of material in the system is so active, and there is such a power of forming new tissues, that, if this power be only sustained by suitable treatment, it is quite astonishing to see how rapidly a large ulcer of the cornea will heal up, and with how

slight an amount of opacity. When this favorable change sets in, the peripheral portion of the cornea acquires a faint pink tint, from the vessels carrying blood to repair the breach.

A child, a month old, was brought to me on the 9th of November, 1846, with Purulent Ophthalmia, which had been going on unchecked for more than three weeks. There was an ulcer in the right cornea, so large as to involve its central third, and so deep that I wondered it had not perforated the whole thickness of the part. The rest of the cornea was quite opaque, and had a slightly pinkish tinge. There was no ulcer in the left eye; but profuse purulent discharge from both. I gave a most unfavorable prognosis. On the 12th it appeared as if the ulcer had completely perforated the cornea; for there was a protrusion from its centre closely resembling a prolapsus iridis: but this was, no doubt, the posterior lamina of the cornea, thrust forward by the aqueous humor.

The ulcer healed; and, as the left eye was perfectly restored, I told the mother she must rest satisfied with such a termination of the case; for that the right eye would never be an useful one. I ordered—rather as a *placebo* than with any hope of its proving of real utility—a weak solution of sulphate of zinc to be dropped into the eye twice a day.

On July 27th, 1847, I saw the child again. It was strong and healthy, and the left eye bore no trace of diseased action. The right cornea was rather less convex than the other; the peripheral portion perfectly clear; and even at the centre, where so large and deep

an ulcer had existed, there was merely a hazy opacity, through which the pupil was quite discernible.

I need hardly say that it was not the sulphate of zinc that had worked this change, but the improved vital energy of the patient; and this had, no doubt, been aided by the astringent effect of the alum injection, which I had prescribed from the first.

Weakly infants are sometimes much benefited by giving them daily a few drops of Battley's liquor cinchonæ, in a teaspoonful of milk. Blisters only exhaust and irritate such subjects; and bleeding by leeches, even to the smallest extent, may destroy the last chance of arresting the progress of a corneal ulcer.

To attempt "bringing up by hand" a feeble infant affected with such ulceration, is to doom the eye to almost certain destruction.

SCROFULOUS OPHTHALMIA.

(*Strumous Ophthalmia; Phlytœnular Ophthalmia.*)

Perhaps there is hardly an eye disease less correctly named than the well-known irritable form commonly called "Scrofulous Ophthalmia; for, although it is very frequently met with in patients who afford decided evidence of a scrofulous constitution, it undoubtedly affects others who have never shown any such tendency; and, again, the *cornea* is the tissue in which the disease especially manifests itself, not the *conjunctiva*, which the conventional meaning of the word "Ophthalmia" would imply to be primarily affected. We must, however, retain the old term until an unexceptionable substitute has been suggested, only taking care not to confound the

disease with mere conjunctival inflammation, or to suppose that medicines of specific action against scrofula (if any such there be) can afford a substitute for that general dietetic and other treatment which has for its aim the strengthening and soothing of an enfeebled and irritable system.

Scrofulous Ophthalmia is chiefly met with in patients above two years of age, and below puberty. The most prominent symptom is extreme intolerence of light (*photophobia*), and the lids are often so forcibly closed by involuntary spasm, that it requires all the surgeon's tact to obtain a thorough examination of the eyeball. Frequently the evidences of local inflammation in the latter are trifling, as compared with the distress evinced by the patient. We find on the cornea a small cloudy speck, an ulcer, or a slightly elevated whitish point, like a minute pustule:* or there may be several such morbid appearances. But whatever form the inflammatory deposit or the ulcer may assume, we invariably trace an opaque pinkish streak, formed by a lash of fine vessels, extending to it from the edge of the cornea.

Should the cornea be more deeply affected, it becomes hazy throughout, and traversed by vessels in various directions; or softening, and deposit of pus, may occur within its substance.

The sclerotic exhibits more or less of the pink zone, in proportion as the corneal inflammation is more or less considerable. The conjunctival injection is chiefly seen in the enlargement of the veins running in the course of the recti muscles.

* "Phlyctenula" of Mackenzie.

The secretion of tears is very abundant, and they gush out every time the lids are drawn asunder. Violent sneezing often attends the admission of light to the eyes, especially in those truly scrofulous patients whose nasal membranes are in a constant state of unhealthy irritability, with over-secretion of mucus. Swelling of the lips and alæ nasi, fissures about the nostrils and behind the ears, various forms of impetigo and eczema, and enlargement of the cervical glands, are all accompaniments of inflammation of the cornea in scrofulous subjects.

There is no disease of the eye so tedious, so liable to relapses, and in all respects so trying to the surgeon's patience, as that now under consideration; and in a work like the present I can but briefly indicate the chief heads of treatment.

Constant attention to the state of the bowels is necessary, and an occasional purge of calomel and rhubarb, or calomel and jalap, or, in a very young child, a few doses in succession of hydr. c. cretâ, are most useful; but any thing like a "mercurial course," as it is termed, I hold to be most mischievous, and likely in every way to aggravate the complaint. To allay irritability—to strengthen the digestive power—and to improve the quality of the blood—should be the object of our general treatment. Locally, we should abstain from over-stimulating and *teasing* the eyes, and employ such applications only as are grateful and soothing. Counter-irritation, short of weakening the patient, affords the greatest relief. Abstraction of blood I can hardly conceive admissible in any case. As for the barbarous proceeding termed

"scarification of the conjunctiva," it is so nearly obsolete that one may hope to see it, ere long, discarded from ophthalmic practice.

As internal remedies, I would place in the very first rank, iron and bark. The iron I usually give as tinct. ferri sesquichloridi, or to infants as the syrup ferri iodidi; the bark as liquor cinchonæ. In very weakly children, cod-liver oil may supersede both these medicines. Where there is restlessness at night, and extreme intolerance of light during the day, patients are often much benefited by a pill of ext. hyoscyami (gr. iv.) at night, or night and morning.

I have said we should avoid irritating the eyes with too stimulating applications; and indeed I believe that, during the irritable stage, fomenting them occasionally with warm water, and at night applying a little ung. cetacei, or sweet oil, to the eyelashes, comprises nearly all that is prudent to be done. Afterwards a lotion of acetate of lead (two grains to the ounce of distilled water), or a weak solution of alum, may be employed twice or thrice a day. Lead lotions, however, must not be employed so long as there is any unhealed ulceration on the cornea; otherwise some of the white precipitate may be deposited on the abraded surface, and give rise to indelible opacities.

Counter-irritation, by means of blisters, is, of all local means, the most common in Scrofulous Ophthalmia; and certainly they often, in a most marked degree, relieve the intolerance of light. I prefer them about the size of a shilling, and usually direct to be removed from the temples at the end of five or six hours, whereby

the skin is less deeply inflamed, and the blistering can be repeated at shorter intervals. Tincture of iodine, if painted on the skin of the lids very carefully, so that none of the liquid runs into the eyes, is sometimes even more efficacious than blisters in subduing the intolerance of light. In most cases it may be repeated twice a week.

But all remedial measures will be in vain unless proper care is paid to the child's diet and mode of life. Plenty of plain, nourishing food should be given; but there should be no over-feeding. Some of the most troublesome cases I have ever seen have been those where a young child of three or four years, has been *stuffed* with meat twice a day, with beer at dinner, and even a little wine besides; while, at the same time, the bowels were constantly worried with some mercurial preparation, and a solution of nitrate of silver was dropped, night and morning, upon the irritable eyeball.

Confinement to dark, close rooms is of all things the most prejudicial. A large shade should be worn in the house, and a gauze veil may be added, or substituted, when the child is taken out of doors, which should be done whenever the weather is dry and fine.

EXANTHEMATOUS OPHTHALMIA.

Under this head, authors have arranged several forms of Inflammation:—*Ophthalmia morbillosa*, *O. scarlatinosa*, *O. erysipetalosa*, *O. variolosa*, &c. But in fact these cannot be considered as special or separate diseases; nor can they, for the most part, be termed *Ophthalmiæ* at all, according to the strict meaning of the

word. They may be reduced under one general head of *Corneal Ulceration from impaired nutrition of the part.*

Injection of the conjunctiva, and an abundant flow of tears, are, indeed, among the best known marks of an attack of measles; but this sort of Ophthalmia commonly requires no special treatment. It is after the eruption has passed off, and the patient is left weak and exhausted, that ulcers of the cornea are apt to appear, accompanied sometimes with an intolerance of light and other symptoms, commonly described as characterizing Scrofulous Ophthalmia. Hence it is that these ulcers are such a common sequel of measles among the poor, with whom the eruptive attack is rarely followed up by a course of tonic treatment.

In like manner, scarlatina is sometimes succeeded by corneal ulceration, although, from the extreme depression so frequently caused by this terrible disease, its consequences are even more severe than those which succeed to measles; and even slough of the whole cornea occasionally happens in children who have had scarlatina in its most exhausting form.

Every one is familiar with cases in which sight has been lost in consequence of small-pox. They are characterized by large and dense opacities of the cornea, often converting the whole extent of that tissue into a chalky white cicatrix, over which arborescent veins are sometimes seen to ramify. The globes are frequently much shrunken, and have a constant rolling motion.

Formerly, these opacities were attributed to the formation of small-pox pustules on the cornea; but Mr. Marson, resident surgeon at the Small-pox Hospital, in

an interesting paper which he communicated to the *London Medical Gazette*,* announced, as a well-ascertained fact, that *pustules never form on the cornea*, even in the most severe attacks of variola; but that rapid ulceration, which sets in during the period of extreme prostration succeeding the eruptive stage, is uniformly the cause of the opacities just mentioned as so common a cause of blindness.

CHRONIC OPHTHALMIA.

This general term is made to comprehend several affections having but little real affinity with each other. Catarrhal Ophthalmia, which has passed into a chronic form, with or without a granular condition of the eyelids, and irritable state of the tarsal margins, or a slight degree of obstruction to the passage of tears into the sac,—are all occasionally arranged under this rather vague heading.

The chronic state into which Catarrhal Ophthalmia, if not suitably treated during the acute stage, is so apt to pass, is characterized by a slight redness about the edges and corners of the lids, and a swollen condition of the caruncula and semilunar fold of the conjunctiva. When the lining membrane of the lids is examined, its vessels are found enlarged, and its surface, instead of being perfectly smooth, is slightly villous. The patient complains of the eyes watering much when exposed to a cold wind. By candle-light (and still more by lamp-light) they itch and prick, and the flame of a candle appears surrounded by a halo of prismatic colors, from

* Vol. xxvi., p. 204. 1839.

the refraction caused by the thickened mucus on the surface of the cornea. The eyelashes are gummed together in the morning.

Tailors, needle-women, clerks, and all persons occupied in working upon small objects by artificial light, especially if in ill-ventilated rooms, are frequent subjects of this form of Chronic Ophthalmia. They are often unable to take precautions for modifying the irritating effect of the light they employ. When, however, they can do so, great relief may be obtained by the use of a pale blue chimney or shade to the lamp or gas jet. Weak lotions of acetate of lead or alum, used night and morning, with unguent. cetacei at bedtime, to prevent agglutination of the eyelashes, are useful in the more irritable forms of this Chronic Ophthalmia. In cases of a less active kind, unguent. hydrarg. nitratis, or unguent. zinci oxydi, diluted with fresh lard or spermaceti, may be substituted. These applications should not be used for too long a time; but should now and then be omitted for a week, and then resumed, if necessary. Small blisters to the temples, or tincture of iodine to the eyelids, will often be found more serviceable than direct applications to the conjunctiva itself.

The surgeon must be careful to correct whatever may be faulty in the general health; and not to trust solely, or chiefly, to local means.

When watering of the eyes, on exposure to cold winds, is the symptom most complained of, the excretory lachrymal apparatus should be carefully examined. Pressure on the sac, made in a direction towards the puncta, will show whether the contents of the former

consists of pure tears, or of a mucous and muco-purulent secretion. A probe of a suitable size should be very carefully passed through each punctum, as far as the inner wall of the sac, to ascertain whether the canaliculi are free from obstruction. This important examination is very frequently neglected. I shall speak of it more fully when treating of the Diseases of the Lachrymal Apparatus.

In all cases of tedious Chronic Ophthalmia, which cannot be traced either to previous Catarrhal Inflammation, or to obstruction in the lachrymal passages, the surgeon should most carefully scrutinize the edges of the tarsi, and observe whether some irregularly growing eyelash may not be the cause of the irritation. A single fine hair, so delicate as to be perceptible only in a good light, and to a practised observer, is quite sufficient to cause great annoyance; and I have met with several cases where, for want of a thorough examination of this kind, patients have for months, or even years, tried in vain every form of ointment and lotion.

CHAPTER III.

ABNORMAL STATES OF SUB-CONJUNCTIVAL TISSUE.

ECCHYMOSIS.

The bursting of a small vessel beneath the conjunctiva may take place not only in consequence of a blow, but during violent coughing, sneezing, or vomiting; or even without any assignable cause. The blood sometimes appears as a small patch on the white of the eye; in other cases it is so abundant as entirely to hide the sclerotic, and extend quite up to the edge of the cornea.

The appearance of extravasated blood is so peculiar, that it can never be mistaken for the redness of inflammation produced by closely aggregated vessels.* Whether in large or small quantity, the extravasation is wholly unimportant, and will gradually disappear of itself, but it often greatly alarms the persons to whom it occurs; and they are naturally anxious to get rid, as quickly as possible, of the unsightly appearance. A poultice, composed of the scraped root of the black bryony, (*Tamus communis*,) mixed with linseed meal or bread-crumbs, applied over the closed lids, and renewed every six hours, will hasten the absorption of the blood; although not so rapidly as when the effusion has taken place beneath the skin of the eyelids themselves.

* Dalrymple; plate vii., fig. 3. The recently effused blood is well represented, but the artist has added numerous fine vessels passing to the clot in a manner not usually seen.

One sometimes meets with cases where the surgeon, misled by some vague notion about "mercury inducing absorption," has endeavored to quicken the removal of the blood by that means. I need hardly point out the impropriety of such treatment. It is wholly useless, or, if pushed to such an extent as to depress the patient, is sure to retard considerably the disappearance of the effusion.

ŒDEMA.

This is not to be regarded as in itself a disease, but as a condition accompanying several morbid processes in the immediate neighborhood of the eyeball. Anything which, by pressing on the conjunctival veins, obstructs the return of blood from the part, may produce Œdema; and in fact *Chemosis*, in its early stage, is nothing more than the serous exudation between the conjunctiva and sclerotic. Tumors and abscesses in the orbit, thickening of periosteum about the sphenoïdal fissure (through which the ophthalmic vein leaves the orbit); small abscesses in the lids, or inflammatory thickenings of their areolar tissue, may cause Œdema beneath a portion or the whole of the ocular conjunctiva.

The membrane is then raised up in the form of a watery bladder, over which a few straggling vessels ramify.* In old persons, and others of feeble circulation, Œdema sometimes advances until the loosened

* Sichel; plate iii., fig. 5, is an admirable representation of this transparent watery appearance. Dalrymple; plate vii., fig. 4. The œdematous swelling is correctly drawn but the general effect is that of a fatty, rather than a watery prominence of the conjunctiva.

conjunctiva overhangs and hides the margin of the cornea.

From what I have said of the causes of this Œdema, it follows that no special treatment is to be directed towards it; but that it will subside when the pressure on the conjunctival veins is removed.

FATTY DEPOSIT BENEATH CONJUNCTIVA.

This is occasionally met with as a small tumor of slow growth, loosely attached to the sclerotic. A few vessels ramify over its surface; and the fat imparts a yellowish tint to the whole mass. Beneath the conjunctival covering there is a capsule of condensed areolar tissue, such as we find investigating fatty tumors in other parts of the body.

I met with one of these little growths in a boy seven years of age. It resembled a French bean in size and shape, and extended along the line of junction of the lower lid with the globe, from the outer canthus to the cornea, the margin of which it had covered to the distance of nearly a line. To remove these little tumors, it is only necessary to slit up the conjunctiva and the condensed capsule investing the fat, which is then easily turned out.

CYSTICERCUS TELÆ CELLULOSÆ.

This parasite is sometimes found in the areolar tissue between the conjunctiva and sclerotic, where it forms a rounded, watery-looking vesicle, about the size of a pea. There is some increased vascularity of the conjunctiva immediately surrounding it, and some enlarged veins

are seen spreading over its surface. I have met with two cases only of this rare affection.

The first was in a young woman of eighteen, who had suffered so little inconvenience from the growth, that she could not precisely say how long it had existed; and my advice was sought simply on account of the deformity. In dividing the conjunctiva, the parasite was punctured, and collapsed. The circlet of hooks surrounding the mouth was distinctly seen under the microscope.

The other case occurred in a girl aged six years. A little watery tumor, rather larger than a pin's head, had been noticed, it was said, eighteen months before the patient was brought to me. I found it a rounded vesicle the size of a large garden pea, midway between the inner canthus and the margin of the cornea.* It was surrounded by a good deal of conjunctival redness. The cyst was injured in removing it from the areolar tissue, or subsequently, and I could not find any hooks, so as to identify it as a *cysticercus*. The cyst was lined with a layer of granular matter, and might have contained specimens of *echinococcus* which had escaped when the fluid was evacuated.

CHEMICAL INJURIES.

Heated substances, or escharotics, brought into contact with the conjunctiva, inflict injury, varying accord-

* It presented the appearance depicted in fig. 2, pl. lxxii., of SICHEL'S *Iconographie*. In fig. 1 of the same plate a cysticercus is seen developed beneath the semilunar fold of the conjunctiva. Other figures exhibit the creature both in its natural size and magnified.

ing to the intensity of the agent, from inflammation of a transient kind to slough of the part. Where merely increased vascularity is the result, it suffices to apply water-dressing over the closed lids, and then to keep the organ at rest, and defended from the light. Where melted lead or other metal has flown into the eye, the surgeon should explore the inner surface of the lids, beneath which considerable portions are sometimes found hidden.

Unslaked lime so instantaneously destroys the life of the superficial layers of the cornea, that permanent opacity is produced before the surgeon can be summoned; the cornea and conjunctiva assuming a peculiar pulpy, dead-white appearance. It has been recommended in such cases to syringe the eye with a lotion of vinegar and water, so as to decompose the lime. The lotion, however, can very rarely be applied soon enough to do more than mechanically assist in washing away extraneous matter.

Where lime or mortar has been thrown into the eye, the surgeon should always evert the lids, and remove with a scoop every particle of grit or other foreign body; but if he finds the cornea already of a pearly whiteness, he must hold out no hope of restoration of sight. When granulation is going on, he must endeavor, by using the probe, to prevent the formation of bands (*frœna*) between the opposed surfaces of the palpebral and ocular conjunctiva.

The strong mineral acids produce effects as destructive as those of lime, and the treatment of both injuries will be of the same soothing kind.

I may in this place allude to the disfigurement caused by the injudicious use of nitrate of silver. The surgeon should never allow a solution of this substance to be dropped into the eye, for the purpose of stimulating the conjunctiva or cornea, unless he has the patient under constant observation; otherwise the metal may become deposited in the substance of the conjunctiva, as an indelible brown stain. If patients are allowed to use nitrate of silver drops at their own discretion, they will sometimes continue to do so for many months, or even for a year or more. The first beginning of this stain escapes observation, on account of its always taking place at the line where the conjunctiva is reflected from the lid to the globe. It resembles a faint tint of sepia, and gradually deepens as more and more of the metal is deposited. The ocular portion of the conjunctiva is next discolored, until, if the solution be continued long enough, the whole sclerotic assumes a dirty brown hue.

In a case of this kind I tried the effect of a solution of cyanide of potassium, applied by means of an "eye glass," so as to ensure a prolonged contact of the fluid with the conjunctiva. After several months, little benefit resulted, and I then tried, in the same manner, a solution of hyposulphite of soda. It seemed reasonable to suppose that whether the brown stain were caused by the silver being deposited in a finely divided metallic state, in the form of a chloride, or of a sulphuret, it would be dissolved by this salt; and certainly the stain was so much diminished as to lead me to expect that it would be wholly removed by a longer use of the solution.*

* See *Ophthalmic Hospital Reports*, vol i., p. 51.

CHAPER IV.

THE CORNEA.

ITS APPEARANCE IN HEALTH.

Duly to fulfil its important function of transmitting light, the cornea must be not only perfectly transparent, but smooth and brilliant on its surface.

When examining a patient near a window, the student will observe how clear and sharply-defined an image of the window-frame is depicted on the cornea, if it be wholly free from disease; and he will be struck by the contrast its surface presents when in a state of acute or chronic inflammation. The image is then blurred and indistinct, as if it were received on a steamy glass, and the straight lines of the wood-work looked broken and wavy. It is often of great importance to mark this alteration in the epithelial surface of the cornea; as, for instance, when it accompanies those obscure changes in the deep-seated tissues of the globe collectively termed "Glaucoma:" changes so insidious in their approach, and so obscure in their earlier manifestations, that every sign becomes valuable which can aid the young practitioner in forming betimes a correct opinion of their real nature.

DISEASES OF THE CORNEA.

The cornea occasionally undergoes a very remarkable alteration, whereby its figure, which is naturally that of

a portion of a sphere, becomes a cone, its transparency remaining unaltered. This rare affection is usually termed

CONICAL CORNEA,

But it has also received various other names, as *Hyperkeratosis* (from a belief that there was an actual overgrowth of corneal tissue), *Staphyloma corneæ pellucidum ; Keratoconus*, &c.*

Any one who has seen a well-marked case of Conical Cornea, will ever afterwards recognize the affection at the first glance. From a distance, the eye presents a peculiar bright and sparkling appearance, as if a tear were hanging on the centre of the cornea. When viewed more closely, and in profile, the change of figure in the part is at once perceived. In all other respects the eye appears healthy, the plane of the iris being vertical, and the motions of the pupil naturally performed. The apex of the cone is almost always at the centre of the cornea, but, in certain rare instances, nearer to the margin.†

* Dalrymple ; plate xxxii., figure 1. An indifferent representation, but better than that given by Sichel.

† I have seen a remarkable instance of this peculiar arrangement. The patient, an elderly lady, has in the left eye well-marked Conical Cornea of the usual form ; so that she cannot see to read even large letters. The right eye is also short-sighted, and she is obliged to hold a page of common type within six inches of the cornea. Nevertheless, she is surprised to find that objects on a rather distant horizon are plainly seen with this eye. The cause of this seeming contradiction is, that the right cornea bulges forwards into a slight cone just below the level of the pupil, and in reading she of course looks through this conical portion ; while distant objects are perceived through the flatter part, opposite to, or a little above, the centre of the pupil.

Sometimes one only of the corneæ is conical; more commonly, however, both are affected, although very rarely to the same degree. When the cone is strongly developed, there is frequently a little cloudy opacity at its apex. The commencement of the deformity (which is unattended with any inflammation) usually occurs when the patient is between twenty and thirty. At first he grows short-sighted; then, as the cone becomes fully developed, even near objects are confused and indistinct, and luminous bodies appear surrounded with a halo. The flame of a candle or a lamp seems to be split into a multitude of branching rays, or, instead of one flame, several flames are seen arranged in a circle.*

In saying that Conical Cornea usually begins when the patient is between twenty and thirty years of age, I restrict the remark to the genuine, uninflammatory affection; for a similar deformity is sometimes the result of inflammation of the part, with or without ulceration. I quote a case of the latter kind, as it presents a rare instance of Conical Cornea occurring at an early age.

Priscilla S., aged four years, was brought to me on the 9th of April, 1847, with an opacity at the centre of the left cornea, the result of a small ulcer which had cicatrized. The cornea was *very slightly* conical, and, except at the centre, quite transparent. On February 8th, 1849, she was brought again, the sight of the eye

* A paper, by Mr. White Cooper, in the second volume of the *London Journal of Medicine* (1850), contains some figures illustrating the appearance which luminous bodies presented to a patient, the subject of Conical Cornea, who himself furnished the drawings.

having become very defective. I found the small cicatrix in the same state as before, but the cornea had assumed a *completely conical* form.

It was, perhaps, from some isolated cases like the foregoing, that SICHEL too hastily advanced the statement as to conical deformity of the cornea being *always* preceded by a central ulcer. This is disproved by the fact (which I have repeatedly verified), that in some corneæ, exhibiting the deformity in the most marked degree, not the slightest opacity has been found either at the apex of the cone or elsewhere.

Very few specimens of *Conical Cornea* have been examined after death; but in every instance, I believe, the central part—that is to say, the apex of the cone—has been found thinner than natural.*

It seems almost impossible to assign a constitutional cause to the deformity, so widely different in every respect are the persons liable to it. Florid, robust country people, pale, sickly artisans—those who lead an active life, and those following the most sedentary trades—may all become the subjects of this singular affection.

In proportion to the obscurity of its pathology, has been the diversity of treatment recommended for its cure. The following operative plans have been tried. Removal of the lens, by *extraction* or *solution;* displacement of the pupil towards the lateral, less prominent, part of the

* JÆGER of Erlangen described the part as being extremely thin in an eye which he dissected. His account, although short, is the fullest I am acquainted with; it is contained in a German Inaugural Dissertation, published by C. SCHMIDT in 1830.

cornea ; simple evacuation of the aqueous humor ; evacuation with subsequent pressure ; cutting large slices out of the cornea. Almost every kind of stimulating, astringent, and escharotic substance has been applied either to the eye itself, or to its immediate neighborhood. Various plans of general treatment, more or less scientific, have been pursued, according to the supposed defects of the patient's constitution. Undoubtedly the most extraordinary is that styled the "emeto-purgative plan," which consists in making the patient swallow a grain of tartar emetic, or a scruple of sulphate of zinc, with two, three, or even four drachms of sulphate of magnesia, *every day for the space of a year or more.* Just let the reader think over the functions of the stomach, and then say what kind of organ that must be which could with impunity go through twelve months of such discipline as this ! I will not stay to inquire in what way the "emeto-purgative" is supposed to have the power of restoring a Conical Cornea to its natural figure ; but will content myself with observing that in several cases where it had been tried, and which have subsequently fallen under my notice, not the slightest benefit had been obtained. In one instance the patient had been under treatment, at intervals, for more than *ten years.* During one whole year she had steadily followed the "emeto-purgative" plan (tartar emetic and sulphate of magnesia), and had tried it since, for shorter periods, without any improvement of sight. Her health, she said, had become much impaired, and she suffered greatly from dyspepsia. She was thin, very pale, and looked like a woman of fifty, rather than of thirty-eight, which was her real age.

The conical deformity was fully developed in the left eye, with which she could not read, even at one inch focus: the right cornea was rather less conical.*

As regards my own experience of Conical Cornea I have never found astringent or stimulating applications of the slightest use; nor have I felt warranted in performing any of the operations which have hitherto been recommended. In the present imperfect state of our knowledge, I believe we must content ourselves with employing such palliative contrivances as may best modify the effects of the deformity. When this exists to only a small degree, a deeply concave glass is often of service; and when the cone has become more developed, a blackened metal plate, pierced along the middle with a very narrow transverse slit, and fitted into the spectacle frame in front of the glass, affords much assistance. Sometimes the perforated plate is even more useful alone than in combination with the glass; and I have met with two or three cases, seemingly uncomplicated with any other disease of the eye, in which both the concave glass and the perforated plate were equally useless.

ARCUS SENILIS.

This name is given to an opacity which, in most elderly persons, is seen close to the margin of the cornea. When fully developed, it appears as a complete circle, but it begins as a faint haziness, of a crescentic form, close

* I regret to say that this poor woman's case stands recorded in print as one of Conical Cornea *cured* by the emeto-purgative plan, without injury to the general health.

to the upper or lower edge of the cornea, and, if carefully looked for, may be detected in one, or both, of these situations in many persons between thirty and forty; or even at an early period of life. It does not consist in an extension of the opacity of the sclerotic on to the cornea; for the extreme margin of the latter always remains more or less transparent, and appears as a narrow, darkish line between the dense white of the sclerotic and the crescentic or circular opacity I am describing. The concave opacity is gradually shaded off into the transparency of the healthy structure.

From what I have said, the reader will perceive that the term *Arcus Senilis* is by no means well chosen; for, eventually, the arc becomes a complete circle, and its formation begins at middle life, or even earlier. Indeed, I have in my case-book a note of a perfectly circular and strongly-marked deposit in both corneæ of an apparently healthy girl of eighteen.

The true nature of this change was not known until recently, when Mr. CANTON discovered that it chiefly consisted in a fatty degeneration of the part. "Arcus adiposus," or "Circulus adiposus," would, therefore, be a more correct designation than that hitherto employed.

INFLAMMATION OF THE CORNEA.

(*Keratitis*;* *Corneitis.*)

Inflammation attacking the proper tissue of the Cornea, manifests itself by a general haziness of the whole

* "Keratitis" has been formed from κέρας, on the same principle as "Pleuritis" (a genuine Greek word, used by ancient writers) from πλευρα· Κέρας, horn, κερατιτης, horny; κερατιτις (νοσος understood),

structure, and a rapid prolongation of vessels into its substance. The transparency and polish, which I mentioned as characterizing the healthy cornea, are lost. Its surface has the appearance of a "steamy" glass, and the image of the objects reflected upon it is indistinct. If the inflammation has existed several weeks, there is commonly some portion more opaque than the rest; this denser opacity being usually found about the centre. In severe cases, the cornea gradually acquires increased convexity, which however, wholly or partially disappears after the inflammation has subsided. A zone of vessels in the sclerotic, immediately surrounding the cornea, is always present whenever inflammation is going on either in the cornea or iris. By remembering this fact, the student will be enabled to avoid the difficulty he would otherwise find in discriminating between corneal opacity, the result of an *extinct* inflammation, and that produced by inflammation which is *still active;* the presence of the sclerotic zone in the latter case, and its absence in the former, enabling him at once to determine the question.

The peculiar diagnostic mark of genuine Keratitis consists in a plexus of fine vessels, arranged in a crescent, or even a semicircle, along the upper or lower edge of the cornea; sometimes in both situations; and occasionally, even forming almost a complete circle.*

"the disease of the horny part." Strictly, perhaps, it would mean "the horny disease" "*Corneitis*" is a bastard word, neither Greek nor Latin, but a jumble of both.

* I can refer the reader to no good representation of this appearance. Figs. 4 and 5, plate xiv., in DALRYMPLE, are hard and exaggerated.

These vessels, which extend into the proper substance of the cornea to the distance of half a line or a line, are so fine and so close together that they produce the effect of a smear of blood, of a dull red color, on the edge of the cornea. Close inspection, however, detects the individual vessels which constitute the plexus, and with a lens of an inch focus they may be seen forming a series of loops along the concave borders of the crescent.

These plexiform patches of recent inflammation are totally unlike the vascularity resulting from chronic inflammation of the cornea, and frequently seen to follow Purulent Ophthalmia, in consequence of the mechanical irritation of the granular lids. In such cases, the vascularity consists of separate venous trunks, of considerable size, which ramble all over the cornea, even as far as its centre, where they often appear as a lash of minute radicles.*

Besides the *crescentic plexus* in the substance of the cornea, and the zone of sclerotic vessels, there are always found, in cases of severe Keratitis, large and tortuous conjunctival veins running across the globe in the direction of the four recti muscles. In general, the patient suffers much from intolerance of light, and every attempt to expose the eye causes a gush of hot tears.

True Keratitis commonly occurs in children and young persons; rarely during the middle period of life. It is sometimes confined to one eye, but much more frequently involves both; and is very apt to appear in the second eye just as that which had been first attacked is getting

* Dalrymple; plate xv., fig. 1.

well. In young children it may be of very short duration, and the transparency of the cornea may be recovered to a remarkable degree; but in persons above the age of puberty, and from that to twenty, it is usually very obstinate; and if the inflammation has lasted some months, and much interstitial deposit has occurred, the cornea never quite regains its transparency. There remains, ever after, a slight cloudiness, which is not disposed in well-marked patches, like cicatrices, with intervening clear spaces, but the whole tunic is throughout very slightly hazy.

Inconsiderable, however, as this kind of haziness may appear to the observer, it offers a very serious impediment to sight, and some experience of such cases is required to convince the surgeon that so small an amount of generally diffused opacity can have so great an influence on the patient's power of distinct vision.

Treatment.—I am aware that the treatment of Acute Inflammation of the Cornea, recommended by those whose opinions are entitled to the utmost attention, from their large experience and high scientific attainments, comprises active depletion, in the form of general and local bleeding, and the administration of mercury so as to affect the mouth. Nevertheless, I must express my decided conviction that, in the vast majority of such cases, if not in all, both bleeding and "mercurialization" are most injurious. I speak, be it observed, of that form of inflammation which is characterized by a general haziness of the cornea, the peculiar *crescentic plexus* of vessels at its margin, tenderness of the globe, intolerance of light, and lachrymation, and which occurs, for the

most part, in young persons of a manifestly delicate and irritable frame; or in those who, with an outward appearance of what may almost be termed *vigor*, are really over-excitable, and as readily depressed by local diseases as the habitually pale and ex-sanguine. Such patients are always injured by mercury, but under the steady use of tonics, especially iron, with or without quinine, the inflammatory symptoms subside, the vessels which had begun to shoot into the cornea dwindle and disappear, the haziness is lessened, the irritability of the eye subsides, and the organ is gradually restored to usefulness. Counter-irritation, by means of repeated small blisters to the temples, or behind the ears, is an important aid to the tonic treatment. In certain subjects, a few leeches occasionally applied to the temples afford great relief; but in the majority of cases they are useless, or even injurious, and aggravate, instead of lessening, that neuralgic character which the pain so often assumes when the fibrous tissues of the eyeball are inflamed.

I cannot quit the subject without briefly noticing the extraordinary way of treating an actively inflamed cornea recommended by WALKER in his *Oculist's Vade-Mecum*. He says, at page 111, "The treatment I have found most effective in cases of Corneitis, has been the stimulant, and I prefer the use of the nitrate of silver in substance. It is to be applied to the conjunctival surface of the inferior lid, precisely as for a case of Conjunctivitis. In addition, I generally recommend the use of the solution of either sulphate of zinc or sulphate of copper, with the application of the red precipitate oint-

ment at night." It is difficut to see on what principle this irritating plan could be adopted; or to understand at what period an eye so teased would cease to be irritable and disposed to hyperæmia. One of the most severe cases of pure corneal inflammation I ever met with, occured in a young woman who had been treated in this manner.

She came to me with both corneæ unnaturally prominent, and so hazy that it was barely possible to ascertain the position of the pupils. The crescentic plexus was strongly marked along the margin of each cornea; there was a broad sclerotic zone; and the large veins of the conjunctiva were full and turgid. The admission of light caused much pain, and a profuse flow of tears. The patient was pale, with cold extremities, and a weak pulse. She had been several weeks in a finely-situated provincial hospital, where her general treatment appears to have been very judicious. She had been allowed animal food, with a due proportion of stimulants; counter-irritation had been kept up by means of blisters: but all had been counteracted by the local treatment, which consisted in the repeated application of nitrate of silver.

While reprobating the plan of treatment recommended by WALKER, I would also draw attention to the exaggerated description he gives of the appearance presented by corneal vascularity in cases of long-continued inflammation. He says, "The cornea looks as if it were covered with a piece of *red cloth*. . . . . VALPEAU, with perhaps as much correctness, compares the appearance of the eye in this condition to a *red cherry*." Ex-

aggerations of this kind are most mischievous, for they accustom the student to expect glaring and striking effects of color, and those shades and gradations which are always seen in nature.

As a contrast to the above, I would recommend for careful perusal JACOB'S Chapter "On Inflammation of the Cornea," in which there is an artist-like appreciation of delicate and minute changes, both of form and color, directly contrasting with the overstrained description of WALKER. If, however, the student has any doubt as to what an inflamed cornea is really like, let him, on the first opportunity, place a "piece of red cloth," and a "ripe cherry," by the side of a cornea in a state either of Acute or Chronic Inflammation, and then judge for himself as to the correctness of WALKER'S and VELPEAU'S comparisons.

INFLAMMATION OF CORNEA, WITH SUPPURATION.

In simple Keratitis, the opacity is due to inflammatory deposits in the tissue of the cornea; and after the inflammation has subsided, these deposits may become absorbed, and a cornea which had been so hazy that the position of the pupil could not be discerned, may regain very nearly its healthy transparency. Such excellent recovery, however, seldom happens, except in children, in whom a rapid and active interchange of material exists throughout the various tissues of the body.

A very different result follows that form of Keratitis which is attended with the formation of *pus* among the fibres of the cornea, or with loss of its substance by *ulceration*. In both these cases, permanent opacity—a

cicatrix, in fact, more or less dense—invariably remains. It is, therefore, of importance that the surgeon should use his utmost endeavors to limit, as much as possible, the spread both of suppuration and ulcers in the substance of the cornea.

Soon after the onset of an acute Keratitis, while the cornea is hazy, the intolerance considerable, lachrymation profuse, and the sclerotic much injected, one part of the cornea (commonly the centre, or a spot a little below that point) may become whitish, and densely opaque; then yellowish, indicating the formation of pus. Although this is commonly spoken of as "*Abscess* of the Cornea," it must be remembered that the pus is not contained in a distinct, circumscribed cavity, as commonly happens when suppuration occurs in other tissues of the body. It is infiltrated among the fibres of the true cornea, which become softened and broken down; so that if a puncture be made (as has frequently been recommended), the matter does not escape. We know that the true fibrous cornea is bounded before and behind by a firm layer of almost cartilaginous density—the anterior and posterior elastic laminæ; these for a considerable time resist the softening process, and the pus continues to be infiltrated more and more among the fibres of the true cornea.* Commonly the posterior lamina is the first to give way, and the pus slowly oozes into the anterior chamber, and sinks to the bottom of that cavity, where it assumes the appearance of a crescent, and is

* Sichel; pl. ix., figures 5 and 6. Hypopyon is shown in two stages of Keratitis, with perforating ulcer of the cornea.

termed "Hypopyon."* The disease may stop here; the pus in the anterior chamber being absorbed, and the site of its deposit in the true cornea becoming permanently opaque.

It more frequently happens, however, that within a very short time of the posterior lamina giving way, the anterior one yields to the same process of softening. In that case the aqueous humor slowly drains away, the iris falls against the cornea, and the anterior chamber is obliterated. The site of the suppuration is now marked by a greyish-white patch, the surface of which is flocculent with little shreds of the softened corneal tissue. These gradually fall off, and then a perforating ulcer of the cornea is established, through which the iris may protrude, appearing as a small brownish nodule in the centre of a whitish or yellowish depression.

Severe *Neuralgia* often attends the formation of pus within the substance of the cornea; and those who have

* A good deal of confusion exists as to the names given to this deposit of pus in the anterior chamber; one set of writers terming it *Onyx*, another *Hypopyon*. The former word, again, is by some employed to denote a patch of suppuration within the substance of the cornea—an abscess. The best way to rid ourselves of the difficulty is, I think, to discard altogether the unnecessary word *Onyx* from our vocabulary.

We often see Hypop*ion* written for Hypop*yon*. Both ὑπώπιοι and ὑπόπυον are to be found in GALEN, but with totally different meanings: ὑπώπιον, as GALEN explains is synonymous with ὑπὸ τοὺς ωπας,—"*something under the eyes;*" and he uses the word to imply an effusion of blood into the areolar tissue of the lower lid. "Hypopyon," he says, "takes place when pus involves the whole or half of the iris:"—ὑπόπυον δέ ἐστιν ὅταν πῦον ὁλὴν τὴν ἶριν περιλάβῃ ἢ τὸ ἥμισυ. Just the modern acceptation of the word.

not been in the habit of seeing such cases would hardly believe that a little yellow patch, not bigger than the section of a hempseed, could be the cause of sleepless nights, and days of acute suffering, requiring the administration of full doses of hyoscyamus or morphia. As soon as the whole thickness of the cornea has given way, in the manner I have described, the aqueous humor escapes, and the pain ceases.

The manner in which these cases of suppuration of the cornea terminate, depends very much upon their treatment. If, at the time when the corneal tissue (either its anterior or posterior layer) is giving way, and allowing the slow exit of the pus, the patient be depleted and kept on low diet, a large perforation of the cornea, and a proportionate protrusion of the iris, are almost sure to take place; but if the patient's powers be properly supported by good nourishment and by tonics—as bark and ammonia, or quinine—not only will the ulceration stop short of forming a large breach in the cornea, and giving rise to *Prolapsus Iridis*, but frequently only one surface of the cornea, the posterior or the anterior will give way, the other retaining its vitality; and even if complete perforation should have taken place, the process of reparation will go on so rapidly, that the aqueous humor will be retained, and the iris, which may have fallen against the cornea, will even recover its natural position, the site of the suppuration being occupied by a firm cicatrix. In such cases, although a central opacity of the cornea must ever afterwards remain, and of course prove a great hinderance to vision, very useful sight will be enjoyed

through the lateral, healthy portions of the tissue; and such an eye (in the event of the other being lost) may be restored to almost its original perfection by judicious displacement of the pupil, by operation.*

Our *local treatment*, in these cases of suppuration in the cornea, should be of the simplest kind. Fomentations of warm water, or of poppy decoction, may sometimes afford relief while the suppuration is going on; but as soon as the cornea has given way, perfect rest of the part is to be enjoined. The eye must be kept constantly closed, and not be examined, even by the surgeon, except from time to time to ascertain the progress of the case. A small quantity of cotton wool, arranged around the edge of the orbit, and kept in place by means of a light bandage, forms perhaps the best dressing for ensuring gentle closure of the lids.

ULCERATION AND OPACITIES OF THE CORNEA.

Some of the more formidable kinds of corneal ulceration have been already described in the Chapters on Purulent Ophthalmia, and Exanthematous Ophthalmia, while a more chronic form has been mentioned as characterizing the so called Scrofulous Ophthalmia. There are, however, other forms of ulceration which cannot be brought under any of these heads, but must be separately considered. A few remarks may be suitably made, at the same time, on the appearances presented by corneal ulcers in general, and by the various opacities which result from their cicatrization, or from inflammatory and earthy deposit.

* See the Chapter on ARTIFICIAL PUPIL.

Thoroughly to examine a corneal ulcer, the light from the window must be made to fall directly upon it; the excavation which it forms is thus appreciated, and the observer can at a glance distinguish between a true ulcer and a mere hazy spot, appearances which in a dull light may easily be mistaken for each other; for where the ulcerative process is still actively going on, there is commonly very little opaque halo around the edge of the excavation; sometimes, indeed, there is none at all, the ulcer resembling a little hollow made in a piece of clear glass, by chipping out a fragment from its substance.

The edge of an ulcer, in which the destructive process has ceased, and reparation begun, is always more or less hazy, and at the same time there will be found some vascularity of the sclerotic immediately adjoining that part of the cornea where the ulcer is situated; and occasionally a fine vessel, or a delicate plexus of vessels, may be traced from their vascular portion of the sclerotic to the border of the ulcer itself.

These vessels are too often regarded as evidences of an unhealthy action in the part, whereas they are nothing more than the channels through which reparative material, necessary to the filling up of the ulcer, is conveyed to it. A small breach of surface in the cornea can be repaired without any noticeable development of new vessels; but if the breach be extensive (as, for instance, when a considerable portion of the fibrous tissue has been broken down by suppuration,) a vascular plexus forms the necessary apparatus for organizing new material; and as soon as the work of repair has

been accomplished, the vessels dwindle, and gradually disappear.

Where the general vigor of the patient has been well maintained by suitable treatment, an ulcer in healing usually fills up to the level of the healthy cornea; but in feeble subjects, or where the ulcer has been very large and deep, the cicatrix remains permanently depressed. An inexperienced observer may readily mistake such a cicatrix for an unhealed ulcer; but if the part be examined with the light falling full upon it, the margin of a depressed cicatrix will be found to be smoothly rounded off, whereas a true ulcer always presents an edge more or less sharp and abrupt. In most cases, also, the absence of vessels in the cornea, and the adjacent sclerotic, distinguish the perfected cicatrix from the ulcer, which is still in progress.

When an ulcer has completely perforated the cornea, the aqueous humor of course escapes, the iris falls forward, and a portion of it protrudes through the aperture, forming what is termed *Prolapsus Iridis.* The protruded portion appears as a brownish nodule, surrounded by the greyish or yellowish margin of the ulcer. In some books on ophthalmic surgery, the reader is directed carefully to push back again with a probe such protruded portions of iris; but he is not told how they are to be *kept* back. It must be self-evident that they will slip out again the moment the probe is removed; and therefore, instead of wasting time in such fruitless efforts, the surgeon must endeavor to produce speedy adhesion between the protruded iris and the edge of the corneal ulcer, with which it lies in con-

tact. This adhesion will be hastened by suitable tonic and stimulant treatment; and very often further protrusion is checked, and the healing up of the ulcer quickened, by very carefully and lightly touching the parts with a finely-pointed stick of nitrate of silver.

I may notice in this place a form of ulceration (fortunately very rare, and of which I can at present recollect only two cases) in which a crescent-shaped ulcer, beginning at the edge of the cornea, slowly but steadily extends until it has formed a completely circular groove, isolating the central portion of the cornea, which, by that time, has become opaque. The ulceration goes on until it has gradually destroyed this isolated portion, and indeed the whole of the cornea, except the posterior lamina, which perhaps gives way only at one or two points. In both the cases I allude to, the patients were between forty and fifty years of age; not suffering from any marked impairment of health: indeed, one of them, the elder of the two, was a stout, hearty-looking man from the country. Although the appearance of the ulceration itself was in these patients so like that ulceration which accompanies Gonorrhœal Ophthalmia, there was in these patients no discharge of any kind. There was a total absence of all acute inflammatory symptoms in the conjunctiva and sclerotic, but of course both structures presented some increased vascularity. There was but little intolerance of light, and not much pain. No treatment was of any avail, and each patient wholly lost the sight of one eye, the other cornea remaining unaffected.

Ulceration of the Cornea is one of the results of dis-

ease of the fifth nerve, but when arising from that cause does not present any peculiarity requiring special notice in this place.

Opacities of the Cornea have received different names, according to their density. Those having a whitish, cloudy appearance, are called *nebulæ*, while the perfectly opaque, white patches, are distinguished by the terms *Albugo* and *Leucoma*. A forced distinction has sometimes been drawn between the two latter terms, but their etymology shows them to be perfectly synonymous (λευκος=albus).

Cloudy opacities, diffused throughout the greater part of the cornea, result from long-continued inflammation of its tissue (*Keratitis*): those which are confined to certain portions of the cornea, the rest remaining clear, are the effect of superficial ulcers. The perfectly opaque, chalky-white patches overspreading a large part, perhaps nearly the whole, of the cornea, are the cicatrices succeeding to extensive suppuration, and breaking down of its fibres. Penetrating ulcers produce cicatrices almost as white and opaque as those following suppuration; but the former are of smaller size, and they have almost always a portion of the iris adherent to their posterior surface. Caustic lime, when it does not produce actual slough of the whole cornea, and subsequent *Staphyloma*, renders the part opaque; but the opacity has not that chalky appearance which follows the loss of corneal substance, and the formation of a cicatrix; it rather resembles what one sees in the dead subject when decomposition is just commencing.

From the frequency of corneal opacities, and the de-

formity they occasion, the surgeon's aid is continually being sought to remove them, and it would be an endless task to enumerate the various substances which have been, and still are, recommended as specifics. Stimulating drops, ointments, and powders, have each their advocates; and no doubt corneal opacities disappear, or diminish, under the use of many of these applications; but so they do when no application whatever has been employed. I have already alluded to the manner in which the diffused opacity of Keratitis clears off as the inflammation ceases. Every ulcer at the time of its healing is surrounded by a halo, which, when cicatrization is completed, slowly disappears. In infancy, when the interchange of material in tissues is so active, this disappearance of the haze surrounding an ulcer is more rapid, and even transparent corneal substance is, perhaps, to a certain extent reproduced, which is never the case in the adult. If, therefore, after all inflammatory, or reparative, action in the cornea has ceased, drops or lotions be continued for a certain time, the clearing, which is really due to the ordinary process of nature, will be attributed to the medicated application. *Time*, I believe, is the great clearer of corneal opacities; and the surgeon who is consulted respecting those which follow recent ulcers in children, may comfort their friends with the assurance that as the children grow up, the specks—they can never wholly disappear—will become smaller, and less noticeable, provided no fresh inflammation should set in. If, however, the speck is of old date, and its margin abruptly defined, it is useless to attempt its removal.

The student and young practitioner are so apt to be led away by great names, that I would put them on their guard against the specifics which some of the old medical writers extol so highly, as capable of removing corneal opacities.*

To pare them away seems at first sight a much more feasible proceeding than to wear them off by friction, and the former plan is still revived from time to time, with various modifications as to the extent and manner of the operation. But when we remember the fact that (in the adult, at least), transparent fibres are not reproduced in the cornea, it will be evident that each successive loss of its substance can only give rise to a fresh opacity.

Few ophthalmic surgeons, I think, will feel disposed to repeat the more radical cure attempted by DIEFFENBACH, who, for a large central Leucoma, the result of Scrofulous Ophthalmia, in a child two years old, removed the opaque piece of cornea, by making two elliptical incisions through its whole thickness, and then brought together the edges of the wound with stitches.†

* It is not likely, indeed, at the present day, that any one would try the plan sanctioned by the classic name of MEAD; who, in his Chapter "Of the Albugo," recommends us to use equal parts of powdered glass and sugar-candy, levigated to an impalpable powder. A little put into the eye *every day*, he says, "gradually absterges and wears off the spot, by its inciding quality." The other method is "to order a dexterous surgeon to pare it cautiously *every day* with a knife." He adds, with amusing candor, "the paring of the cornea has not succeeded with me above once or twice." (*The Medical Works* of RICHARD MEAD, M.D., 8vo., Edinb. 1775, p. 410.)

† See VON AMMON'S *Journal of Ophthalmology*, (*Zeitschrift für die Ophthalmologie,*) vol. i., p. 178, where the operation is said to have

The newest suggestion for remedying blindness, occasioned by total opacity of the cornea, has also emanated from Germany. I should hardly think it worth while to notice so wild a proposal, had it not been made known in a periodical of well-established reputation and scientific character.* It consists in cutting a hole through the cornea, and inserting therein a small piece of glass shaped like a shirt-stud, which Dr. NUSSBAUM hopes will not only be worn there permanently by the patient, without inconvenience, but will act as a substitute for the transparent cornea.

Deposits in the form of permanent white patches on the cornea, are described by some writers as frequently resulting from the application of acetate of lead in solution to the surface of ulcers; while TYRRELL and others allude to such occurrences as being very rare. They certainly do sometimes happen. I saw an instance in an old lady, who, while tending her flowers, was struck on the cornea by a pointed leaf, which caused a slight abrasion of epithelium. She had among her stores a bottle of lotion, which she appears to have regarded with great veneration, as a sovereign remedy for all sorts of eye diseases, having kept it by her for about two years. During that time the acetate had become

been suggested by DARWIN. But, in fact, the proposal of the latter was even more startling. "Could not a piece of the cornea be cut out by a kind of *trephine* about the size of a thick bristle, or a small crowquill, and would it not heal with a transparent scar?" "An experiment," he adds, "I wish strongly to recommend to some ingenious surgeon or occulist." *Zoonomia*, third edition, 1801, vol. iii., p. 71.

* *Zeitschrift für wissenschaftlische Zoologie:* conducted by Professsors VON SIEBOLD and KŒLLIKER, vol. v., p. 179, 1853.

decomposed, and the old lady, thinking that all the good stuff was at the bottom of the bottle, took care to shake up the white deposit, and drop some of it into the eye. At the end of a few days she came to me, and I found a chalky-white patch occupying the centre of the cornea, and hiding the pupil. I carefully scraped off the newly-formed epithelium, and with it the deposit of carbonate of lead, and found the cornea beneath perfectly clear. As soon as the epithelium was re-formed, all opacity was gone, and vision quite restored.

Calcareous Deposit.—This is a curious form of opacity, depending upon spontaneous deposit of earthy salts between the epithelium and the anterior surface of the cornea. It was first observed by myself; at least, I am not aware of its having been met with earlier than the following date.*

October 16th, 1848: John Trevelyan, aged fifty-eight, a cabinet-maker, applied at the hospital, complaining of dimness of sight, which within the previous six months had been gradually getting worse, until it had entirely prevented him from following his trade. His eyes, when cursorily viewed by a person directly in front of him, seemed to have no pupillary apertures; but, on closer inspection, it was found that this appearance was the effect of a transverse opaque band, passing along the equator of each cornea, so as entirely to hide

* By a strange coincidence, it happened that while this patient was in attendance at the hospital, a second instance of the same affection came under the notice of Mr. Bowman, who at that time took part with me in seeing out-patients. I furnished him with a report of my case, and he published it, together with his own, in the Appendix to his Lectures on the Anatomy of the Eye.

the middle third of the iris. These bands were of a brownish tint closely resembling that of the irides, and about a line and a half in breadth at the middle of the cornea, but tapering off towards its inner and outer margins. The opacity seemed very superficial, as if just beneath the epithelium; and, when minutely inspected, it was seen to be traversed by a few delicate dark lines—fine cracks, apparently, in the deposit. Through the upper and lower, quite transparent portions of the corneæ, an oblique view of the pupils could be obtained. These were rather small, but perfectly healthy in appearance, and the patient could distinctly see objects placed above or below the level of the eye.

Except the opacities of the corneæ, no morbid condition could be detected in either eye; and the patient stated that there had been no inflammatory symptoms during the time the dimness had been coming on.

Thinking it possible that the deposit might nevertheless be of inflammatory origin, I tried the effect of counter-irritation by means of issues in the temples; but, no benefit having resulted, I attempted to remove the opacities by operation, and having very carefully scraped off the epithelium from the centre of the right cornea, found a layer of hard matter beneath it. This was closely united to the proper substance of the cornea, and could be raised from it only in small flakes, and with much difficulty. Wherever a fragment of the deposit was chipped off, the cornea beneath was found perfectly transparent. I cleared a space equal to the area of the dilated pupil, and applied to the denuded surface a drop of castor oil, to soothe the extreme pain which the

patient complained of. The irritability of the eye had quite subsided in the course of about ten days, and the spot where the deposit had been removed was covered with new, and perfectly transparent, epithelium.

I afterwards performed the operation on the left eye, with an equally satisfactory result. I have seen the patient since, and his sight is excellent, enabling him to work at his trade as well as ever. The deposit which I left undisturbed near the inner and outer margins of the corneæ presents the same aspect it did when I first saw the case; and the edge of the opacity surrounding the cleared space appears as abruptly broken as at the time of the operation.

My friend, Mr. Thomas Taylor, the well-known chemical lecturer, kindly examined the flakes I removed, and found them to consist of phosphate and carbonate of lime.*

INJURIES OF THE CORNEA.

Abrasion of Epithelium.—A slight scratch on the surface of the cornea will sometimes scrape off a portion of its epithelial covering; and it would be impossible for any one who had not actually witnessed the effects of this seemingly trifling injury, to believe it could give rise to such acute suffering as it sometimes produces, especially in persons of an irritable nervous system. I have seen men almost fainting in consequence of the pain resulting from the edge of a sheet of paper, the cuff of a coat, or an infant's finger-nail, coming in con-

* In the other case, the deposit was without any brownish tinge, but had the whitish appearance of ordinary corneal *nebula*.

tact with the cornea, even although the abrasion of epithelium was so minute that it required the most careful examination to detect it.

The abrasion is usually best seen if the surgeon seats the patient opposite a window, and stands behind him, raising the upper lid, and fixing it against the edge of the orbit, while the patient moves the eye in different directions, so as to allow the light to fall on each portion of the corneal surface. Sometimes a minute flap of the membrane will be found doubled down; at other times, the surface of the cornea, at one small spot, appears roughened to a hardly appreciable extent. The admission of light—or rather, the motion of the lids in the attempt to open the eye—causes a sudden dart of pain; and there is sometimes a considerable amount of zonular redness in the sclerotic. The most soothing application, and one which causes instantaneous relief, is a drop of perfectly fresh oil upon the surface of the cornea. Castor oil is the best, but olive oil may be used as a substitute. The eye should then be closed with a suitable bandage, which should only be removed, after a lapse of several hours, for a re-application of the oil. In cases of extreme irritability, it is well to bandage both eyes for twenty-four hours, to ensure perfect repose of the injured one. As soon as a fresh layer of epithelium has been formed, all pain ceases, and the sclerotic redness soon subsides.

To those who have not witnessed the effect of this accident, it will seem almost ridiculous in me to have said so much about its treatment; but in fact a large clean wound of the cornea—such, for instance, as that

made for the extraction of a Cataract—seldom gives rise to as much real suffering as the little abrasions I have been describing.

PENETRATING WOUNDS OF THE CORNEA.

These differ widely in their importance (as is the case in wounds of other parts of the body), accordingly as they are *punctures*, clean *incisions* with sharp instruments, or the result of *contusions*.

As regards the appearances they present, all are easily recognized if seen immediately after their infliction; but when the parts have become obscured by the effusion of fibrine, blood, or pus, it is sometimes extremely difficult, or quite impossible, to form a correct estimate of the injury. Within a few hours the edges of a clean cut of the cornea become hazy, and the wound is at once traceable as a whitish line; but if the patient be seen directly after the receipt of the wound, while its edges are still transparent, it may require the closest scrutiny to detect it; for sometimes the edges lie in such nice apposition, that the greater part of the aqueous humor is retained, and no deformity of the pupil exists. If, however, as more commonly happens, the aqueous humor has drained away, the obliteration of the anterior chamber, caused by the falling forward of the iris against the cornea, will aid the detection of the wound. Where a portion of iris has been forced into it, the case of course speaks for itself.

Just as we often meet with scalp-wounds, which have been inflicted with blunt bodies, clean and linear as if cut with a knife, so do we find wounds of the cornea

from blows with a stick or whip, quite indistinguishable from those done with the sharpest instruments. Still, whatever appearance such wounds from blows may present, we must remember that they are attended with a considerable shock to the whole eye-ball, and we must be extremely guarded in our prognosis. A good illustration of this is afforded by a case which I some years ago communicated to the *Lancet*.*

A boy received a blow, with a piece of wood, on the cornea, which was cut through to the extent of about a line. At the same time the capsule of the lens was rent, and Cataract was the result. Under simple treatment the wound healed, with a small adhesion of the iris to the cicatrix, and all inflammatory changes seemed at an end. Within two years, however, the cornea had become enlarged and prominent, forming what is termed a *Conical Staphyloma;* and five years later the deformity was so considerable, and the pain in the eyeball so great, that I evacuated the contents of the globe, and allowed it to collapse.

The Treatment of Wounds of the Cornea must rest on the same principles as guide us in treating wounds of other tissues. Foreign bodies must be removed, and anything that can hinder the perfect adaptation of the cut surfaces; and then absolute rest, and a due performance of the nutritive functions, are the main requisites. It is quite astonishing to see some surgeons, who, in the case of an incised wound of the arm or leg, or a compound fracture, would never think of doing more than I have just mentioned, resorting, as soon as an

* May 25th, 1658, p. 622.

incised wound of the cornea comes under their notice, to bleeding, purging, low diet, and the administration of mercury; while they perhaps overlook the one thing needful—absolute rest of the wounded part.

It is sometimes very difficult, or even impossible, to remove the foreign body which has caused a corneal wound, as it may have penetrated the iris, or gone through the pupil into the depths of the eye; but whenever it can be seen, an attempt should be made to extract it, by enlarging the wound, if necessary, and employing such instruments as the surgeon's good sense and ingenuity may suggest as applicable to the particular case. The elasticity of the corneal fibres is such that they will allow a foreign body, if projected with great rapidity and force, to traverse them, and will then instantly close up again; so that, but for the positive evidence of the body in the anterior chamber, iris, or pupil, one could not believe it had passed through at all.

If the iris protrude between the lips of the wound, an attempt should be made to replace it with the small spatula.* My remarks as to the inutility of attempting this reduction in cases of perforating ulcer of the cornea, do not apply to incised wounds. In the former there is actual *loss of substance*, and the breach can be filled up only by a slow process of repair; in the latter this is not the case, and it may be possible to place the lips of the wound in such close apposition that further escape of the iris, or even of the aqueous humor, may be prevented, and rapid union may ensue.

The treatment of Incised Wounds of the Cornea,

* See Plate at the end.

attended with partial dislocation of the lens, will be noticed in a future Chapter.

When a fragment of stone or metal strikes the cornea, and bruises without rupturing it, very serious consequences often ensue, especially in old or enfeebled persons. In hospital practice, such accidents are met with in their severest form among old men employed in stone-breaking. Suppuration within the substance of the cornea quickly sets in; and the eye at first presents an appearance very similar to that described as characterizing inflammation of the cornea. The softening and breaking down of the fibrous tissue rapidly extends, until the whole is reduced, except perhaps the extreme margin, to a grayish or buff-colored mass. As soon as the aqueous humor escapes, the pain, which had previously been severe, subsides, and the case terminates in *Staphyloma*. By supporting the patient's feeble powers with ammonia and bark, good diet, and suitable stimulants, and, if necessary, soothing pain by the use of narcotics, some check may occasionally be put to the destructive process; but in feeble subjects there is seldom any chance of saving vision.

Much of what I have said with regard to the appearances presented by *incised wounds* of the cornea, will apply to *punctures*. Of course these appearances differ according to the time which has elapsed before the patient is seen by the surgeon, and the nature of the penetrating body. Whenever the cornea has been perforated, there is a likelihood of the lens having been injured, and the pupil should therefore be carefully explored. Sometimes the lens does not show any

opacity until several hours after it has been wounded. When the puncture has been made with a thorn, or a splinter of wood, a portion of the foreign body is often left sticking in the wound, and it should be carefully looked for and extracted. A striking instance of the different results of punctured wounds of the cornea, was afforded by two patients who came under my care at the Ophthalmic Hospital. One, a boy aged eleven, received a wound of the cornea and lens from the point of a rusty steel pen. Suppuration within the anterior chamber rapidly took place, extending behind the iris; pus pointed in the sclerotic just above the upper margin of the cornea, and was evacuated. Finally the cornea became opaque, and the whole eye thoroughly disorganized.

The other patient, a child three years old, ran a clean, sharp sewing-needle through the middle of the cornea, and punctured the lens. Within a few days the slight irritation caused by the injury subsided, the lens became cloudy, and a small portion of its substance protruded through the lacerated capsule into the anterior chamber. Not a trace of inflammation appeared; and as absorption went on, fresh portions continued to come forward, until nothing but opaque capsule remained in the pupil. This was afterwards torn through by operation, and the eye restored to usefulnes.

FOREIGN BODIES IN THE CORNEA,

When very minute, sometimes require for their detection the closest scrutiny on the part of the surgeon. Those which are fixed near the centre of the cornea,

and consequently on the black back-ground of the pupil, are especially likely to be overlooked by a hasty observer; but by placing himself and the patient in the position mentioned at p. 111, the surgeon is enabled to get the foreign body relieved against the lighter color of the iris. Nothing must satisfy him but his own careful examination of the corneal surface; for, while one patient may come with a reddened globe, intolerance of light, and a profuse flow of tears, although the foreign body which had set up the irritation be already dislodged from the eye,—another may complain of only trifling uneasiness when the lids are moved upon the globe; there may be no trace of vascularity in the sclerotic or conjunctiva, and yet the surgeon will discover a foreign body sticking conspicuously on the cornea. Pointed chips of metal, projected with violence, are commonly driven firmly into the tissue; but the small scales and flakes of metal, fragments of coke, &c. (which are the bodies most commonly met with), extend no deeper than the epithelium, and sometimes even lie flat on its surface. To *dig out* such little bodies with a pointed cataract-needle or a lancet, as many surgical works advise, is not only unnecessary, but injurious, as causing needless injury to the cornea, every puncture of which is followed by more or less of permanent opacity.

If the surgeon has thoroughly commanded the movements of the patient's eye, by placing the point of one finger on the sclerotic, just above the cornea, and the other against the inner side of the globe, he has only to tilt out the foreign body by inserting beneath it the

thin, rounded extremity of an instrument which I have figured in the Plate at the end of the volume under the denomination of a "spud."

If the foreign body be a scale of iron which has remained some days on the surface of the eye, the metal, having become oxydized, will crumble under the instrument, so that it must be removed piecemeal. Should any considerable surface of epithelium have been disturbed in the operation, a drop of oil will prove a soothing application. Bathing with warm water, and resting the eye for a day or so, are usually all that is required by way of after-treatment.

If a sharp little fragment of metal be driven straight into the cornea, so that one end projects above the surface, it may be seized with a well-made, closely-shutting forceps, and drawn out. A little more management is necessary if the fragment strikes the eye in a slanting direction, and buries itself completely among the fibres of the cornea. Any attempt to pick out such a fragment is very likely to drive it still deeper, or even thrust it quite through the posterior lamina of the cornea into the anterior chamber. A little cut must be very carefully made, with a cataract-knife, through the superficial fibres of the cornea, to the extent of the whole length of the fragment, which may then be tilted out with the "spud."

If the fragment be long enough to have transfixed the cornea, so that one end extends backward into the aqueous chamber, the other being, at the same time, too deeply buried in the cornea to allow of its seizure with the forceps,—there is great risk of the fragment being

wholly pushed into the anterior chamber during the attempts at extraction. In such cases, I have several times avoided this accident by first thrusting through the outer margin of the cornea a broad cutting-needle, and carrying it onwards until its anterior, flat surface could be brought into contact with, and pressed against, the point of the foreign body.

By this precaution, the fragment has not only been prevented from falling backwards into the aqueous chamber, but has been pressed forward sufficiently to allow of its being tilted out with the "spud" held in the other hand. The surgeon may use both his hands at once, provided the lids be kept asunder with the spring speculum.

The operation above described is one which I would not advise a beginner to undertake; for he would be very likely to wound the lens with the broad needle, and thus produce Cataract. This risk may be guarded against by making the incision at the outer margin of the cornea, with a cataract-knife, and just large enough to introduce the spatula,* the edges of which, being blunt and rounded off, can neither wound the lens nor the hinder surface of the cornea. Special care should be taken not to rotate the blade in making the wound for its introduction, for fear of evacuating the aqueous humor.

FOREIGN BODIES IN THE AQUEOUS CHAMBERS.

Bodies which are lying loose in these cavities may sometimes be got rid of by simply making an incision

* See Plate at the end.

through the cornea sufficiently large to allow of their escaping with the aqueous humour. Others may require, in addition, the aid of some kind of forceps,—the *cannula-forceps*, or ASSALINI'S,—to draw them out. In no case must the practitioner delude himself into a belief that chips of copper (fragments of percussion-caps, for instance), however minute, will in time become *absorbed*. They may even become encysted in the iris, and remain quiet for years; and then, from some cause or other, set up inflammation which may destroy the eye. In the *Dublin Journal of Medical Science*, for August, 1848, (p. 210), is the case of a patient of mine, in whom a tiny scale of copper cap remained fixed in the iris for eight years, during which time it gave rise to repeated attacks of Iritis. At last it made its way through the cornea by ulceration. I am not aware of any instance in which a foreign body has remained so long in this situation, and been ultimately expelled.

CHAPTER V.

THE SCLEROTIC.

APPEARANCE IN HEALTH.

THE term "white of the eye," popularly applied to this part, cannot be said accurately to describe its appearance at any period of life. In infancy it has a bluish or leaden cast; its thinness allowing the dark color of the choroid to show through it. During adult life it becomes thoroughly opaque, and the bluish cast disappears. In elderly persons it acquires a yellowish tint, with patches here and there of a dull drab color.

In some eyes, at a distance of a line from the margin of the cornea, little brownish blotches are to be seen, from each of which a small vessel emerges to pass backwards along the sclerotic. If these blotches be examined after death, they are found to consist of round foramina in the sclerotic, with thin beveled margins. They have been regarded as evidences of a congested state of the choroid;* but this cannot be their true signification, for I have repeatedly met with them in persons whose sight was perfect.

Whenever the sclerotic is inflamed, the conjunctiva is more or less involved; the carmine, or slightly violet tint of the former, being overspread with the more vermilion network of the latter, membrane. I have described these appearances in Chapter I. p. 37.

* DALRYMPLE has figured them as such on his twenty-first plate fig. 1.

Sclerotic Inflammation, although so commonly associated with inflammation of other parts, as the iris and cornea, may exist without any disease in those tissues. It assumes two very distinct forms—Acute and Chronic.

In the former, the redness is equally diffused over the surface of the eyeball; there is sometimes such extreme intolerance of light, that it requires much tact and patience in the surgeon to make his examination; each admission of light causing fresh pain and a gush of hot tears. Intense neuralgia throughout the ophthalmic division of the fifth nerve, occasionally extending to the other divisions, sometimes attends an acute attack of Sclerotic Inflammation, and deprives the patient of sleep, unless full doses of morphia be given. Attacks of this kind are much more modified by rheumatic complications, and it would lead me too far were I fully to enter upon the treatment to be pursued. Quinine combined with purgatives, in some cases, and colchicum in others, are of the utmost service. Blisters often aggravate the neuralgia; and leeches, in the severer neuralgic forms of the affection, afford but slight and temporary relief. A liniment of chloroform diluted with oil, applied on lint to the forehead and temples, is in many cases a most effectual means of controlling pain.

Chronic Inflammation rarely involves the whole surface of the sclerotic. The upper, lower, inner or outer half, may be deeply injected, while the rest of the globe exhibits only a slight increase of vascularity. The intolerance of light is but trifling, and patients can, to a certain extent, follow their ordinary occupations; the cornea, iris, and other important tissues, remaining quite

free from disease. In this chronic affection, quinine is very useful; and blisters, applied to the temple or behind the ear, act most beneficially.

Exposure to cold and damp winds must be carefully guarded against, as it will often bring back an inflammation which had become almost extinct.

MACKENZIE describes both the *acute* and the *chronic* inflammation of the sclerotic under the name "Rheumatic Ophthalmia," but he does not "believe this Ophthalmia to be an inflammation differing *in kind* from common inflammation, in consequence of the existence of what has been called the rheumatic habit or diathesis." "Were I asked," he says, "'what is meant by *Rheumatic* Ophthalmia?' I should answer—'by Rheumatic Ophthalmia, I mean simply inflammation of the fibrous membrane of the eye (the sclerotica), and of the surrounding parts of similar structure, excited by exposure to cold.'" And he adds—"I have adopted the term *Rheumatic Ophthalmia*, but perhaps *Sclerotitis idiopathica* would be a truer appellation."

In the severer forms of the acute disease, however, there is sometimes decided evidence of rheumatic complication; the urine being highly acid, and depositing in abundance the characteristic red sentiment. These are precisely the cases in which colchicum is often found so beneficial.

STAPHYLOMA SCLEROTICÆ.

This name is given to a bulging of the sclerotic, with thinning and partial separation of its fibres, the result of fluid pressure, acting, from within the cavity

of the globe, upon tissues which have undergone a slow degeneration.

When, in consequence of Iritis, combined with disease of the choroid, the pupillary margin has become united to the capsule of the lens, and the communication between the anterior and posterior aqueous chambers is cut off, continuing to accumulate, thrusts the iris forwards, thinning it, and distending it into irregular pouches, which almost touch the hinder surface of the cornea. At the same time the fluid exerts pressure on the anterior portion of the sclerotic, and stretches its fibres, so that they yield, and form a *Staphyloma*—a tense, bluish-black prominence, streaked with whitish lines (the separated fibres of the sclerotic), passing in an antero-posterior direction. A single prominence of this kind may exist, in which case it is usually found at the upper part of the globe; or the whole of the sclerotic between the line of insertion of the recti muscles and the margin of the cornea may be more or less prominent and lead-colored.*

When *Staphyloma Scleroticæ* forms farther back than the line I have mentioned, it is usually produced by effusion of fluid (*sub-sclerotic dropsy*) between the sclerotic and choroid, as a result of inflammation.

As affording proof of morbid changes in structures more important than the sclerotic itself, *Staphyloma Sclerotcæ* is a very serious affection. It is incurable by medical means: if any attempt be made to remove it by an operation, this would be undertaken solely

* Dalrymple; pl. xx. fig. 6; pl. xxiv., figs. 2, 5, and 6, show extreme cases of Staphyloma Scleroticæ.

for the purpose of remedying a deformity; such an excrescence being never met with, save in a thoroughly damaged organ.

WOUNDS OF THE SCLEROTIC.

These are usually so self-evident, that I need say little about the mode of detecting them. When the sclerotic alone is injured, the gaping of the wound exposes the black surface of the choroid. If the latter also be divided, the retina bulges into the aperture, as a bladder-like-membrane; while rupture of the retina itself is attended with protrusion, and, most commonly, escape of the vitreous body.

Clean cuts, and punctures inflicted with sharp instruments—as in the various operations of extracting portions of opaque capsule, or using the needle to a Cataract—readily heal up without giving rise to inflammation. Accidental cuts, besides being often of much greater extent than those made in surgical operations, are always the result of violent blows, which at the same time impart a shock to the whole eye.

What has been said respecting the treatment of corneal wounds, applies equally to those of the sclerotic. Absolute rest of the eye is the most essential point; all disturbance of it, by unnecessary inspection, or by too frequent fomentation, should therefore be avoided.

It has been asserted that "wounds of the sclerotic do not unite;" but I am at a loss to conceive how such a statement could have originated. If the term "union" be arbitrarily restricted to mean, "repair of a wounded

part by newly-formed substance, absolutely similar in structure to the original tissue," there is, perhaps, no such process as *union* to be met with in the human body; for the composition of every cicatrix differs from that of the once-severed parts which it brings again into apposition. But if the word be taken in its ordinary acceptation, then, most assuredly, wounds of the sclerotic *do* unite, and very closely, too.

RUPTURE OF THE SCLEROTIC, WITH SUB-CONJUNCTIVAL DISPLACEMENT OF THE LENS.

That the sclerotic and choroid should be extensively ruptured, the conjunctiva remaining uninjured, and that the lens, slipping out through the rent, should become lodged beneath the unbroken conjunctiva, would *à priori* appear a most improbable occurrence. Such an accident, however, sometimes comes under the notice of ophthalmic surgeons.*

From the recorded cases, it would appear that the point where the sclerotic usually gives way, is either *above* the cornea, or to its *inner* side. Among upwards of thirty published cases, I do not find one in which the sclerotic has been burst below the cornea, or to its outer side; nor have I myself ever observed such to be the case when rupture of the sclerotic, without displacement of the lens, has occurred. Now, as the sclerotic is equally thick and strong at all points of any circle drawn concentrically to the circumference of the cornea, the rupture, if it were produced by direct violence, would as often occur at one side of the eyeball

* Appendix: Case A.

as another. But it seems that the sclerotic bursts under the extreme bending of its fibres, which takes place at the point nearly *opposite* to that which receives the blow; and this is commonly inflicted on the outer or the lower side of the globe, where it is most assailable; the inner and upper sides being protected by the prominence of the nose and supra-ciliary ridge.*

I may take this opportunity of saying a few words as to what happens when, from an accident, or otherwise, matter forms within the globe. The thinnest part of the sclerotic is that immediately behind the insertions of the recti. The tendons of these muscles enter wholly into the substance of the sclerotic, without uniting to form any such superficial expansion as is mentioned in the older anatomical works under the title of "tunica albuginea." A circle described on the sclerotic concentrically to the circumference of the cornea, and distant from it about a quarter of an inch, will, generally speaking, correspond to the lines of insertion of the tendons; and the upper part of the space included between this circle and the margin of

* Shortly after the first edition of this volume was published, I saw a most curious case illustrative of the statement in the text. A man in fighting received on the *right* eye a blow, which ruptured its coats to the inner side of the cornea, and drove out the lens, either beneath the conjunctiva, or quite through a rent in the latter membrane. The pupil afterwards remained mis-shapen and drawn inwards, and a bluish line marked the spot where the rupture had taken place.

Two years later, the man fought another battle, and was struck on the *left* eye. The sclerotic was ruptured at its inner side, and the lens displaced beneath the unbroken conjunctiva. I was present when the lens was removed by one of my colleagues, under whose care the patient had been admitted to the hospital.

the cornea is the spot where pus almost invariably points, when it is making its way outwards from the interior of the globe. Here, too, the dark-colored protrusions termed "Staphylomata Scleroticæ" form by the thinning of this coat from undue secretion of fluid in the posterior aqueous chamber. For although, as I have said, the sclerotic is in itself weakest just behind the insertion of the recti, this weakness is compensated by the action of the muscles; and it is the thicker portion of the coat in front that yields, either to the pressure of fluid from within, or violence from without.

The appearance presented in a case of ruptured sclerotic, with or without displacement of the lens, will vary a good deal, according to the amount of hæmorrhage. Sometimes the anterior chamber will be found full of blood, and when that is the case any injury which the iris may have sustained will pass unrecognized until the blood has been absorbed. Such an injury, however, may be expected; for, in a large proportion of recorded instances, the shock appears to have extensively separated the iris from its ciliary attachment.

In a recent case, where much hæmorrhage has taken place, the conjunctiva covering the seat of rupture will be found raised up by the effused blood, which will also envelop and hide the lens, should dislocation of that body have occurred. But should the accident come under the surgeon's notice after the sub-conjunctival effusion of blood has become absorbed, he will at once recognize the displaced lens by its peculiar form, as traced beneath the unbroken conjunctiva.*

* The eye would then more or less closely resemble fig. 4 in SICHEL'S nineteenth plate.

The prognosis of ruptured globe, with displacement of the lens, and partial or total separation of the iris from its attachments—even if unattended with laceration of the retina, or large extravasation of blood—must, of course, be very unfavorable; and yet the history of recorded cases of this accident shows it to be by no means of so invariably destructive a kind as to deter the surgeon from all hope of doing good. But he must not trust too much to "energetic treatment;" for those cases seem to have done best eventually where there was the least amount of interference with the reparative efforts of Nature, but where the one essential—perfect repose of the injured organ—was secured.

The striking benefit attending the use of mercury in some idiopathic inflammation of the eye, has led many persons to believe that it must be as effectual in combating inflammation resulting from violence. But those who, in the latter case, employ bleeding and mercurializing, seem to overlook the fact, that when the coats of an eyeball have been divided, Nature's first attempt towards repairing the mischief consists in *increasing*, *not lessening*, the flow of blood to the part. The breach can only be filled up by the organization of material deposited there by the blood: to bring the patient under the influence of mercury, diminishes the tendency of such material to become organized, and thus counteracts the very efforts Nature is making to repair the breach. As to "moderating the determination of blood to the part," inasmuch as we have no means of precisely knowing how much blood is necessary to furnish an adequate quantity of reparative material, we may,

by bleeding, be depriving Nature of her very material for cure. The blood of one patient is rich in reparative matter, the blood of another is poor. What means have we of appreciating the exact quantity of this matter, which, in any given patient, is being carried to the wounded eye?

All that the surgeon can do, when called in to cases of ruptured globe, is to inform himself, as well as he is able, of the habit of the patient, and endeavor to keep his powers as near the standard of everyday health as possible. The local treatment consists in maintaining the wounded part *in perfect repose*, both in respect of motion and light. For this purpose it is not sufficient to bandage only the eye which has been wounded. Both eyes must be kept covered, or the movements of the sound one will of course be accompanied by corresponding movements of the other. A week or ten days is not too long a time for keeping the lids *uninterruptedly* closed, without examining the injured part. Premature motion, and exposure to light, are almost sure to be followed by irritation and pain.

I need hardly add, that in cases of sub-conjunctival displacement of the lens, that body is to be removed by carefully dividing the conjunctiva covering it. Should the iris have been detached from its connections, and hang out of the wound, it must be snipped off close to the surface of the globe. These, and all other manipulations which may be found necessary, should, of course, be performed as much as possible without pressure on the eyeball; and this evil may be best avoided by holding the lids asunder with a speculum. By some sur-

geons it has been recommended to delay the removal of the displaced lens for a few days, to allow time for the breach in the sclerotic to close. This delay would manifestly be improper if the lens were to be the cause of pain. In that case it must be removed at once.

That the state of the patient's bowels should be attended to; that, if restless, he should be soothed with such narcotics as experience may have proved suitable to him, or as the surgeon's judgment may suggest; that the amount of food should be regulated by the vigor of the patient's circulation; and stimulants either given or withheld on the same grounds; all these are points which must be left to the good sense of the surgeon, since no fixed rules can be laid down as applicable to the treatment of all cases.

CHAPTER VI.

THE IRIS.

CONGENITAL DEFECTS.

THE irides are sometimes wholly absent, a condition which has been termed *Iridermia;* but in most of the cases which are so denominated, there really exists a slight rudiment of the iris, which, on close observation, may be traced as a very narrow colored ring—or more commonly as a crescent—skirting some portion of the margin of the cornea.

Children affected with *Irideremia* appear to be confused and dazzled by ordinary daylight, and unable to fix the eyes on any definite object, rolling them about uneasily in various directions. The fundus of the globe, when a favorable view of it can be obtained, has a red tint, and the edge of the lens is seen as a ring of golden light.

Coloboma is the name given to a congenital malformation of the iris, whereby the border of the pupil is left incomplete at one part, the aperture therefore assuming a pyriform figure, lengthened out to the margin of the cornea.

The cleft most frequently exists at the lower part of the iris, but occasionally it extends in a lateral direction* *Coloboma Igidis* usually co-exists in both eyes.

* DALRYMPLE; pl. xxxii., fig. 4, shows Coloboma in a downward, and pl. xxxii., fig. 5, in a lateral direction.

The absence of corneal cicatrix will serve at once to distinguish the affection from elongation and displacement of the pupil, resulting from old *Prolapsus Iridis.*

If the margin of a *Coloboma* be carefully examined, it will usually be found that the actual opening which transmits light is not quite so large as a superficial observer might at first have fancied it to be; for as the deficiency of the uveal layer of the iris is less extensive than that of the anterior fibrous layer, the aperture in the latter appears fringed with a margin of black or blackish-brown tissue.

Sometimes the pupil, retaining its rounded form, is placed close to the margin, instead of opposite to the centre of the cornea. The absence of cicatrix in the latter structure, would, in this instance, as in a case of Coloboma, enable the surgeon to recognize the deformity as congenital.*

It is said, that in rare instances, the "pupillary membrane," which exists in the fœtus, is not wholly absorbed at birth; and its persistence may give rise to a belief that the infant is the subject of congenital Cataract. I have never met with a case in which the whole of this membrane was persistent after birth; but I have occasionally seen in adults what appeared to be slight vestiges of it, in the form of little tags of the fibrous tissues of the iris, projecting from that part to which the pupillary membrane had been attached. This membrane, it must be recollected, is not united with the iris at the

* In vols. xxvii. and xxviii. of the *Dublin Quarterly Journal of Medical Science*, will be found several figures of Coloboma and misplaced pupil, illustrating papers by Mr. WILDE on those subjects.

extreme edge of the pupil, but at some little distance from it.

In the iris of a gentleman who consulted me on account of shortness of sight, I noticed a fine hairlike fibre, about half a line in length, one end of which was attached to the iris, at a short distance from the pupillary margin, while the other end was free, and projected into the area of the pupil.

I need not allude at any length to the peculiar aspect which the iris presents in those persons termed *Albinoes*, as their general appearance is so remarkable as immediately to arrest the attention of the most superficial observer. The deficiency of black pigment in the choroid and uvea of the Albino, imparts a pink color to the pupil and iris; the surface of the latter being also marked by a variety of wavy, whitish lines and loops, intermixed with others of a faint lilac color.

Intolerance of light is the most marked inconvenience which their defect of pigment entails on these persons.

APPEARANCE OF THE IRIS IN HEALTH.

The most striking phenomenon of the healthy iris is its motory power, whereby the pupil is alternately enlarged and diminished, so as to regulate the amount of light admitted to the retina.

It is important to bear in mind, that the motions of the iris are usually less brisk in old subjects than in young ones; and in elderly persons we frequently find a small pupil, which hardly undergoes any perceptible change under varying degrees of light, without any disease existing in the iris itself, or in the retina. This

partial immobility of the iris is also occasionally noticed in persons of middle life.

A very contracted and immovable state of the pupil is described by some writers under the name of *Myosis;* but I cannot say I have met with it as a simple and independent affection. Some persons, who have naturally very small pupillary apertures, enjoy such excellent sight, that we are not warranted in calling such a state of the pupils—morbid.

Dilatation and immobility of the pupil constitute a well-known symptom—by no means, however, an invariable one—of impaired function of the retina; but they may also exist quite apart from any such retinal defect. *Mydriasis* is the term applied to this fixed dilatation of the pupil, originating in a loss of motory power in the iris; such a condition as may be artificially induced by belladonna, or naturally follows total paralysis of the third cerebral nerve.

Cases of simple Mydriasis, being attended with indistinctness of sight, are often mistaken for Amaurosis. A simple experiment suffices to distinguish between them. Let the patient supply the want of a contracted iris by looking through a small aperture, such as a pin-hole in card held close to the eye. If the case be one of *Mydriasis*—dilated pupil, with a sound retina—he will see perfectly; but if the retina be affected, the aperture will either be quite useless, or, at the utmost, afford very little assistance.

The *treatment* of Mydriasis is not easily reduced to precise rules, as the affection may originate in various ways. Exhaustion of nervous energy, dyspepsia, intes-

tinal irritation from worms, &c., rheumatism—all seem in turn to be the exciting cause. Tonics, alone or in combination with purgatives, strychnine, as an internal medicine, or applied "endermically," and colchicum, may all be useful, if judiciously administered, according to the indications of a precise diagnosis. Powdered ergot of rye, snuffed up the nostril of the affected side, had been described as efficient in inducing contractions of the iris.

Tremulousness of the Iris is met with in very various degrees. Sometimes the vibrations of the part are so slight as to be hardly noticeable, except on the closest inspection; in other cases, the whole iris flaps loosely to and fro with every movement of the globe. This flaccidity seems to depend on various causes, but to be almost always connected with some loss of the natural consistence of the vitreous body. After the operation of extraction of Cataract, the site of the removed lens becomes occupied with aqueous humor; and this alteration in the support afforded to the iris by the surrounding media, and the stretching to which the pupil is subjected by the passage of the lens through it, are probably the combined causes of the tremulousness and want of contractile power in the iris, which so frequently follow the operation.

To observe those very slight vibrations of the iris which are met with in some eyes apparently free from serious disease, the patient should be so placed that the light falls on the iris sideways; its vibration will then be found to accompany each action of winking.

Variety of color is so remarkable a characteristic of

the *Iris*, as to have caused that name to be given to the structure. It may assume every shade, from the palest blue-grey to dark or blackish brown, as in the negro; and it is important to remember that some healthy irides are particolored. An iris may be half grey and half hazel, or there may be a patch of one or the other color, without any disease having existed in the part. Sometimes brown or blackish pigment is seen on the anterior face, assuming the form of little tufts, slightly elevated from the surface.

A third characteristic of a healthy iris is its peculiar fibrous aspect. This is difficult to describe in words, but must be familiar to all, and its loss is one of the most striking symptoms of inflammation. The round shape of the pupil is equally familiar. This aperture is not placed exactly at the centre of the iris, but a little nearer to the median plane of the body. In some persons, the narrowness of that portion of the iris internal to the pupil, as compared with that external to it, is very marked. The edge of the pupil is sometimes a little thickened, and of a different tint from the rest.

Such, then, being the appearance of the Iris in health, we may consider its changes in inflammation, as respects its *mobility*—its *color*—its *texture*.

INFLAMMATION OF THE IRIS (*Iritis*).

We first meet with the word "Iritis" in a treatise by SCHMIDT, of Vienna, published in 1801, where that form of the disease is described which follows the operation for Cataract.

But if the older surgeons failed to detect this most

important disease, the moderns have surely gone too far towards the opposite extreme; and, while making minute subdivisions which are of no practical utility, have overlooked the fact that, in what is called *Iritis*, other textures of the eye besides the iris are often the seat of active inflammation. This has been well alluded to by JACOB, where he says of Iritis, that "the use of the term has the effect of directing the practitioner's attention to the iris, which bears a great deal of inflammation, without destruction to the organ, and withdrawing it from the retina, which bears very little without permanent injury to vision;" and he adds, "I would therefore (with the greatest respect for the opinions of eminent men who have written on the subject) suggest that the term should be abandoned, as mischievous, and calculated to lead inexperienced persons astray, by fastening their attention on the iris, where the retina should be the prominent object." Now, it would be too great an innovation, I think to discard a word so universally employed, unless we could substitute one altogether unobjectionable; and it will be sufficient, if the student bear in mind that the anatomical connections of the iris with the other parts of the eye are so intimate that inflammation in the iris always more or less involves the deeper textures of the eyeball. The passages I have just quoted were published by Dr. JACOB many years before the invention of the ophthalmoscope, the revelations of that instrument fully confirm the truth of his remarks. For instances of syphilitic affections of the retina, the reader is referred to the section on Syphilitic Iritis.

The best proof of the inutility of minute subdivisions of eye diseases is, that those who have had the largest field of practice, and have devoted most time to its cultivation, have made the fewest divisions, and used the simplest nomenclature. LAWRENCE, in his *Treatise on Diseases of the Eye*, divides Iritis into *acute* and *chronic*, and admits, as modifications of the disease, the *syphilitic*, the *gouty;* the *rheumatic*, and the *scrofulous*. In TYRRELL'S *Practical Work* a similar arrangement is adopted. A treatise *On Diseases of the Iris*, by RAU, a German writer, forms an octavo of nearly 600 pages. The author divides inflammation of the iris into that of its *surface* and that of its *substance;* and subdivides the former into the *scrofulous*, the *rheumatic*, the *venous*, or *abdominal*. These may either exist alone or in the following combinations:—the *scrofulous-rheumatic*, the *rheumatic-scrofulous*, the *rheumatic-venous*. The inflammations of the *substance* of the iris are still more complicated; there are the *syphilitic-scrofulous*, the the *rheumatic-syphilitic*, the *syphilitic-gouty*, the *syphilitic-scorbutic*, the *syphilitic-mercurial* and the *gouty*.

VON AMMON recognizes, in addition to these, two other forms—*Iritis parenchymatosa scrofuloso-plicosa* (which, he says, is associated with the disease of the hairy scalp termed "plica polonica"), and *Iritis perenchymatosa scrofuloso-psorica*, the origin of which seems equally fanciful—namely, "suppressed itch!" He also devotes an entire book of his Essay (the 6th) to the pathology and treatment of "Uvëitis," or inflammation of the posterior serous covering of the iris, of which he gives a minute description.

No doubt the back part of the iris becomes inflamed, as well as the front; but to treat of such affections as if they were distinct diseases, seems to me mere trifling: and on the same principle the inflammation of the outer circle and the inner circle, of the upper half and lower half, or of any given portion of the iris, might equally receive a distinct name and a special plan of treatment.

What we have to do in all inflammations of the iris, is—to moderate the flow of blood towards the part, to check the effusion of fibrine, and promote the speedy absorption of that already poured out; and if we succeed in doing this, it matters little whether the fibrine was in front of the iris or behind it; and equally little, I should fancy, whether the patient had been suddenly deprived of the itch.

Whatever may be the degree of inflammation of the iris, or however the disease may be modified by peculiar conditions of the system, there is one unfailing sign which demands the surgeon's attention; I mean the *vascular zone in the sclerotic.*

It is at the junction of the cornea and sclerotic that the communication between the deep and the superficial vessels of the eye takes place; and hence we may judge pretty accurately of the amount of internal congestion of the organ by the intensity of this zonular redness. Some large vessels which pass along the globe seem to terminate abruptly in the vascular zone; but these are veins, which do not dip in, but emerge, at this point, and convey blood away from the deeper textures of the eye. In old cases of Glaucoma, these communicating

trunks attain a large size, and assume a dark purple tint; and they plainly indicate a congested condition of those parts (the choroid and retina) which are themselves hidden from our view.

An inflamed iris loses its contractile power. At a later period, when the inflammation is subdued, and the part has regained its healthy aspect, it may still remain immovable from a different cause—namely, on account of fibrinous adhesions having formed between it and the capsule of the lens. A thickening of the papillary margin is another early symptom of Iritis, and whether mere distension of the vessels or a deposit of fibrine be the cause of this thickening, it is quite natural it should take place at the edge of the pupil, where the arteries and veins form their most free anastomosis. We have seldom the opportunity of seeing an iris in its first stage of inflammation, as it is not until vision has become impaired, either by deposit of fibrine in the pupil, or by extension of the disease to the deeper textures of the eye, that a patient applies for medical advice.

A very remarkable symptom in inflammation of the iris, is its *change of color*. If the part be naturally of a bluish tint, it becomes greenish; in hazel or brown irides, the change is less observable. The cause of this change is commonly said to be the deposit of lymph in the substance of the iris; but it chiefly depends upon yellowness of the aqueous humor.

If in an eye which has suffered from old Iritis, producing permanent greenness of the iris, a puncture be made through the cornea with a broad needle, the fluid of the aqueous chambers, as it flows out, will be seen to

have a golden yellow color; and if the iris be originally bluish, the tint will be perfectly restored as soon as the last drop of fluid has drained away. If the fluid be caught in a spoon, the presence of albumen may be demonstrated by the application of heat.

The appearances common to all cases of Iritis are—a red zone in the sclerotic, close to its junction with the cornea; more or less deformity of the pupil, and loss of its normal mobility; a change of color in the iris; loss of its peculiar fibrous appearance.

Symptoms which depend upon the specific character of the inflammation—upon its degree of intensity and duration—upon the susceptibility of the patient, or the extension of inflammation to other tissues of the eye, are—deposit of fibrine on the surface of the iris, and in the anterior chamber; the appearance of red vessels in the iris; closure of the pupil, or adhesion of its margin to the capsule of the lens; pain, and impairment of vision; opacity of the cornea; and permanent opacity of the lens or its capsule.

The first form of Iritis which I shall speak of is the *Traumatic;* I shall next consider that arising *without external injury*, as modified by different morbid conditions of the system—Rheumatism, Syphilis, and Scrofula.

Very little inflammation follows a simple incised wound of the iris. The fact is illustrated by various surgical operations, wherein the part is cut either by accident or design. If, in the operation for extracting a Cataract, the aqueous humor escapes too soon, the margin of the pupil, or even a larger piece of the iris, folds over the edge of the knife. If the knife cannot be liberated, it

is thrust on, and a piece of the iris shaved off. Blood flows from the wound into the anterior chamber, and hides the lens from view; but if the capsule be sufficiently lacerated, the lens commonly escapes with great facility through the artificially enlarged pupil, and little farther hæmorrhage takes place. When the eye is examined on the fourth or fifth day after the operation, the blood has commonly disappeared, and the iris exhibits a healthy aspect.

Again: in making an Artificial Pupil, where the iris is intentionally divided, either by cutting or tearing, we seldom find inflammation of any consequence come on, unless the operation be roughly performed, or the iris have previously suffered from disease.

But a very different result attends those wounds of the iris which are accompanied with displacement of the lens; and the symptoms are still more serious if the wound extends to the cornea, so as to cause the escape of the aqueous humor. In such cases the iris becomes squeezed between the cornea in front, and the dislocated lens behind. Vessels are seen traversing the iris, and fibrine is poured out on its surface and on the capsule of the lens. If the cornea have been wounded, it participates in the inflammation, becoming at first hazy, and afterwards highly vascular. A deep-red zone surrounds its circumference, and the redness extends throughout the whole of the sclerotic, and no doubt, in many cases, to the deeper textures of the choroid and retina. The patient suffers constant pain in the eye, especially at night; exposure to light increases the pain, and is followed by gushes of scalding tears. When the inflamma-

tion at length subsides, the pupil is found to be closed with fibrine, and all useful vision extinct.

This form of Iritis is so uncontrollable, on account of the constant irritation kept up by the displaced lens, that it has been proposed, in such cases, to anticipate inflammation by extracting the lens as soon after the accident as possible. Mr. BARTON, of Manchester, was, I believe, the first to suggest this operation; and in the *Medical Gazette* for the year 1830, he relates several cases in which he tried it with good results. The operation, to be of any service at all, must be performed early, otherwise fibrinous adhesions form between the iris and the capsule of the lens, which would hinder the extraction of the latter.

Of course, it is not to be supposed that whenever the cornea and lens are wounded, extraction of the latter is to be attempted. Such accidents occur every day, and, *provided the lens be not displaced*, they usually terminate well. A greater or less protrusion of the iris may take place through the wound in the cornea, which gradually heals up. In the mean time, the lens, which had become opaque, is absorbed (except in very old persons, where its structure is too dense and firm), and if the opaque capsule prove an impediment to sight, it may afterwards be carefully lacerated with a needle, and useful vision restored.

What has been said respecting the treatment of Iritis, caused by the pressure of a displaced lens, will apply, in some measure, to that which follows the entrance of *foreign bodies* into the anterior chamber. If the patient is seen shortly after the accident, before effusion of

fibrine has taken place, and while the foreign body is still free and unattached, an incision through the cornea, proportioned to the size of the body, may give exit to it. But if inflammation of the iris have already set in, and the foreign body be enveloped and hidden in fibrine, it is probable that any attempt to extract it will be fruitless, and only give rise to increased irritation.

Mercury, which is such an invaluable remedy in other inflammations of the iris, has little effect, comparatively, in that which results from injury. The surgeon must wait, and be on the watch to take advantage of the first opportunity, which the partial disappearance of the fibrine may offer, to seize and extract the foreign body.

We come now to consider those inflammatory affections of the iris which arise *independently of injury*. They present themselves under two principal forms: the one is characterized by a rapid appearance of red vessels in the iris itself, and extension of inflammation to the sclerotic, and posterior surface of the cornea, attended with that intolerance of light which always accompanies inflammation of these fibrous tissues. Effusion of fibrine takes place slowly and to small extent, chiefly showing itself in bands passing from the edge of the pupil to the capsule of the lens, and on the surface of the latter mixed with patches of pigment. This form is described under the name of *Rheumatic Iritis*, and an attack of it may usually be traced to some of those causes which, under certain conditions of the fluids of the body, give rise to rheumatism in other organs—as sudden exposure to damp, and to cold currents of air, especially when the body has been previously overheated.

This inflammation is especially characterized by a tendency to involve the sclerotic and cornea, producing a mottled opacity of the latter which remains after the more violent inflammatory symptoms have subsided; and it is distinguished from that of purely syphilitic origin by being less prone to the excessive effusion of fibrine on the surface of the iris, and into the anterior chamber, which occurs in the latter disease.

Partly from actual vascular distension, and partly from being viewed through a hazy medium, the iris, in Rheumatic Inflammation, has a dull and cloudy aspect; the pupil is contracted, more or less misshapen, and its margin thickened and reddened with distended blood-vessels.

The converging red lines traceable on the surface of the iris are not newly-formed vessels, but the normal veins of the part distended with blood. Sometimes the edge of the pupil is coated with fibrine, but such large masses are seldom seen as accompany Syphilitic Iritis.

The vascular zone common to the other kinds of Iritis exists equally in the rheumatic form, but is less distinguishable, on account of the purplish redness pervading the whole surface of the eyeball.

The sclerotic and iris so readily sympathize, that Rheumatic Inflammation will pass gradually from one to the other; and what at first seemed a simple attack of "Sclerotitis," as it has been termed, extends to the iris, and constitutes the disease I am now speaking of. In other cases, the iris and cornea are the chief focus of the inflammation, and there is little more in the sclerotic than the vascular zone, which, as I have said, invariably attends every form of Iritis.

By these circumstances the treatment will be regulated. If the sclerotic and cornea alone suffer, active purging, bleeding from the temple by leeches, and abstinence from stimulating drinks of every kind, with moderate diet, are the means to be first adopted. When the more active symptoms have been subdued, there often remains a chronic affection of the sclerotic, attended with dull, aching pain in the eyeball, the temple, and all over the scalp, which is especially felt at night; and the morbid sensibility to light continues until this chronic inflammation of the sclerotic is extinct. In these cases, quinine or bark twice or thrice a day, with a dose of hyoscyamus at bedtime, usually complete the cure.

The mottled opacity of the cornea is, as regards vision, a still more serious *sequela* of rheumatic disease than the chronic inflammation of the sclerotic; and, if of long standing, is very difficult to remove. If, while the opacity is yet recent, a blister be applied to the temple, and a discharge kept up with savine cerate, the opaque deposit may disappear.

Local applications, in the form of washes or drops, are of little or no service in Rheumatic Inflammation. Warm water is, I think, the best thing that can be used, and poppy-heads may be boiled down to give it a pharmaceutical character, which will induce many patients to use it who would think warm water alone quite ineffectual. I have never used *vinum opii*, which some writers recommend; for really the quantity of opium contained in a drop or two of the wine is so minute, that I cannot conceive its momentary application to the

surface of the conjunctiva can produce any effect whatever.

In what manner mercury acts upon the system, I will not venture to decide; but it so obviously controls that peculiar tendency to the formation of fibrine in the blood, and its effusion from the capillaries, which accompanies the inflammatory process, that whenever this tendency is manifested in the iris, mercury should be given, whether the inflammation be of syphilitic origin or not.

I may now briefly sum up what has been said concerning the symptoms of Rheumatic Iritis.

It chiefly attacks the fibrous tissues of the eye, and is always attended with pain, such as accompanies inflammation of similar structures in other parts of the body.

The phenomena are eminently those of vascular engorgement; the sclerotic exhibits a peculiar purplish-red tint, and blood-vessels become visible in the iris, where they are never seen in a state of health.

There is little tendency to effusion of fibrine, as compared with the Syphilitic Inflammation; but, although the fibrine is poured out in small quantity, it is deposited in a situation eminently injurious to vision—namely, between the lens and the posterior surface and pupillary margin of the iris.

In the cornea there is a marked disposition to inflammatory deposit, and consequent opacity; and this frequently becomes more marked as the inflammation in the sclerotic and iris subsides.

SYPHILITIC IRITIS.

Syphilitic Iritis is frequently found in conjunction with other secondary venereal affections—such as eruptions on the skin, sore throat, and nodes. Its leading characteristic is a tendency to deposit of fibrine on both surfaces of the iris, and in the anterior chamber. The change of color in the iris is very well marked in the Syphilitic Inflammation, especially if the part be naturally of a bluish tint; it then assumes the green color which I have said is owing to effusion of yellow albumen into the anterior chamber.

Effusion of fibrine, by uniting the capsule of the lens here and there to the margin of the pupil, causes that aperture to assume a more or less irregular and angular form. Such adhesion is termed *Synechia posterior*, to distinguish it from that which takes place between the iris and cornea, known as *Synechia anterior*.

BEER and other German writers describe the shape of the pupil in Syphilitic Iritis as diagnostic of its specific nature; they say it is drawn upwards and inwards, towards the root of the nose. A few weeks of observation in the out-patients' room of a large Eye Hospital, will convince the student that this is not true. He will see cases, undoubtedly syphilitic, in which the pupil assumes every variety of form. Another odd fancy of BEER'S was to compare the rounded masses of fibrine which collect on the edge of the pupil to venereal "condylomata."

These masses of fibrine are of the most varied color, shape, and size. In some cases they are less than pins'

heads; in others they occupy a considerable portion of the anterior chamber. They may be yellow, reddish, or reddish-brown, according as they are recent, or of some duration, or in proportion to the number of vessels traversing them. They are usually first noticed at the margin of the pupil, and it is only in severe inflammation that similar masses are effused on other parts of the iris.*

The cornea rarely exhibits any morbid appearance beyond a slight haziness; the sclerotic presents the vascular zone, but is less injected in the rest of its extent than in Rheumatic Inflammation. There is also much less intolerance of light than in the latter form, and in some very acute cases of Syphilitic Iritis this symptom is altogether wanting. Sometimes, however, it exists to a considerable degree.

It is on *mercury* that we place our chief reliance for controlling this morbid tendency. The mode of administering this remedy will, of course, vary with the intensity of the disease, the age of the patient, and his general condition. Two grains of calomel every eight hours, with the addition of one-third of a grain of opium, is the form we may commonly employ in the more active cases, having first thoroughly cleared the bowels, if costive, with an aperient. The success of this treatment depends on its being begun at an early state of the disease. The fibrine then exists as a mere

* We are very deficient in really good and natural representations of the earlier stages of Iritis. Sichel; pl. xiii., fig. 5, shows a well-marked case of fibrinous effusion, reddened with vessels at the edge of the pupil.

unorganized secretion, and, even if very abundant, rapidly undergoes absorption; but when it has become consolidated and traversed with blood-vessels, it yields much more slowly to medical treatment, and the pupil always remains more or less obstructed with adhesive bands, and patches of pigment deposited from the uvea.

In private practice, where our patients remain at home, and are not exposed to the weather, as too many of our public patients are, we may give the mercury more frequently,—one grain every four hours,—until the mouth becomes tender, or rather until the appearance of the eye assures us that fibrinous effusion has ceased; for mere soreness of the mouth must not be relied on as a guide in administering mercury. Some persons' mouths cannot be made sore by any amount of the medicine, while others are salivated with a few grains of it.

"*Salivation*" *should be carefully avoided;* the gums never being made tender except in the slightest degree; indeed, the best cures of Iritis are effected when even that point is not reached.

If the nocturnal pain be very severe, it may in some cases be relieved by the application of leeches to the temple, when great redness of the sclerotic exists, or else an additional quantity of opium or morphia may be added to the pill at bedtime.

As regards diet, animal food and stimulants should be very cautiously given, or even wholly forbidden, if the patient be robust and plethoric. He should be protected from sudden changes of temperature, and from strong light, if the eye be morbidly sensitive.

Invaluable—indispensable as Atropine is in our examination of many morbid states of the eye, I do not regard it as of any service in Iritis; for, as I stated at the commencement of this section, an inflamed iris loses its power of motion. Atropine, therefore, must be *useless* during the active stage of inflammation. At a later period, when the iris is beginning to recover its motory function, it may, I think, even *do harm;* and in the following way. The hinder surface of the iris, termed "uvea," is covered with a layer of pigment-cells. When fibrine is poured out behind the iris (which no doubt happens in all cases of acute inflammation), these pigment-cells become, for a time, firmly united to the capsule of the lens; and if, when the iris is regaining its motory function, a forced dilatation of the pupil be effected by the influence of Atropine, some of the pigment may be detached from the posterior surface of the iris, and left adhering to the capsule, forming those brown patches so familiar to us in patients who have suffered from Iritis. Only get rid of the fibrine which is glueing the pigment cells to the capsule of the lens, and the iris is at once effectually liberated.

People sometimes talk and write as if occlusion of the pupil in Iritis were the result of spasm of some sphincter muscle, the contractions of which could be paralyzed by Atropine, and the pupil thus kept permanently dilated. But the real cause of closure is totally different from this. Fibrine is poured out from the surface of the iris and edge of the pupil, upon the front part of the capsule of the lens; overspreading the latter where it corresponds to the area of the pupil. Now, if this effusion

is not quickly removed by absorption, it becomes organized, and forms a membrane stretching across and blocking up the pupillary opening. Gradually this membrane contracts, and, in doing so, draws together the edges of the pupil, until that aperture is reduced, in some cases, to the size of a pin-hole.

If the patient's mouth becomes tender, the mercury must be given less frequently, and in smaller doses; but we must remember that fibrinous deposit may take place in parts of the eye where we cannot see it—behind the iris or even on the choroid and retina; and therefore we must not leave off the medicine, merely because there is no longer any effusion visible in the anterior chamber. So long as the vascular zone exists in the sclerotic, and vision remains dim, we may be sure there is disease going on in the eye. It may assume a chronic form, and will then require a corresponding change in the treatment: the use of tonics, and a more generous kind of diet.

Those who have seen many cases of Syphilitic Iritis must have been struck with the fact, that the impairment of sight often bears but little proportion to the amount of inflammation visible in the iris itself. One patient may exhibit a large quantity of fibrinous deposit on the edge of the pupil, and in its area, with considerable confusion of sight, and yet, under judicious treatment, the deposit may all disappear, and vision remain very little impaired. In another case there may be very slight evidence of inflammation in the iris, and that slight inflammation may speedily disappear, and yet vision may be permanently injured to such an extent as to render the eye all but useless.

Formerly we assumed that the contrast between these two sets of cases depended upon the degree in which the retina was involved; but we had no means of demonstrating the fact. The ophthalmoscope now overcomes the difficulty, and we find that Syphilitic Inflammation, when it attacks the eye, may involve the iris actively, and affect the retina but little;—may affect the iris very slightly, and concentrate all its violence upon the retina;—or, may affect the retina, almost exclusively, while the inflammatory appearances in the iris and sclerotic are so slight as wholly to escape observation.

During the acute stage of Iritis, the use of the ophthalmoscope is contra-indicated. The undilatability of the pupil, and the haziness of the media, would effectually prevent the retina being seen: while, at the same time, the glare of light would probably exasperate the inflammation. But after the iritic inflammation has subsided, we may thoroughly examine the retina, and observe the changes it has undergone; or fix our attention upon those flaky deposits which sometimes fill the vitreous humor, and either overcloud the retina, or wholly hide it from our view. (See the Sections—*Retina; Vitreous humor.*)

It sometimes happens that Iritis comes on while the patient is under the full action of mercury for general syphilis.

In such a case the mercury may be left off, and quinine administered alone with good effect; or iodide of potassium in decoction of bark may be found of more service. Should the patient, during his treatment for primary syphilis, have been kept on too low diet, a

change in that respect will be necessary ; for if, in certain states of the blood, the patient's powers be depressed below a given point, local congestions take place, and fibrine is effused, constituting the phenomena of what we term "inflammation." In such cases, we may drain the patient's body of blood until farther abstraction is impossible, and yet be as far as ever from subduing the local disease.

The successful treatment of such cases consists in *choosing the right time* for giving tonics. A striking instance of the good effects of such treatment in Iritis, when occurring in an enfeebled constitution, may be seen in a case forming part of an interesting paper, "On the Rapid Organization of Lymph in Cachexia," published by Mr. DALRYMPLE, in the *Medico-Chirurgical Transactions for* 1840.

Syphilitic Iritis will frequently assume a *chronic* form, which is very difficult to deal with, and, if left to itself, is as destructive to vision as the acute form of the disease; for it gradually extends to the deeper textures of the eyeball, until complete disorganization of the globe takes place. When this chronic form of the disease attacks patients suffering from the tertiary forms of syphilis (after having been, perhaps, debilitated by a long course of mercury), they are sometimes improved, to a surprising degree, by the careful administration of iron.

In some patients, after all traces of syphilis appear to have been eradicated, the eyes still retain a susceptibility to inflammation, which manifests itself upon any accidental exposure to cold or wet. A case of this

remittent form which came under my own observation, is sufficiently remarkable to be related.

Henry H——, aged thirty-nine, married, came to me on the 6th of May, 1845, with Iritis in the *left* eye. The iris was of a dirty-green color, the pupil irregular, the vascular zone in the sclerotic well marked. There was much pain in the globe and around the orbits at night. He was purged, and then took calomel with opium every eight hours, till his mouth became tender, and afterwards less frequently. Leeches were applied four times to the temple. He steadily improved, and was dismissed on the 17th of June.

On the 2nd of December he returned, with the *right* eye attacked just as the left had been. A somewhat similar treatment to that previously employed cured him in about three weeks.

On the 14th of April, 1846, the *left* eye was again attacked, and more severely than before, fibrine being poured out in considerable quantity, so as to produce the appearance termed *Hypopyon*. The disease, however, yielded rapidly to treatment; and he was dismissed at the end of a fortnight.

On the 26th of November, in the same year, he applied for the fourth time, having Iritis in the *right* eye. I examined the left, which I had twice seen so much inflamed, and found scarcely a trace of disease. The natural grey color and fibrous texture of the part were restored, and the pupil contracted, though not very briskly, when exposed to light. This fourth attack yielded to the same kind of treatment which had been adopted before, and within ten days the eye looked well;

but I kept him for some time in attendance, giving him a grain of calomel at night, and two grains of quinine twice a day.

The patient declared his eyes had been bad twice a year,—"spring and fall," as he expressed it,—for the last twenty years! He readily confessed that the complaint began as a secondary symptom of syphilis, but assured me he had never had the primary disease again during the period mentioned.

Whether all the periodical attacks he described were those of *Iritis*, it is impossible to say; probably some of them merely involved the sclerotic; but the regular alternation of disease I had *four times* the opportunity of watching is very remarkable, as is also the complete recovery of the healthy aspect of the iris after each attack, and the good vision the patient enjoyed in the intervals.

The efficacy of *Turpentine* in Iritis was strongly urged some years ago by CARMICHAEL, of Dublin. He by no means proposed it as a *substitute* for mercury on ordinary occasions, but only as useful in those cases where, from extreme debility of the patient, mercury might be injurious. In such cases, more benefit is, I think, likely to result from quinine, in combination, perhaps, with small doses of mercury; the patient's strength, meantime, being sustained by a liberal diet.

The only cases in which I have myself found turpentine beneficial, have been those of a rheumatic character, with visible enlargement of the vessels of the iris, the characteristic sclerotic redness, and tenderness of the globe, but without any marked tendency to the effusion

of fibrine into the anterior chamber. I wish I could point out some guiding sign by which it could be determined that a given case of this peculiar form of Iritis would be benefited by turpentine; but I cannot. I can only say from experience, that now and then I have met with a case in which mercury seemed to do harm, and quinine no good; but where Chian turpentine, in five-grain pills, three or four times a day, effected a cure. In other cases which seemed of the same kind, I have found the turpentine apparently useless.

SYPHILITIC IRITIS IN INFANTS.

In the first edition of this work, I stated that "Syphilitic Iritis in Infants was, according to my own experience, an extremely rare disease." Mr. HUTCHINSON, in an article in the *Medical Times and Gazette*, (Aug. 28, 1852,) after reporting two well-marked cases, observes that "The occurrence of Iritis in infants suffering from inherited syphilis is probably not so rare as it has been considered. It is not at all uncommon to find in unhealthy, so-called 'strumous,' children, the effects of past inflammation of the iris; and if it be recollected that in infancy this disease is very insidious, and might easily escape the notice of both nurse and medical attendant, the supposition that some of those cases may in infancy have suffered from congenital syphilis, becomes not improbable."

When Mr. HUTCHINSON wrote the article I am quoting, he had been watching, for a lengthened period, and at the same time, the practice of our Ophthalmic Hospitals and of the Hospital for Diseases of the Skin, and thus

had had peculiar opportunities for appreciating the frequency with which affections of the iris may co-exist with secondary cutaneous eruptions. He has since continued his observations, and published the results in a series of very interesting papers in the *Ophthalmic Hospital Reports.** He first gives the details of the cases published by LAWRENCE,† JACOB,‡ EVANSON and MAUNSELL,§ WALKER,‖ and myself; and then adds ten cases which came under his own notice. The whole Essay is very instructive, and affords, as far as I know, the best account of Syphilitic Iritis in infants which has yet appeared. "Rare" is a relative term; and although Mr. HUTHINSON'S industry and acuteness of observation have brought together so many cases of infantile Iritis, they are still few in number as compared with those which might be collected to illustrate other syphilitic symptoms in infants, and I must still adhere to the assertion I made in 1855,—that the disease in question is a rare one. Indeed, I can now (1859) quote Mr. HUTCHINSON'S extended and mature observations against those he had made from more limited data in 1852; for he sums up his remarks on Infantile Iritis in the following terms: "Respecting the frequency of iritis in infants, there can be no difficulty in admitting that it is among the

* *On the Different forms of Inflammation of the Eye, consequent on Inherited Syphilis*, vol. i. p. 191.

† *Treatise on the Venereal Diseases of the Eye*, 1830, p. 306; *Treatise on the Diseases of the Eye*, 1841, p. 426.

‡ *Treatise on the Inflammation of the Eyeball*, 1849, p. 97.

§ *Practical Treatise on the Management and Diseases of Children.* Fourth edition, 1842, p. 524.

‖ *Provincial Medical and Surgical Journal*, 1845, p. 293.

rarest of the symptoms of hereditary syphilis. I am sure, however, that it often escapes notice. The absence of the sclerotic zone, and the very small amount of local symptoms which it causes, taken with the fact that infants usually keep their eyes shut, will account for this. . . . In proof that, however carefully looked for, it is really very rare, I may mention that, during four years' practice at the Metropolitan Free Hospital, I have never treated a single case, although numbers of congenito-syphilitic patients present themselves, and I have scrupulously looked at the eyes in all."

A well-marked case of Syphilitic Iritis in a child four months old, came under my notice about seven years ago; another case had been brought to me two years previously, in which nothing but the mother's own testimony was wanting to establish positively the specific origin of the disease. Perhaps the best way of describing the appearances presented by this form of Iritis, will be to relate the particulars of these two cases as they stand in my note-book.

Case 1.—William Thomas J——, aged four months, was brought to me Feb. 19th, 1852. He was a well-grown child, lively, and taking the breast well; and this had been his character, his mother said, from his birth. A week before coming to the hospital she noticed that the sclerotic of the right eye looked "pinkish," and the child seemed rather to shun the light. Both these symptoms, however, had passed off when I saw him, and the absence of sclerotic redness was remarkable, when compared with the large amount of fibrinous effusion in the anterior chamber. The cornea was clear; the upper

half of the iris (of a grey color) not perceptibly altered in structure; the lower half was completely hidden by a nodular mass of deposit, of a pale Naples-yellow tint, which came in contact with the cornea, and completely filled the anterior chamber as high up as the middle of the pupil; this aperture was rather dilated than contracted, misshapen, uninfluenced by light, and rendered indistinct in its outline by a film of half-fluid deposit, which encroached on the capsule.(*a*)

a

b

At this time nothing was known about either the child or mother having had syphilitic symptoms; and the absence of sclerotic or conjunctival redness led me to regard the deposit in the anterior chamber as most probably of scrofulous nature. As the child's bowels were in good order, nothing more was ordered on this first visit than five minims of Battley's *Liquor Cinchonæ* twice a day, and fomentation in the event of the eye becoming red or irritable.

23d: The eye to-day looked much worse; the upper part of the iris, previously healthy in appearance, had assumed a dirty tint, and was seen through a turbid aqueous humor, which looked as if recent fibrine were diffused through it, and rendered the form of the pupil almost indistinguishable. The left pupil had also become slightly irregular, and the aqueous humor had assumed, though in a less degree, the turbid appearance so re-

markable in the other eye. Still there was hardly any redness of either sclerotic.

I now obtained the following account from the mother:—About six weeks before she became pregnant of this child, her husband communicated to her the venereal disease. She had sores and enlarged inguinal glands, and was under treatment for five weeks, towards the end of which time "pimples" appeared on her face and arms. Both sores and eruption yielded to a moderate course of mercury. She said she had no sore throat, and there were no scars to be seen about the palate or tonsils. When the child was about a month old, he was attacked with a moist, dusky-red eruption over the greater part of the body. A medical man to whom he was taken, administered powders, and in about five weeks the eruption disappeared, with considerable desquamation of cuticle.

The increased tendency to deposit in the child's right eye, and the extension of disease to the left one, together with the history which had been obtained from the mother, showed that no time was to be lost in administering mercury; and accordingly a grain of Hydr. c. Cretâ was ordered to be given night and morning, the *Liquor Cinchonæ* being continued as before.

26th: No extension of disease in the left eye; indeed the aqueous humor seems, if anything, rather less turbid. In the right eye the yellow deposit is no longer aggregated together in a mass at the lower part of the anterior chamber, but seems as if softened, and undergoing solution in the aqueous humor, so that the position of the pupil can hardly be traced through the cloudy medium.

The child's health continues good, his bowels are moderately open, and he takes the breast well.

March 1st: Less deposit in the right anterior chamber. The outer circumference of the iris is more distinctly seen, the fibrine having collected in a denser mass about the pupil, which is even more obscured than on the last visit. The left pupil is rapidly clearing, and becoming more regular in its outline.

4th: There has been an improvement during the last three days. More and more of the outer part of the right iris is coming into view, and the denser portion of the fibrine is seen lying in the pupil. The left eye is almost well.

11th: The right eye to-day presents the appearance I have sketched in fig. *b*. The iris has regained its natural color and texture, except near the upper and outer edge of the pupil, where some enlarged veins are visible; and a minute patch of blood is seen extravasated among the fibres of the iris. The pupillary margin is jagged, and adherent throughout to the capsule of the lens, which is overspread with an opaque layer of pale yellow fibrine, in the centre of which is a raised nodule of the same deposit. The left eye is well; the pupil round and clear; and the child enjoys good sight with it.

25th: The left eye remains perfectly healthy. A considerable change has taken place in the right; much of the fibrine which was filling the pupil has been absorbed, and only a very thin, smooth layer overspreads the capsule. The edge of the pupil has lost its jagged outline. The lens comes a good deal forwards, so as very much to diminish the anterior chamber. The veins of the iris

are still here and there visible. The child's general health is very good, and his skin is losing a certain dusky tinge which it had when he was first put under treatment. He still continues to take a grain of Hydr. c. Cretâ twice a day.

Case 2.—Mary Ann W——, aged three months, was brought to me from the country, Nov. 13th, 1848. The child was strong and healthy-looking at birth; but when about seven weeks old, a brownish-red, scaly eruption appeared over the greater part of the body, which the medical man to whom the mother applied, considered to be syphilitic, and for which he prescribed some Hydra. c. Cretâ, and one-tenth of a grain of iodide of potassium, twice a day.

About a fortnight after the eruption broke out, the mother noticed that the child, who hitherto had appeared quite well, had "a pearly appearance" in each pupil, and seemed to be nearly blind. I found the eyes in the following condition:—Both globes rather unsteady, rolling a little from side to side. There was no redness of either sclerotica. All the eyelashes had fallen off. The left iris (grey) was dotted over, throughout its lower half, with little greyish-white masses, almost like grains of coarse sand, and the inner portion of the iris was streaked with lines of a similar tint, passing vertically, as if fibrine had trickled over the part, and left a track behind. The pupil was contracted, and fringed with the same kind of greyish-white deposit as appeared on the surface of the iris; and the pupillary edge adhered to the capsule of the lens, the body of which was a little cloudy.

The right iris looked healthy throughout, and the lens itself was clear; but on the capsule, just skirting the outer edge of the pupil, was a chalky-white, crescentic patch; the iris, however, did not adhere at this point, for, when Atropine was used, the patch became separated to some distance from the pupillary edge. (*c*)

c

The child's mouth was affected with *Aphthæ*, and a scaly eruption covered the face. On the lower limbs, patches of a coppery tinge, extended upwards to the belly and downwards below the knees, with desquamation of the cuticle.

Although both parents denied having had venereal disease, the condition of the child convinced me that its symptoms were of syphilitic origin, and accordingly I ordered two grains of Hydr. c. Cretâ to be taken night and morning.

November 20th: The eruption has nearly faded away, and the mouth is free from *Aphthæ*. The dots on the left iris, and the crescentic patch on the left capsule, are smaller. Ordered Hydr. c. Cretâ two grains every night; Liquor Cinchonæ five minims twice a day, in milk.

27th: All eruption gone. The child takes the breast well, and is improved in general appearance. The greyish dots and streaks on the left iris have entirely disappeared, and the whitish line of adhesion between the

pupillary edge and the capsule exist only towards the upper and outward part. In the right eye, the chalky-looking patch on the capsule is reduced to two small dots, marking the horns of the crescent.

December 4th: The child's health is excellent. The pupil of the right eye, when dilated with Atropine, is very slightly irregular, owing apparently to some little adhesion of its outer edge to the capsule. Every trace of the white patch on the latter is gone, and the pupil is quite black and clear. The left iris now looks healthy in its texture, but there is irregularity and immobility of the pupil; and a slight milkiness of the lens remains. The child seems to have regained good sight in the right eye, and follows white objects, such as a pen or piece of paper, moved to and fro before it.

January 1st, 1849: Two grains of Hydr. c. Cretâ have been taken every night up to the present time. The left pupil is still rather smaller than the right, although no synechia can be detected. The child is in good health, and notices objects well, but seems to use the right eye more than the left. The eyelashes have grown again, and are thicker than ever. The medicines were continued in diminished doses for about three weeks after this date.

March 25th, 1850: The child is well grown and healthy. There is no synecha to be seen in either eye. The only morbid appearance is a slight cloudiness of the left lens.

The steady improvement, under the use of mercury, without any local depletion or counter-irritation, seems to confirm the belief that both these cases were really

of venereal origin. In Case 2, one link in the chain of evidence is wanting—namely, the mother's admission that she had suffered from venereal disease; but no one who has had much experience in treating syphilitic patients will allow the absence of this testimony entirely to set aside the positive proof afforded by well-marked morbid phenomena.

The very slight degree of redness in the sclerotic of infants attacked with this form of Iritis, is a fact which has not escaped the accurate observation of JACOB. In Case 1, above related, there appears to have been some little redness of the eyeball at the first onset of the inflammation; but, during the time when effusion of fibrine was going on, the sclerotic was, as nearly as possible, of healthy appearance; and in Case 2, it was cloudiness of one of the child's lenses, and its impaired sight—not any redness of the eyeball—which drew the mother's attention to the disease. Yet, notwithstanding this seemingly low stage of the inflammatory process, organization of fibrine was rapidly proceeding to form opaque adhesions between the iris and capsule of the lens.

WALKER,* on the contrary, asserts that Iritis in infants is usually accompanied with "considerable intolerance of light and lachrymation." There are several points in his treatment which call for remark. He advises leeches to the palpebræ as "useful in most cases—in such numbers as are suitable to the age and constitution of the child." The "constitution" of the children brought as patients to the eye hospitals of our great towns is seldom so robust as to allow of their losing

* Op. cit.

blood without injury; and the occasional application of two or three leeches to the lids, as WALKER advises, could influence but little the deep-seated tissues of the iris, choroid, and retina, so as to lessen the disposition of their vessels to exude fibrine.

He goes on to say, that "purgatives, and in some instances even nauseants, should be freely administered in the first instance." Now, that the contents of the child's bowels should not be allowed unduly to accumulate, is self-evident; but the use of any medicines likely to nauseate and unfit the stomach for retaining food, I cannot but regard as most mischievous. In no patients do we find fibrinous effusions on the iris and in the anterior chamber more abundant than in those whose vital energy has been depressed below the natural standard.

WALKER next adverts to the use of mercury:— "Small doses of Calomel or of Hydr. c. Cretâ should be administered without delay, and continued until the progress of the disease has been arrested, or the system has been brought under the influence of this powerful agent." With this opinion I entirely agree; but let us see what he considers to be "small" doses. In his first case, an infant seven months old, two grains of Calomel were given twice a day during five weeks; then once a day for two months longer; at the end of that time the dose is resumed night and morning. And what is the result? The last report says: "No alteration of the eye was observed after this time, the pupil remaining permanently contracted, and the capsule opaque." The eye, in other words, was useless. This patient had had no eruptions, nor was there any suspicion, apparently,

that the Iritis was of syphilitic origin, and yet this enormous quantity of calomel was administered; while in his second case, where eruptions of supposed venereal origin had attacked a child six months old, the accompanying Iritis, although attended with as great a tendency to fibrinous effusion as in the former case, was treated with moderate doses of Hydr. c. Cretâ—two grains night and morning. After less than three weeks of this treament, "the inflammatory action had entirely ceased; the pupil was moderately dilated, and apparently fixed; the iris appeared dull, but the tubercules [fibrine] had disappeared from its surface . . . the blotches on the forehead were much diminished, the bowels more regular, and the general health better." So that (other things being to all appearance equal) the case treated with moderate doses did better than that where such large quantities of calomel had been given.

"GONORRHŒAL" AND "ARTHRITIC" IRITIS.

Ophthalmic writers of credit and experience describe a "Gonorrhœal Iritis," but I have never seen an inflammation of the iris which I could trace as a consequence of mere urethral discharge, unmixed with syphilis.

Another form of Iritis is mentioned by some ophthalmic authors (especially the Germans) as the "Arthritic." A peculiar ash-colored ring, intervening between the vascular zone in the sclerotic and the edge of the cornea, a transversely oval pupil, and a purple tint of the enlarged veins of the globe, are the chief signs

which these writers insist upon as diagnostic of the Gouty inflammation.

I cannot recollect ever to have seen a case of true *Iritis* which I could distinctly trace to a gouty origin; and the appearances I have enumerated, as assigned to "Arthritic Iritis," are found in patients who have never had the slightest symptom of gout in other parts of the body. They are identical with what we see in the early stage of that general inflammation of the globe which has received the name of "Glaucoma."

SCROFULOUS (?) IRITIS.

I should have hesitated to speak separately of *Scrofulous* Iritis, were it not for one patient who came under my notice several years ago. He was a pale, ill-nourished boy, five years and a half old. His head was large and depressed at the sutures, as if it had been distended with fluid during infancy. The cervical glands were considerably enlarged, and the abdomen full and hard. He had a dull and listless aspect, and in short presented all the characteristic signs of a scrofulous constitution. His mother was too poor to give him animal food, which he only tasted once in ten days or so, when he was taken to one of his relations. Bread and butter and tea formed his almost unvarying diet. He was brought to me in November, 1845, with his left eye in the following state:—The cornea was slightly hazy throughout, and there was a more decided mottled opacity at its lower part. The iris presented a marked contrast to the light blue tint of the sound eye; it was of a dark slate color, and dull red vessels might

be seen running over its surface. Above the pupil, and to its inner side, lay an irregular, nodulated yellow mass, precisely similar in appearance to the fibrine deposited in Syphilitic Iritis. Some yellowish fluid also lay at the bottom of the anterior chamber. Notwithstanding these evidences of disease, the form of the pupil was not appreciably changed.

Considering the weakly condition of the child, and the inability of the mother to procure proper food, I thought it quite useless to attempt treating him as an out-patient, and admitted him accordingly into St. Thomas' Hospital.

For a few days after his admission, the eye continued to get worse. There was more opacity of the cornea; the deposit upon the surface of the iris had increased so much as to encroach upon the pupil, and the mass had acquired a reddish tinge, as if full of blood-vessels. A quantity of dark blood had replaced the yellow fluid at the bottom of the anterior chamber, the rest of that space being filled with flocculent deposit, which had collected in the pupil so as almost to block it up.

The treatment pursued in this case was rather dietetic than medical (in the vulgar sense of the word). Two or three grains of Hydr. c. Cretâ were given at bedtime, and some *Liquor Cinchonæ* once a day; but good beef-tea and other nourishing food were chiefly relied on.

After a second week of this treatment, the whole aspect of the eye was changed. The effused blood and flocculent deposit had disappeared from the anterior chamber and the solid mass which had formed on the surface of the iris had shrunk to a sixth of its former bulk. The cornea was almost clear.

Ten days later the eye looked all but healthy. The bluish color and fibrous texture of the iris were restored, except that a slight difference of tint might be traced at the part where the yellow deposit had been. The pupil was a little oval, but well defined and clear. A nebula here and there was all that remained of the opacity of the cornea, and even this eventually disappeared.

Now, if in reviewing the history of this case, we regard merely the *pharmaceutical* means employed, it will seem very extraordinary that a few doses of Hydr. c. Cretâ and solution of bark should suffice for so rapid a cure. But, in fact, the drugs formed only a small part of the curative means: indeed, it is probable that if the child had been allowed to remain in his unhealthy dwelling, restricted to a scanty and innutritious diet, the mercury would have been useless or even hurtful. But he was brought from a close, dirty alley, to a clean, airy, upper ward in the hospital, where he had good nourishment at regular intervals, instead of ten days of all but starvation, followed by a glut of probably unwholesome food.

The rapidity of the cure was greater than we should have a right to expect in every similar affection; but the case shows how much may be done by invigorating the vital powers, and how rapidly a local morbid action is subdued when this vigor of the general system has been attained.

The term *Scrofulous*, as applied to the disease just described, requires a word of explanation. I do not mean that the yellow matter deposited on the surface of the iris was of a *tubercular* nature; it seemed to be merely fibrine; but I regard the ill-nourished condition of the child, which induced the local effusion, as origi-

nating in scrofula, and call the Iritis "scrofulous," in the same sense as we speak of morbid intolerance of light being a scrofulous affection.*

Various degenerations of structure result from long-continued or neglected Iritis. Sometimes the whole iris is greatly thickened, and full of varicose vessels. In other cases the part becomes so thin and wasted as almost to resemble a piece of crape.

These changes in the iris, which are usually attended with extensive disease of other tissues, have been minutely described by some German writers—KLEMMER, VON AMMON, RAU, and others,—under various uncouth names: *Iridoncosis*, *Iridauxesis*, *Lymphoncus Iridis*, *Iridarœosis*, &c.

INJURIES OF THE IRIS.

Foreign Bodies.—These cannot of course reach the iris without having first penetrated the cornea or sclerotic; much more frequently they penetrate the former.

I have already spoken of the appearances which wounds of the cornea present; I would now allude only to those accidents where the injury to that structure is so slight as to be of no importance, but where the pre-

* The general appearance of this child was very similar to that which Mr. HUTCHINSON has recently described as originating in hereditary syphilis. Since the first edition of the present volume was published, however, I have seen two or three well-marked cases of Iritis in young boys, who did not present any of the signs pointed out by Mr. HUTCHINSON as indicating syphilitic taint, but all of whom had the swollen cervical glands usually considered characteristic of scrofula. I regarded these cases as true specimens of Scrofulous Iritis.

sence of a foreign body in the iris is the real source from which danger may be apprehended.

If a case of this kind is seen immediately after the receipt of the injury, there may be, perhaps, little or no difficulty in recognizing the foreign body impacted in the iris, especially if it be a fragment of *bright* metal. But if some days or weeks have elapsed since the accident, Iritis may have set in, and the fragment have already become invested with a covering of adhesive matter, so as very closely to resemble one of the fibrinous effusions so characteristic of Syphilitic Iritis.

To extract a minute foreign body from the iris without inflicting further injury on that part, or on the lens, is at all times a work of extreme delicacy. It is, of course, a much easier task when the fragment is situated near the ciliary margin of the iris, than when close to the pupil. A fine "cannula-forceps," introduced through a small opening at the outer edge of the cornea, will, in most cases of the latter kind, be found the best and safest instrument. If the fragment be near the edge of the cornea, ASSALINI'S spring-forceps will answer the purpose. A speculum, to separate the lids, and a common forceps, to steady the globe by nipping up a piece of the conjunctiva, are almost indispensable.

I would caution the young practitioner against believing that fragments of metal impacted in the iris will, if let alone, "become oxydized and absorbed," or encysted with fibrine, and so rendered for ever harmless. Whatever changes iron may occasionally undergo, chips of copper and brass will remain for years in the iris without apparent diminution of bulk: and although they

may for a time become coated with fibrine, even that will not secure the patient from repeated attacks of inflammation, which will eventually destroy the eye. It seems that long after the foreign body has become invested with a cyst-like covering, suppuration may occur within the latter, and the fragment become once more denuded; it may then either fall down into the anterior chamber, or be thrust forward against the hinder face of the cornea by successive deposits of exudation. In the latter case the cornea ulcerates, and the foreign body may thus be expelled from the eye.

In illustration of these morbid changes, I would refer to a case which I communicated several years ago to the *Dublin Quarterly Journal of Medical Science*, (vol. vi., New Series, Aug., 1848, p. 210). It affords an instance of the most prolonged sojourn, with which I am acquainted, of a foreign body in the anterior chamber;—*eight years* having elapsed between the occurrence of the injury and the expulsion of the fragment; it shows that even the formation of a fibrous cyst around such a body does not prevent the occurrence of Iritis;—and it enforces the importance of most carefully examining the iris whenever there is reason to suspect that a foreign body has gone through the cornea.

Wounds.—One of the most frequent consists in a partial separation of the iris from the ciliary ligament, the result of blows, sometimes comparatively slight ones, such as are inflicted by the rebound of a twig, the lash of a whip, &c. The appearances presented by this accident are, of course, very various, according to the extent to which the separation has occurred. Sometimes

the secondary pupil so produced is not larger than a pin's head, and from its position may be overlooked by a superficial or careless observer. When the laceration is more extensive, involving, perhaps, a third or the half of the ciliary margin of the iris, there is always some effusion of blood into the anterior chamber, and the form of the natural pupil is altered by the relaxation of that part of its border which is nearest to the laceration. In some cases of extensive detachment, the margin of the pupil falls together, so that its aperture is wholly obliterated.*

The margin of the iris, when once torn from its ciliary attachment, never returns to it again; and vision remains much impaired, even although the lens may have escaped injury.

The *Treatment* should be of the simplest kind. Protection of the eye from light, and occasional fomentations, comprise nearly all that is required locally. As regards general treatment, no fixed rules can be laid down—many patients requiring no medicines at all; while others, of a more irritable nature, may need narcotics for the first few nights after the injury. Provided the patient's general vigor be good, the blood effused into the anterior chamber soon becomes absorbed. Mercury, which is often given in these cases, in nowise hastens the absorption.

Foreign bodies, which, after traversing the cornea,

* Figures of this accident, in various stages of separation, may be found in MACKENZIE'S work, fourth edition, pp. 396–7. A *total* detachment of the iris is described in the Appendix to the present volume.

have penetrated deeply into the eye, so as to lodge themselves in the lens or vitreous chamber, sometimes penetrate the iris on their way. In such cases, the wound of the iris is the least important part of the accident, the more serious effects of which will be noticed under the head of "Injuries of the Lens." If the foreign body is small—a shot, for instance—and projected with great swiftness, the wound of the iris gapes but little, and may even be hardly discernible. The same remark applies to those chips of metal which pass through the iris in the course of its fibres; when, however, these are divided transversely, the wound gapes, and forms a secondary pupil.

The uncertainty as to where the foreign body has lodged, will induce the surgeon to give an unfavorable prognosis in all cases where he finds a recent wound of the cornea associated with one of the iris, and learns that the injury has been inflicted by some small body projected against the eye.

MORBID GROWTHS ON THE IRIS.

In most of the cases described by the older ophthalmic writers, as exhibiting "excrescences," "tubercles," "tumors," and so forth, on the iris, the morbid appearances seem to have been produced by the part becoming gradually involved in malignant or scrofulous deposits, which had advanced from the interior of the globe; or else the fibrinous effusions of Iritis have been mistaken for permanent tumors. The only morbid growths I have myself seen on the iris, have been in the form of cysts, apparently developed within its substance, and gradually

encroaching upon the anterior chamber. These cysts are usually of slow formation, and at first not attended with much uneasiness; but as they increase they give rise to pain. When small, they resemble a good deal those *pouches* of the iris which are met with where complete adhesion of the pupillary margin to the capsule of the lens has occurred, and where the fluid secreted by the posterior chamber of the aqueous humor, being unable to pass through the pupil into the anterior chamber, pushes the iris forward till it almost touches the cornea.

The best mode of treating cysts of the iris, seems to be to puncture them repeatedly with a rather broad needle, introduced through the cornea.

In the Appendix, the reader will find the details of a case in which a cyst, developed in the substance of the iris, as a consequence of injury, was treated in this manner.

COMBINED INFLAMMATION OF IRIS AND CORNEA.

Although, as I have already observed, these two structures are simultaneously attacked in the so-called "Rheumatic" Iritis, there is another affection, of a less acute kind, to which they are subject, in which the posterior face of the cornea presents changes so marked as frequently to divert the surgeon's attention from those which are at the same time going on in the iris.

This affection has been named "Aquo-capsulitis," and described as quite distinct from inflammation of the cornea itself. The term, however, ought to be erased from our ophthalmic vocabulary, as being based on false anatomy. The existence of a structure was formerly

assumed, which could not be demonstrated, and which the best modern observers have failed to detect,—namely, a perfectly continuous serous membrane, lining the posterior surface of the cornea, both surfaces of the iris, and the front part of the capsule of the lens. To this imaginary shut sac, the name of "capsule" or "membrane," of the aqueous humor was given; and an analogy was supposed to exist between its inflammatory phenomena and those of the peritoneum, pleura, &c. TYRELL* describes this membrane as forming a shut sac; its structure similar to, but more delicate than, other serous membranes. He even speaks of it as having *blood-vessels of its own*, "principally derived from the iris," and anastomosing "with those of the cornea, sclerotic, and iris;" and he devotes a section to the symptoms and treatment of its "Inflammation" and "Ulceration."† In fact, under the name of "Aquo-capsulitis," he describes cases both of Iritis and of severe inflammation and softening of the cornea; whereas the affection I am now speaking of runs a much less acute course than either of these, and is characterized by the superficial manner in which the cornea suffers. For, although there is a well-marked vascular zone in the sclerotic, the true vessels of the cornea are not seen forming those crescentic red patches so characteristic of genuine Keratitis; neither does the iris present any of those large fibrinous deposits which I have so fully

* Op. cit.; vol. i. p 300.

† WARDROP goes still further, and actually has a chapter (ch. xvii., vol. ii.) treating "Of *Ossification* of the Capsule of the Aqueous Humor."

treated of under the head "Iritis." Enlargement of its veins, slight change of color, and effusion of puss into the anterior chamber, are the extent to which the morbid phenomena of the iris usually proceed. Sometimes, however, very slight adhesions are formed between the pupillary margin and the capsule of the lens, which are not detected until the disease is at an end, and the transparency of the cornea restored.

The most frequent subjects of this superficial inflammation of cornea and iris, are young persons, more especially delicate children under twelve years of age. There is intolerance of light, and a vascular zone in the sclerotic. The cornea is slightly hazy throughout, and presents a peculiar *mottled opacity*, which has been said to have its seat exclusively in the membrane lining the hinder surface of the cornea. This mottling is most observable in the part of the cornea which lies in front of the pupil. In a case seen at an early stage of the inflammation, before the haziness of the cornea has become considerable, the iris will be seen slightly changed in color, owing to the enlargement of its veins giving a faint pinkish tinge to the part. Sometimes the separate venous trunks are distinctly traceable.

As the disease advances, the corneal opacity becomes so considerable as to prevent these changes in the iris being seen. *Hypopyon* commonly occurs in the more acute cases. The patients are usually restless at night, with bad appetite, and derangement of bowels, and they therefore commonly need an aperient at the outset of the treatment; but any regular "course of mercury" is contra-indicated by the debility which they almost uniformly exhibit.

Two or three grains of Hydr. c. Cretâ may be advantageously given for several nights in succession, provided the general powers of the patient be at the same time raised and maintained by tonics—bark or quinine, and plain nutritious food given at regular intervals. Where there is much intolerance of light, small blisters the size of a shilling, to the temples, or tincture of iodine to the skin of the lids, often afford relief. Iodine taken internally will frequently assist in restoring the transparency of the cornea; and the syrupus ferri iodidi will be found a useful form.

Mr. Hutchinson has recently described this disease under the name of "Chronic Interstitial Keratitis," and believes it to be uniformly the result of inherited syphilis.* He finds the subjects of this inherited taint to present a peculiar physiognomy, and very characteristic changes in the teeth, and he recognizes these signs of syphilitic infection in all well-marked instances of the *Combined Inflammation of Iris and Cornea* I have just been describing. The peculiarities in the features and complexion, to which Mr. Hutchinson has drawn attention, have hitherto been regarded by most medical men as characteristic of scrofula; but no one, I believe, has described and illustrated them so well as Mr. Hutchinson, or pointed out the connection between them and the morbid conditions of the teeth.†

* *Opthalmic Hospital Reports;* vol. i. p. 169.

† *Trans. of Pathol. Society;* vol. ix. p. 449. *Med. Times and Gazette,* Sept. 1858.

CHAPTER VII.

THE CHOROID AND RETINA.

"CHOROIDITIS"—"RETINITIS"—"AMAUROSIS"—"AMBLYOPIA."

THE Ophthalmoscope has effected such a revolution in the opinions formerly entertained as to the morbid conditions of the choroid and retina, that the terms at the head of this Chapter have already lost much of the meaning they would have suggested a few years ago; and many cases, which then were vaguely spoken of as "functional Amaurosis," could now be proved to depend upon actual changes of structure.

But while, in certain instances, the ophthalmoscope enables us to detect the morbid changes which induce failure or loss of sight, in other cases the deep tissues present a healthy appearance in patients whose vision is seriously impaired; and thus a more careful and extended use of the ophthalmoscope, by demonstrating the presence or the absence of structural changes in the choroid and retina, will tend, at the same time, both to narrow and to widen our principles of ophthalmic practice.

Before speaking of the ophthalmoscopic appearances of the choroid and retina, I would direct the reader's attention to certain conditions of impaired sight, which have been ascribed,—untruly in my opinion,—to disease in those tissues; and will then briefly notice some other

affections, which may fairly be assumed to depend upon a morbid state of the retina itself, although the ophthalmoscope can detect no structural change in that part.

"*Choroiditis.*"—No one who has examined a well-injected preparation of the choroid, and has seen how it is, for the most part, made up of a mass of blood-vessels, can need to be told that such a tissue in the living body must be peculiarly liable to inflammation. Indeed, we might take it for granted that, in the event of inflammation attacking the whole eyeball, it would be in the choroid that the chief inflammatory changes would take place. We may feel assured, too, that, in the severer forms of Iritis, the inflammation is by no means limited to the tissue from which the disease derives its name, but that the connection subsisting between the vessels of the iris and those of the choroid will involve both structures in the same morbid process.

So, again, in that chronic inflammation which gradually involves the whole eyeball, and is distinguished by the arbitrary term, "Glaucoma," the choroid suffers, if not primarily, at least in a very marked degree, as is proved by the serous effusions, and other inflammatory deposits between it and the retina, which have been found in "glaucomatous" eyes examined after death. But that any *recognizable* inflammation of the choroid can exist apart from disease of the retina, appears to me an entirely arbitrary assumption, unsupported by the phenomena observed in actual practice, and tending only to perplex the student, by giving rise to a needless multiplication of terms, and fine-drawn distinctions.

"Congestion" and "Inflammation of the Choroid" are mentioned by TYRRELL in such a way as to demand

a few words of notice; inasmuch as his well-deserved reputation, as an accurate observer of the outward manifestations of disease, has caused him, I think, to be too implicitly followed on some few points of theoretical speculation. He attributes to Congestion and Inflammation of the Choroid certain phenomena which are obviously due to causes of a totally different kind. For instance, he describes the threads and spots which, in some persons, float and glide over the field of vision, and are known as *muscæ volitantes*, to "preternatural dilatation of some of the delicate vessels of the choroid."

Now, there can be no doubt that *fixed* bodies—which such dilated vessels must be—if they exerted pressure on the retina, might, at those compressed points, so impair its power of perceiving light, as to give to the patient the idea of spots or discs on the field of vision; but the dark appearances so produced would be *fixed*, like the vessels giving rise to them, and would only change their position when the eyeball was moved. *Muscæ volitantes*, however, move independently of any movements of the eye itself; for, after these have ceased, the little bodies still contiuue to glide and whisk about in various directions.*

Tyrrell attributes to "temporary Congestion of the Choroid," that very common defect of sight which he and others denominate "Impaired vision."† It is the

* For the true explanation of these well-known phenomena, the reader is referred to an admirable chapter by Mackenzie. Op. cit.; fourth edition, 1854, p. 939.

† This term is manifestly very vague and ill-chosen; for surely we do not get one step nearer towards the explanation of a given kind of *damaged sight*, by employing for it a synonym of a more Latinized form.

complaint to which those persons are liable who are occupied, for several hours together, upon minute objects—tailors, jewelers, dressmakers, &c. The patients see well when they first begin to work, but after a short period of application, the objects begin to waver and get indistinct; and very soon, unless the eyes are allowed to rest for a few minutes, the objects wholly disappear. A short interval of repose allows of the work being continued for awhile, but the dimness and unsteadiness of sight recur again and again, until at last the work must be altogether laid aside. The affection, therefore, may be said to consist in *an inability to keep up the adjustment of the eye to near and small objects.* But there is no *proof* of this imperfect adjusting power being dependent upon any change in the blood-vessels of the choroid. Such a change is assumed without any evidence.

In a large number of these cases the patients will be found to be far-sighted, and the use of convex glasses of a low power will at once compensate their defective adjustment for near objects, and enable them to pursue their labors with ease.*

The cases in which we may assume slow inflammatory changes to be going on in the choroid and retina exhibit, in their earlier stage, phenomena referable to the retina

* Mr. RAINEY, in a very interesting paper (*Lancet*, July 26th, 1851), suggests that the adjustment of the eye to objects at different distances may be effected by means of the *ciliary muscle* compressing the ciliary processes through the medium of the aqueous humor; room being thus made in the globe, by the alternate partial emptying and refilling of these processes, to allow of the lens changing its position, and so altering its focus.

alone; at a later period, those of Chronic Iritis may be superadded; in which case, the iris advances a little forward, and becomes less active; the pupil expands, and loses its perfectly circular shape; its margin, at the same time, seems to be less sharply defined, in consequence of its area no longer presenting the clear blackness of health. Eventually, either the lens loses its transparency, and the case terminates in complete "Glaucoma;" or the iris becomes the chief seat of disease, and points of adhesion form between the pupillary margin and the anterior capsule, with more or less of filmy deposit over the surface of the latter. The case was then said to be one of "Choroiditis," "Choroido-Iritis," "Sclerotico-Choroiditis," "Chronic Iritis," according as the surgeon assumed the disease to have had its original seat in this or in that tissue of the eyeball.

The reader will at once perceive, that where chronic changes are involving so many different structures, the most varied appearances must be presented for observation; and that it must, therefore, be impossible to draw one picture which shall stand for a type of all cases of combined choroidal and retinal inflammation. In one patient these deeper tissues, in another the iris, will be the chief focus of disease.

We frequently meet with patients who have gradually lost sight in one eye or in both, and yet have neither suffered pain nor observed any unnatural appearances—such as spots, sparks, or flashes—on their field of vision. There is nothing faulty in the structure or functions of the iris; in fact, the eye presents every appearance of perfect health; and yet even the brightest light fails to make any impression on the retina.

Such cases have been commonly classed as "Amaurosis;" the absence of inflammatory action in the superficial tissues of the globe making the surgeon discard all thought of the choroid being the seat of mischief. Yet the ophthalmoscope may at once reveal extensive changes both in the choroid and retina. These two structures may be widely separated from each other by effused fluid. The retina may be partially or wholly overspread with opaque, whitish deposit, or the remains of extravasated blood. The optic nerve may be atrophied, so as to be barely traceable; the branches of the central artery or vein being few in number and diminished in size. In short, the whole fundus of the vitreous chamber may afford evidences of extensive disorganization, while the iris and superficial textures appear perfectly healthy.* Such examinations prove how little dependence can be placed on the descriptions of "Choroiditis," and "Retinitis," as set forth by some systematic writers, who would teach us, from the condition of the pupil, the color of the iris, or the appearances noticed by the patient, to pronounce with certainty as to whether the choroid or the retina be the seat of disease.

"AMAUROSIS" AND "AMBLYOPIA."

From very early times these arbitrary terms have been used, by writers on eye diseases, to express loss or defects of vision, not resulting from any mechanical

* For examples of effusion between the Choroid and Retina, see RUETE; *Bildliche Darstellung der Krankheiten des menschlichen Auges.* Leipzig, 1854. Tab. vii., figs. 4, 5, 6. Extravasation of Blood on the Retina, Tab. iv, fig. 6. Opaque Deposit on the Retina, Tab. iv., fig. 5; Tab. vi., figs. 4, 5. Atrophy of the Optic Nerve, with other changes, Tab. v., fig. 6.

obstacle to the rays of light, nor from inflammatory changes, but depending upon a want of power, in the Retina, to *receive* visual impressions,—in the Optic Nerve, to *conduct* them onwards,—or in the Brain, to *perceive* them.

It will at once be evident how vast a field of obscure and fanciful pathology such a nomenclature implies; and what a contrast the study of the *nervous* diseases of the eye must always have presented, as compared with that of the superficial affections,—of the conjunctiva, the cornea, and the iris. For, whereas, in speaking of the latter, we were able to adhere strictly to an anatomical arrangement; and to say, with absolute certainty, —"This is inflammatory deposit,"—"That, extravasated blood,"—"This is pus, or fibrine, and will pass away," —"That is earthy deposit, or fat, and is necessarily permanent," we were compelled, in assuming disease of the retina, optic nerve, or brain, to be the cause of blindness, to guess at the real nature of the morbid change. Thus, instead of using terms as definite as Keratitis, Iritis, Cataract, we contented ourselves with speaking of Amaurosis, Amblyopia, Hebetudo visûs—terms expressive merely of the patient's feelings, not of the surgeon's pathological knowledge and discernment. For although the word "Amaurosis" has, as I have said, been generally understood to imply that the seat of the disease was in the nervous apparatus, both the disease and its seat were wholly *undemonstrable;* and in saying that such and such a patient was the subject of Amaurosis, we merely asserted that his *sight was dim.*

By some writers, a distinction, purely arbitrary, has

been made between *Amaurosis* and *Amblyopia*, the latter term being restricted to cases where the dimness was less considerable. But the etymology of the words warrants no such distinction. The now discarded term, "Gutta serena," was really just as significant as any of the others; and although the obstacle to vision which the term suggested was altogether an imaginary one, the words had at least a real significance for those who originally employed them; who as firmly believed in the existence of the "drop serene," as of the "dim suffusion" itself.

I would wish to impress strongly upon the student that although, for convenience sake, we may still continue to use the word *Amaurosis*, we do not thereby express any opinion whatever as to the real pathology of dim sight or blindness. "Amaurosis" implies no definite and ascertained disease; it is only a word expressive of our own ignorance as to the cause of our patient's symptoms. Let us hope that improved methods of investigation may some day enable us to introduce such order and precision into the hitherto confused and uncertain nomenclature of nervous diseases, that "Amaurosis" may come to be considered as unsuitable a name for a disease as its English equivalent, "Obscurity," would now be, if applied to any special form of defective sight.

The descriptions of the older ophthalmic writers have so *popularized* "Amaurosis" and its symptoms, that most students, before commencing the practical study of eye diseases, form to themselves some ideal type of an amaurotic patient, with his "vacant stare," and "widely

dilated pupils; and have commonly a vague belief in the exclusive power of *mercury* to effect a cure.

Nothing can be more unfounded than such sweeping generalizations. Not only may the pupil be dilated and fixed, without any disease existing in the retina (see "Mydriasis," *ante*), but the converse is equally true;—a retina may be insensible to the largest objects, insensible even to light itself, although the size and motions of the pupil may be in all respects natural. In fact, as I have already stated, when speaking of Diseases of the Choroid, an eye may offer to the surgeon every outward appearance of health, and yet the ophthalmoscope may show changes to have been going on in the retina to an extent little short of total disorganization.

As for the powers of mercury, we need only pass in review the various causes which may prevent an image being formed on the retina, or, if it be so formed, may prevent its being duly conveyed to, and perceived by the brain, and we shall at once be convinced that many of these causes must be wholly irremovable; and the rest too various in kind to allow of any *one* remedy being of universal efficacy.

If a patient comes before us, complaining of dimness of sight, attended with the constant or occasional appearance, in the field of vision, of moving clouds, dark disks, spots, sparks—in short, of any of the manifold subjective symptoms of disordered retina, we are not hastily to call the case "Amaurosis," and forthwith proceed to treat it according to any fixed routine.

Our first business should be to ascertain *for ourselves*

what sight the patient really possesses; testing his power for near things with type of different sizes, and, for those more distant, by directing his attention to various objects about the room, or out of doors. Some patients involuntarily exaggerate their defects of sight to such an extraordinary degree, that their own accounts are absolutely useless.

Having satisfied ourselves that the cornea and lens are free from opacity, we next examine *each eye separately*, as to the contractile power of the pupil; placing our hand between the eye and the window, and then suddenly withdrawing it. Next, examining *both eyes together*, we are to ascertain whether the sudden admission of light to one retina influences the motions of the opposite iris. If either pupil appears immovable, or is sluggish in its motions, we must closely scrutinize its margin, to see if any adhesion (*synechia posterior*) exists between it and the capsule of the lens. The discovery of even a minute point or two of adhesion is sometimes very important, as proving that Iritis—with all its possible complications—must at one time have existed in the eye; and therefore leading us to conclude that the defect of sight may be the result of an old attack of slow inflammation, involving the retina, and terminating in opacity and thickening of some part of its tissue. If the pupil be unnaturally dilated and fixed, the test of letting the patient look through a pin-hole in a card will determine the nature of the dilatation (see "Mydriasis," p. 120.)

Sometimes a slight deviation of the iris from its naturally vertical position becomes important as an aid to

the diagnosis of obscure cases; for the iris is commonly bulged forward towards the cornea whenever an unnatural dilatation of the vessels of the choroid, an effusion of fluid between the choroid and retina, hæmorrhage on the surface of the latter, or into the substance of the vitreous body, or any other mechanical cause, has increased the pressure which the contents of the globe exert upon the iris.

Should any degree of *squint* exist, a careful examination must determine what muscle is at fault. We must inquire how long the squint has existed; the manner in which it first showed itself; whether suddenly or by degrees; as a result of disease or accident. Loss of motory power in the third, fourth, or sixth nerves, or of sensibility in the ophthalmic division of the fifth, accompanying failure of sight, would lead us to refer the cause to the orbit, or cavity of the skull. Protrusion of the eyeball, in addition to defective movement, might lead us to suspect a tumor within the orbit.

An eye which has remained almost blind for many years together, is very commonly found to be permanently *abducted* to a greater or less degree.

In children, blindness coming on without apparent disease in the eyes themselves, would suggest the presence of *Tubercle* in the brain. The occurrence of fits or paralysis would strengthen the suspicion; although blindness may, for a long time, be the only manifestation of such cerebral affection. During the progress of *Hydrocephalus*, loss of sight invariably takes place; and, in the latter stages of the disease, the pupils become dilated to their fullest extent, and quite immovable.

We know that a sudden change in the supply of blood to the brain may produce total or partial loss of vision. This is made familiar to us by what we see in cerebral concussion, and in the first stage of ordinary syncope. The effect of *gastric and intestinal irritation* in disturbing the function of the retina, is equally well known; although the mode in which the effect is produced is not easy to comprehend. *Exposure to intense light*, or slight *blows on the eyeball*, may produce a temporary blindness, which, in the course of even a few hours, may wholly pass away; and not be followed by inflammation, or, in fact, by any symptoms requiring treatment.

There is, however, one remarkable form of intermittent blindness, which persists for a period sufficiently long to demand the surgeon's attention. It is termed *Hemeralopia*, from the patient being able to see only in broad daylight, and becoming totally blind as soon as the sun has set. The only persons I have myself seen affected with this complaint, have been those just returned from sea-voyages—most commonly from the East or West Indies—and who have consequently been exposed to a strong glare of sunlight. The affection is, I believe, also met with among the inhabitants of the inland parts of India, who attribute it, just as our own sailors do, to sleeping when exposed to the moonbeams.

The real cause of Hemeralopia appears to be exhaustion of the nervous susceptibility of the retina, from overexcitement by the sun's rays, whereby the part is rendered incapable of appreciating the milder rays of twilight or moonlight.

But this exposure to strong light is not always the cause of the affection; for I have met with it among those who had never quitted the temperate parts of the globe. In most of the latter cases, however, the complaint has shown itself after voyages which had subjected the patients to exhausting labor, and exposure to severe weather, when deprived of their proper supply of fresh provisions and vegetables.

I have commonly found that a few weeks' residence on shore, with a wholesome *mixed* diet, and the use of quinine, has restored their vision to a healthy state.

We find *Nyctalopia* mentioned in books, as a disease the very reverse of *Hemeralopia;* characterized by an *inability to see by daylight.* I have certainly never met with this affection; and am inclined to think it altogether an imaginary one, invented, as it were, to form a companion disease to the Hemeralopia I have just been speaking of.

OPHTHALMOSCOPIC APPEARANCES OF RETINA AND CHOROID.

Cases of defective sight, in which no disease could be detected in the cornea, iris, lens, or capsule, were formerly beyond the limits of positive diagnosis. The hinder surface of the lens formed, as it were, the boundary between the accessible and the inaccessible regions of the eye, and all beyond was enveloped in doubt and mystery. The ophthalmoscope, in laying open to our inspection the retina and choroid, has so completely revolutionized our motions as to the diseases of those parts, that we find ourselves in want of new terms to express the un-

expected and varied aspects presented to our view; and there are many apparent deviations from a perfectly normal state of the deep tissues which, as yet, we cannot with certainty class under any definite pathological heading.

Duly to illustrate all the appearances which the optic nerve, retina, and choroid assume, an extensive series of carefully-executed colored drawings would be required; and in the absence of these, I can present but a meagre, and, I fear, hardly intelligible sketch of some of the more striking characteristics of the deep tissues in health and in disease.

Unless the pupil be morbidly dilated, it is, of course, necessary to apply atropine before using the ophthalmoscope.

The following are some of the ordinary appearances presented by a healthy, or but slightly diseased eye.

Retina.—When describing the mode of using the ophthalmoscope (Chap. I.), I very briefly alluded to the color presented by the retina; but it is impossible to indicate any precise tint which may uniformly be regarded as indicating its healthy condition. In pale, anæmic persons it may be almost of a buff color, and in those who are full-blooded it may exhibit a considerable amount of redness, and yet in both cases its vascular supply may be only in due proportion to that of other parts of the body. Practice alone can teach the observer what amount of vascular injection is compatible with healthy action of the nervous tissue.

The vessels of the retina and those of the choroid differ so much from each other in general appearance

and arrangement, that they can never be confounded together by a careful observer. The central artery and vein of the retina emerge, as I have already described, from the middle of the optic nerve, and then divide into branches, which radiate towards the periphery of the retina.

A beginner will fail to distinguish the arteries from the veins, but the difference between the two kinds of vessels is very evident to a practiced observer. An arterial trunk, as it emerges from the optic nerve, is of a paler color than the vein, and each side of the tube presents a distinct outline. Both these appearances result from the same cause—namely, the greater thickness of the arterial walls, as compared with those of the vein. Of course the red color of the blood is more faintly seen through the thicker coat, and while the middle portion of the arterial tube becomes translucent, each side produces the effect of a line of shadow. The coats of the vein, on the contrary, are so thin, that they allow the red color of the blood to be plainly seen throughout the whole diameter of the vessel.

The capillaries of the retina are, of course, too small to be seen as separate tubes, but they impart to the nervous tissue a generally diffused redness, of greater or less intensity.

Choroid.—It is a difficult point to determine how far the vessels of the choroid can become visible in the healthy state. Reasoning *à priori*, we should perhaps have been led to assert that they could not be visible at all; for we know that, in a healthy eye, a variable quantity of brown pigment is interposed between them and

the rods and bulbs of the retina ("JACOB'S membrane.") This pigment is more abundant among the colored than among the white races of mankind; it is, among the latter, but sparingly met with in old persons; in albinos it is wholly absent.

In examining patients with the ophthalmoscope, the choroidal vessels are so often distinctly visible when there exists only slight impairment of sight, that we must suppose either that the pigment between the retina and choroid is very commonly wanting, or that, when present, it only partially obstructs the transmission of light.

The choroidal vessels are considerably larger than even the main branches supplying the retina, and are closely packed together in a somewhat parallel arrangement, leaving very narrow interspaces, in which the dark, deep-seated pigment is deposited. Sometimes the choroidal vessels are so plainly seen, that the observer almost forgets he is looking at them through the whole thickness of an anæmic retina. More commonly they are dimly traceable, as through a minutely granulated and reddish film; while, in other cases, they are wholly invisible.

Optic Nerve.—When seen in a young and healthy eye, the optic nerve presents, as I have said, a round, whitish patch, faintly tinged with pink. But in older subjects the nerve commonly deviates from a perfect circle, and, at the same time, its tint approaches to a dead white. Slight variations in the form of the optic nerve appear to be quite compatible with its healthy functions.

The blood-vessels, at their point of emergence from

the nerve, vary much in different subjects, as to their number, size, and direction. In young persons they commonly pass off at once, in a slightly wavy course, towards the periphery of the retina, but in older subjects they are often very tortuous at their point of emergence, so as to cover a considerable portion of the optic nerve.

MORBID APPEARANCES OF THE OPTIC NERVE, RETINA, AND CHOROID.

I use the word "appearances" rather than "conditions," because, in the present state of our knowledge, we are quite unable to explain the real nature of many morbid changes occurring in the deep tissues of the eye. For the present we must be content to regard them as mere pictures, presented to our view by the illuminating power of the ophthalmoscope.

Optic Nerve.—We now and then see a thin, jet-black line skirting the margin of the nerve, and involving a sixth, a quarter, or even the half of its circumference. This appearance is probably due to an irregular deposit of pigment, but I have seen it in eyes so little impaired as to vision that I know not what stress to lay upon it.

Another not unfrequent change in the immediate neighborhood of the optic nerve consists in a dark halo, like a faint wash of Indian ink, surrounding the nerve, gradually shaded off and lost at a short distance from its margin. This, I think, is most commonly seen in persons affected with that general dimness of sight, and inability to sustain continued application of the eyes,

vaguely termed "Amblyopia." I am quite unable to explain the real nature of the appearance.

The following changes are more decidedly morbid than those just noticed.

At a first hasty glance, the optic nerve seems larger than natural, and of an oval, instead of a circular, form; but a closer examination shows this seeming irregularity in shape and size to be produced by a crescentic patch of white, adjoining the edge of the nerve.* This patch is commonly placed at one side of the nerve, but I have seen it above, and, in some cases, instead of a crescent, there has been a broad white zone entirely surrounding the nervous disk.

The white crescent is frequently found in short-sighted persons,† and in those affected with strabismus of old standing; but in the latter class of cases it is commonly attended with diminution of the nerve itself.

Sometimes, when the area of the optic nerve is diminished, and its outline very irregular, assuming an oval, or even a kidney shape, the change of form seems to depend upon a thickening of the adjacent retina, the

* This white crescentic patch is described by some recent German writers under the name of "staphyloma," as if at this spot there were an actual protrusion of the coats of the eyeball. I am not aware of such a supposition being based on any actual dissection.

† Perhaps it would be more correct to say that the white crescent invariably accompanies *well-marked* myopia. I believe this fact was first pointed out by Dr. BADER (*Ophth. Hosp. Reports*, vol. i. p. 116). From a dissection he has made, it would appear that, to the extent of the crescent, the hexagonal pigment-cells are deficient, and the choroid transparent, so that light is reflected from the sclerotic itself, and thus the white appearance is produced.

hypertrophied nervous tissue encroaching upon the area of the nerve.

The white patches seen on the retinæ of patients who have suffered from syphilis are sometimes associated with an opaque, white deposit upon the optic nerve; but in cases of old syphilitic disease I have also seen the nerve alone affected, presenting, instead of its healthy roundness of outline, an oval, or more irregular figure, and being perhaps twice its natural size. It would be more correct to say that in these cases the real tissue of the nerve is not seen at all, but is overlaid by an opaque whitish patch of old deposit, extending considerably beyond its margin. The central vessels are usually much diminished in size, as if compressed by the shrinking of the deposit in which they are embedded at their point of emergence. The defect of vision in these syphilitic cases may vary from a slight general mistiness to mere perception of large objects.

I have already said that we must not set down as morbid every slight deviation of the optic nerve from a perfectly circular outline, or from an arbitrary standard of color; but there are certain discolorations of the nervous substance which are never met with except in conjunction with serious impairment of sight.

Thus, for instance, in certain cases of what by some would be termed "Amaurosis," and by others "Glaucoma,"—where sight has gradually faded away without pain; the pupil being dilated, but not to its fullest extent; the veins on the sclerotic not remarkably full; the cornea, lens, and vitreous humour, as yet transparent;—the optic nerve assumes the appearance of a dark

grey or drab-colored patch, with a whitish rim. The dusky tint seems to be the result of wasting and shrinking of the nervous tubules, whereby the central portion of the nerve forms a slight depression, which lies in shadow, while the sheath of the nerve stands out in relief.*

In other cases, where the external aspect of the eye is more completely that of so called "Glaucoma" at an early stage,—the veins on the sclerotic large and purple; the pupil widely dilated, and fixed; the iris slate-colored; the globe hard and stony to the touch; and all perception of light gone;—we find the optic nerve rather prominent than depressed, and of a chalky whiteness. An optic nerve which presents a disk of uniform, homogeneous whiteness, like ivory, is found in some of the most hopeless cases of utter blindness. I need hardly add that, in the last stage of Glaucoma, when opacity of the lens is beginning, no distinct view of the optic nerve and retina can be obtained; but even while the lens is as yet clear, if the cornea exhibits only a slight amount of the characteristic cloudiness and irregularity

* This condition was formerly described by GRAEFE as constituting a peculiar form of Glaucoma. He has more recently spoken of it as "Amaurosis, with excavation, or retraction, of the optic nerve." (*Archiv f. Ophthalmologie*, vol. iii. p. 484.) It seems to me impossible that indentation of the extremity of the optic nerve should be mechanically produced, as has been supposed, by the fluid pressure of an over-distended eyeball. For surely such pressure would first act upon the more moveable parts of the organ, and the lens and iris would be thrust forwards against the cornea, before the very substance of the optic nerve was pressed backwards into its sheath. I have seen cases in which this pitting of the optic nerve was very strongly marked, while the iris deviated little, if at all, from a vertical plane.

of epithelium, one is surprised to find that the refraction of light thereby produced is quite sufficient to prevent any details of the optic nerve being seen.

Retina.—Our ophthalmoscopic examinations of the retina will require to be illustrated and explained by a series of well-conducted dissections, before we shall be able to understand the real meaning of many of the appearances we meet with in the living eye. At present I can only mention some of the more remarkable of these, without attempting to describe all their minute peculiarities of color and form.

White patches, varying in form and size, are not unfrequently seen on the retinæ of old persons complaining of dimness of sight. Sometimes a single large patch, with an irregular map-like outline, occupies the axis of vision, or surrounds the optic nerve. These patches have an opaque, parchment-like aspect, and probably vary in their nature in different cases; in some being merely a condensation and hardening of the nervous tissue of the retina, with obliteration of its vessels—in other cases consisting in fatty degeneration. These patches are not to be confounded with the syphilitic deposits noticed at p. 199.

Small white dots, scattered here and there over the surface of the retina, have sometimes a glistening aspect, which suggests the notion of their being small deposits of cholesterine, with perhaps some earthy matter.

One of the most startling revelations of the ophthalmoscope consists in the enormous extent to which *deposits of pigment* occur on the whole surface of the retina, without any external signs of disease existing in the eye.

The entire surface may be blotched over with black* dots and patches of every variety of form and size, so that hardly a trace of healthy retina can be seen, and yet the patient may never have suffered any symptoms of acute or chronic inflammation; and the loss of sight in the affected eye may have been first discovered on accidentally closing the sound one.

The dark-colored patches resulting from old *effusions of blood* into the substance of the retina commonly involve a less extent of its surface than the pigmentous blotches I have just been describing; and if the hæmorrhage, and consequent breaking up of nervous tissue, be of old standing, a pale brown or dusky grey patch may be the only trace of the injury. The patches of pigment are of a deep black, and commonly, as I have said, are distributed over a large extent of the retina: the results of hæmorrhage are more frequently limited to one spot, which may be situated at any part of the retina. The real nature of the blotch resulting from hæmorrhage may sometimes be ascertained by the manner in which one of the large radiating vessels of the retina—the original source of the bleeding—is seen to end abruptly at the edge of the dusky patch. This aid to diagnosis would of course be wanting where the hæmorrhage had come from the choroid.

* It does not necessarily follow that all dots and patches on the retina which appear black are really so. Any opaque, non-reflecting body immediately upon the surface of the retina must intercept some of the rays passing to the eye of the observer from the illuminated layer of choroid, and so produce the effect of blackness. In like manner, a chalky white opacity in the lens, or an opaque, whitish membrane floating in the vitreous humour, will appear quite black when viewed with the ophthalmoscope.

Recent extravasations of blood upon the surface of the retina assume the most varied appearances: sometimes several small red blotches occur in the course of some vessel; in other cases, one large clot is seen overspreading the greater part of the retina. Occasionally, when the extravasation is of small extent, the very spot is indicated by a little smear of blood close at the side of the ruptured vessel. I have several times seen such extravasations within a few hours of their occurrence. When hæmorrhage results from a violent blow on the eye, the vitreous humor often suffers at the same time, and then the clots float about in that fluid at every movement of the eyeball.

One would naturally suppose that *serous effusion between the retina and choroid* could only result from inflammation so well-marked as inevitably to attract the patient's attention; but, in the revelations of the ophthalmoscope, there is nothing more curious than the fact, that extensive separation of the retina from the choroid, involving even half of their surfaces, may go on without any of those phenomena of flashes and pain which stand recorded in our older ophthalmic text-books as invariably accompanying so-called "Retinitis" and "Choroiditis."

A patient, for instance, finds the sight of one eye failing, until, perhaps, half of its field of vision becomes a total blank. No phenomena of inflammation are observed; nothing, in short, but defect of sight; and yet, when we examine the eye with the ophthalmoscope, we find a considerable portion of the retina detached from its connections, and forming a rounded projection into the vitreous humor.

These elevations of the retina, if small, are often very difficult of detection with the ophthalmoscope. They appear at first like cloudy portions of the retina, across which the radiating vessels can no longer be traced in their regular order. Of course that part of the retina which still retains its position, and that which is displaced, cannot be in focus at the same time. When the displaced retina projects so much as to involve the greater part of the patient's field of vision, the contrast between the reddish reflection from the healthier portion, and the opaque, dark-colored, lobe-like projection of that which is displaced, is very remarkable.

When nearly the whole of the retina is separated from the choroid by effused fluid, the ophthalmoscopic appearances are sometimes very puzzling, in consequence of the oscillations imparted to the retina by every slight movement of the eye. At one moment the fundus of the organ appears of a dull grey; then the optic nerve suddenly presents for a moment its white surface; and then again some vessel of the retina comes clearly into view, and as quickly disappears These glimpses are often rendered still more confused by the existence of floating bodies in the vitreous humor.

When treating of Iritis (p. 153), I alluded to the remarkable insight which the ophthalmoscope has given us, into the co-existent inflammation of the retina. But we now know that syphilis may affect the retina without involving the iris at all. If such a case be examined while the deposit is still recent, we may see the optic nerve and retinal vessels uniformly clouded over, and

partially hidden, by a film of inflammatory effusion. At a later period, portions of the retina may in some degree have regained their normal aspect, while other portions may present large, opaque, whitish patches, destitute of any visible vessels. and irregularly blotched over with pigment.

It is no part of my plan to write a complete "History of Amaurosis;" nor, indeed, have I in this work undertaken to do more than point out how diseases of the eye may be studied. There are, however, some points in the *Treatment* of retinal affections which demand a short notice in this place.

Probably one of the most important results of the ophthalmoscope will be a great restriction in the administration of mercury. Patients who, for many months, have lost the perception of objects—perhaps even of light itself—will no longer be encouraged to submit to a lengthened mercurial course by the vague assurance that, "as their case is one of *Amaurosis*, a full course of mercury may give them a chance." A view of the fundus of an eye overspread with *old* coagula; of a retina detached from the choroid by effusion of serum, and undulating with each movement of the globe; of an atrophied optic nerve; of a vitreous humor filled with opaque filaments and corpuscles;—these, and other palpable signs of disorganization, will force the most devoted believer in the omnipotence of mercury to dethrone his idol. As for strychnine, its action appears to be so precisely limited to the motory fibres of the nervous system, that to expect it to influence a nerve of special sense, is to confound all our notions of nervous

physiology. In no case of impaired or lost vision have I ever seen strychnine effect the slightest improvement.

Mercury, administered according to the indications of a clear and intelligible diagnosis, must ever be as invaluable in ophthalmic as in general medicine. It may be as rational, under certain conditions, to treat a case of *Mydriasis* with strychnine, as to employ that agent in any other instance of impaired motory power. But neither of these drugs will henceforth be given, in cases of retinal disorganization, in the vague and uncertain manner which has hitherto prevailed.

A long list might be made of those causes which act prejudicially on vision, by exhausting the general nervous power—protracted suckling, venereal excesses, the abuse of alcohol, tobacco, or opium, &c. In combating the ill effects of these depressing agencies, no special *ophthalmic* remedies are to be adhered to. The same treatment which restores the nervous system generally, will not fail to act beneficially on that portion of it which is subservient to vision.

CHAPTER VIII.

THE VITREOUS BODY.

FREEDOM from all opacity is essential to the idea of this body in a healthy condition. General cloudiness, or discoloration, or any solid masses dispersed through its substance, must prove, in a greater or less degree, hinderances to vision.

Previous to the invention of the ophthalmoscope, we had but little opportunity of appreciating the changes to which the vitreous body was liable. A loss of its natural consistency was known to occur in many cases of chronic inflammation of the deeper tissues, and was evidenced by the peculiar soft, doughy feel communicated to the finger, so different from the firm, resistent elasticity of a healthy globe. The escape of a portion of the vitreous body, during the operation of extracting a Cataract, also afforded occasional opportunities for observing the watery condition to which it might be reduced by chronic disease.

It was known that blood was occasionally effused into the vitreous chamber, as the result of severe blows on the eye; but it was extremely difficult to recognize these effusions during life; and still more so, to detect those smaller extravasations which occur spontaneously in certain connected states of the deep-seated tissues.*

The ophthalmoscope now shows us that morbid changes in the vitreous humor are by no means so uncommon as had been supposed. It is, however, far more easy to

* The rare occurrence, and difficult diagnosis of these "Effusions of Blood into the Vitreous Chamber," induced me to publish a short

determine the precise nature of these changes; for not only is it difficult to bring into a proper focus the variously-shaped bodies, which appear as flakes, rounded granules, filaments, &c., but this difficulty is greatly increased by the rapidity with which some of these bodies are whisked about in the vitreous humor, by every slight movement of the patient's eye. They are, probably, for the most part, coagula of effused blood; mixed, in some cases, with granules of pigment, or the products of inflammation. Some of the larger, more membranous flakes, suggest the notion of their being portions of broken-up hyaloid tissues. We must bear in mind that bodies in the vitreous humor will appear black when viewed with the ophthalmoscope, although they would not do so if seen out of the eye. They intercept the rays of light passing from the patient's retina to that of the observer, and thus produce the effect of dark bodies on a light ground.

The term *Synchysis* is applied to that fluid condition of the vitreous body which results from the disintegration of the delicate membranes traversing it; and of late years, a good deal of notice has been taken of a singular variety of it, known as "Sparkling Synchysis," (*Synchysis étinceiant* of the French), which is produced in the following way.

An opaque lens sometimes undergoes extensive fatty change, the fatty matter crystalizing as minute plates

paper on the subject, (*Lancet* January 28th, 1854). The cases therein related were observed several years before the invention of the ophthalmoscope, and the description of the morbid appearances is very meagre and incomplete, as compared with what it might have been if the present means of examination had then existed.

of cholesterine. If such a lens be dissolved, by the ordinary needle-operation, or broken and thrown down into the vitreous chamber by a blow, the area of the pupil, on close examination, may be seen full of little shining points, which glitter like minute particles of gold-leaf. If the eye is kept at rest, they appear inclined to gravitate towards the bottom of the chamber; but the slightest movement sets them again in motion. They are plates of cholesterine, glancing in the light, as they turn in the mingled aqueous and vitreous humors.

I may here mention, as among the most remarkable revelations of the ophthalmoscope, the existence of Entozoa (*Cysticerci*), either adherent to the retina, or floating in the vitreous humor. Three cases of the former kind, and one case of the latter, have been observed by GRAEFE, of Berlin, who describes them in the first volume of the *Archiv für Ophthalmogie*, p. 457, and gives two colored figures of the parasite, as seen with the eye.*

* As yet I have never met with a single instance of Cysticercus in the living subject, in connection with the vitreous humor or the retina; nor am I aware of any case having been recorded in this country. Perhaps this may depend on a fact, which I believe is well ascertained, namely, that the natives of the British Islands are much less liable to tape-worm than those of Northern Germany. The very curious researches which have recently been made into the natural history of intestinal parasites, have proved that the *Cysticercus cellulosæ* and the *Tænia* are really the same creature, in different stages of development. See KUCHENMEISTER and VON SIEBOLD, *On Animal and Vegetable Parasites.* (Sydenham Society, 1857).

A few instances of Cysticercus, in the anterior chamber, have been noticed in Great Britain, and my colleague, Mr. HULKE, informs me, that, in a disorganized and irritable eye, which had been removed by operation, he found a Cysticercus lying between the choroid and retina.

CHAPTER IX.

THE LENS, AND ITS CAPSULE.

PERFECT transparency is the most marked characteristic of these structures in a state of health. During the earlier periods of life, they are also quite colorless; but in most persons who have passed their thirtieth year, the lens begins to acquire a pale yellow tint, and this continues to deepen as age advances, until the part may eventually assume quite an amber color. This fact must be borne in mind when morbid states of the lens come under our consideration.

We occasionally meet with cases in which there is every reason to suspect that the lens may either have been detached from its natural situation, in consequence of disease, and have fallen out of sight into the depths of the vitreous chamber, or been violently torn from its connections, and wholly ejected from the eye. Upon the presence or absence of the lens, our whole treatment of such cases must depend. How, then, can we with absolute certainty pronounce an opinion on the question?

If, after dilating with atropine the pupil of the suspected eye, we place the patient in the dark, and then slowly move a lighted taper to and fro, on a level with, and at a few inches distant from, the pupil, we shall of course perceive an image of the flame upon the anterior surface of the cornea. If the lens be wanting, this will

be the only reflection visible. If, however, the lens be still in its natural position, two other images, much smaller than that on the cornea, will appear within the pupil: one inverted, which is reflected from the posterior surface of the lens; the other upright, reflected from its anterior surface. If the taper be moved from side to side, the inverted image, which is always indistinct, and sometimes very difficult to be recognized at all, quits its position between the two upright images, and moves away in a direction opposite to that given to the taper.

This experiment—which is so valuable, when employed with the object I have just mentioned—has been recommended as a "catoptric test" for deciding the presence or absence of Incipient Cataract. I believe it to be of no real value for such a purpose. Any opacity in the lens sufficient to interfere with the reflection of light from its two surfaces, must be readily appreciable, on simple inspection, by an observer endowed with those powers of adjustment of vision, for near and minute objects, without which no one can profitably study the diseases of the eye.

Altered position of the Lens.—The "suspensory ligament of the lens" being attached to the capsule along the whole extent of its circumference, movements of the lens backwards and forwards must, in the healthy state, be limited to that slight amount which suffices to adjust vision to objects at different distances.* A blow, or

* I am supposing adjustment of the eye to depend upon change of position, and not change of figure, in the lens, although the latter theory is supported by several eminent authorities.

other shock to the eyeball, however, may rupture some portion of the ligament, and the lens may then acquire mobility proportioned to the extent of the rupture.

Sometimes the ligament is detached, except at one small spot, and the portion which remains unbroken then acts like a hinge, upon which the lens sways to and fro as the patient's head is inclined forwards or backwards. The iris, in such a case, is tremulous, and vision of course much confused.

I have spoken of this partial separation of the lens from its suspensory ligament, as being usually the result of external violence; but it must occasionally happen from some internal cause, inasmuch as I have seen it exist in *both* eyes, in a precisely symmetrical degree.*

If the transparent lens, enclosed in its still unbroken capsule, be wholly detached from its connections, and dislocated into the anterior chamber, the recession of the iris, and the peculiar reflection of light by the lens, —especially the brilliant luminous ring formed by its margin,—will enable even the most inexperienced to recognize the nature of the accident. In young subjects, a lens so displaced will retain its transparency for several weeks, provided no inflammation occur in the iris to cause effusion of fibrine, and consequent deposit on the capsule. Eventually, however, irritation is set up, and the removal of the displaced body becomes necessary.

DISEASES OF THE LENS.

Every morbid process which takes place in the lens is attended with more or less of opacity. The term

* Appendix; Case E.

Cataract,* in its modern acceptation, includes under one common head all the varied forms which this opacity may assume. Its meaning should be restricted to the expression of these forms; and it seems very desirable to abolish the term "Spurious Cataract," applied to inflammatory deposits obstructing the pupil. Our nomenclature cannot be made too precise and definite, especially in ophthalmic medicine, overloaded, as it still is, with words outliving the theories which gave them birth.

I take it for granted that my readers are already acquainted with the more minute anatomy of the eye, and I will therefore only briefly allude to the healthy structure of the lens, before proceeding to the consideration of its diseases.

* To understand how this word came into use, we must be aware of the opinions held by the ancients as to the nature of Cataract. They supposed that a considerable empty space existed between the iris and lens, and that a certain humor, dropping from above into this space, coagulated there into a firm membrane in front of the lens. The latter body they supposed to be quite unaffected by the disease; and this opinion was so firmly rooted in their minds that, even after using a needle to depress a Cataract, they believed they had only removed an opaque skin out of the axis of vision, and had left the lens untouched, and in all its natural transparency. One sees, therefore, how readily they could trace an analogy between a membranous screen descending in front of the lens, and a *portcullis* let down before the gate of a fortress. Now, the original meaning of "Cataracta" is *portcullis;* and in that sense the word is used by Livy (Historiarum, Lib. xxviii. cap 28), where he describes the attempt of Hannibal to take Salapia. The inhabitants raised the portcullis (cataracta), allowed six hundred of the enemy to enter the city, and then—"quum sexcenti ferme intrassent, remisso fune, quo suspensa erat, *Cataracta* magno sonitu cecidit."

Immediately within the very delicate, but firm and transparent capsule, which encloses it, the lens presents (1) a layer of nucleated cells; (2) within these again are the superficial, softer fibres; and (3) most internally of all, the denser fibres, constituting what is termed its *nucleus*.

Now, when any of these tissues undergo the cataractous change, their peculiar anatomical arrangement is made visible, and we are thus enabled to distinguish the particular portion of lens in which the opacity is situated.

1. Opacities in the superficial cellular layer of the lens—depending, as they do, upon the breaking up and disintegration of the cells, and deposit of earthy or fatty matter—have a milky appearance, extending pretty equally over the whole area of the pupil, and mottled over with opaque white patches, arranged in every variety of figure.

2. The fibres may be said (without entering more minutely into their disposition) to form radii, converging from the circumference to the centre, being more or less curved accordingly as they are nearer to the anterior and posterior surfaces, or to the vertical plane of the lens. So long, therefore, as these fibres, although opaque, retain their integrity, they will be recognizable as *streaks*, having different degrees of curvature, and proceeding in a radiating manner from the edge towards the centre of the pupil.

In process of time, the softer and more superficial fibres, which, during several years, may have been clearly traceable as radiating lines of opacity, lose their linear

distinctness, and become blended together into one uniformly whitish or creamy pulp.

3. The *nucleus* is composed of fibres, radiating in the same manner as those of the superficial portion, but of a denser and firmer character than the latter. When this "nucleus" becomes cataractous in an old person, the change seems to consist in a process of drying and atrophy of its fibres, although its amber tint, and a certain degree of translucency, are still retained. When, therefore, softening of the superficial fibres begins, the *nucleus* is the part least disposed to yield; and it sometimes happens that the cortical portion has even passed into a state of fluidity, while the nucleus still remains firm and solid. It was to a Cataract in this condition that the ill-chosen term "Morgagnian" was formerly applied.

In younger subjects, the nucleus of the lens will not have undergone that preliminary process of drying and atrophy which in old persons constitutes its cataractous change; and, therefore, when the softening process sets in, the whole lens may yield, and eventually become completely fluid throughout.

With respect to *Opacities of the Capsule*—hitherto supposed to play so important a part in Cataract—it seems doubtful whether they have any real existence in that disease.

STELLWAG,* who has taken advantage of the immense number of *post-mortem* examinations occurring in the General Hospital of Vienna to investigate the histology of Cataract, after a careful microscopical examination

* *Die Ophthalmologie*, &c., 2 vols., 1853–8.

of about fifty Cataracts, with apparently opaque capsules, asserts that, in every instance, the opacity was produced by matter *attached to the lenticular surface* of the capsules; not *deposited in the very tissue of the capsules themselves.* This matter, which to the naked eye appears identified with the membrane, consists, for the most part, of earthy and fatty substances, firmly adherent, yet separable by careful mechanical and chemical manipulation. The various irregular patches in which the substances arrange themselves, give rise to that marbled or mottled appearance hitherto described as characterizing the *mixed*, or "capsulo-lenticular" form of Cataract.

A distinction between opacities *upon*, and opacities *of*, the capsule, has comparatively little interest in a surgical point of view; although it is very important in its bearing on classification and nomenclature. But my present object is not to discuss questions of nosological arrangement, but merely to point out the various aspects which opacity of the lens assumes, according to the age of the patient, or the duration of the disease.

To prevent being misunderstood, I may here observe that, however erroneous may be the opinions hitherto entertained, as to opacity of the capsule accompanying the formation of Cataract, there can be no doubt that the capsule does become opaque under certain conditions. For instance, after the lens has been removed by operation or accident, the shreds of divided capsule, by mere shrinking and rolling together, acquire a very marked opacity, quite independent of any earthy or fatty matter which may be still adhering to their surface

or of any inflammatory deposit exuding upon them from the vessels of the iris.

If the arrangement of Cataracts under the two heads, "Lenticular" and "Capsular," be abandoned, as founded on an anatomical error, their classification as "Hard" and "Soft" is by no means unobjectionable. Neither of the latter terms expresses more than a certain stage in the progress of Cataract. For in the so-called "Hard Cataract" of an old person, it is only the *nucleus* that undergoes any condensation or drying of its tissue; the peripheral portion is no harder than that of a healthy lens; and as soon as the softening sets in, the whole of this portion actually undergoes a change from solid to fluid.

The terms "Nuclear" and "Cortical"* might be conveniently used to distinguish the two grand divisions of Cataract.

The *nuclear* form is that met with in old persons, either alone or (much more frequently) in combination with *cortical* opacity.

Under the head of *Cortical* Cataract would be arranged—1. That congenital kind characterized by a single white dot (Cataracta centralis) or cone (Cataracta pyramidata), corresponding to the middle of the pupillary space.

2. That rarer form, occurring both in childhood and at adult age, which exhibits itself in irregular, opaque patches on the anterior or posterior surface of the lens, and immediately within the cavity of the capsule. These

* The word *cortical* is already in common use among foreign ophthalmic writers.

have hitherto been described as opacities of the anterior or posterior capsule itself.

3. That which is the most common Cataract of middle age, and even of old age, commencing as opaque striæ at the edge of the lens, and thence converging along its anterior and posterior faces.

The softening process which, sooner or later, involves *all* Cataracts, is invariably *cortical* in its origin; the nucleus being, as I have said, always the last portion to undergo solution.

Having drawn this slight sketch of the nature of Cataract, and its mode of development, I may now proceed to notice the leading varieties of appearance it presents, as modified by the duration of the disease, and age of the patient.

To give special names to Cataracts, according to the various figures which the opaque deposits may assume, is but to confuse the student's mind, and burden his memory with a mass of unnecessary terms. It must be evident that the transparent and opaque elements of a Cataract may so arrange themselves as to induce an endless variety of shades and markings, which practice alone can render familiar and intelligible. All that a teacher can do, either orally, or in a volume like the present, is to describe the general laws which govern the formation of Cataract, and then leave the student, by patient observation, to acquire tact in the diagnosis of particular cases.

The two important marks for him to keep in mind, as indicating the composition of a Cataract are,—(1) striated, radiating opacity; and (2) irregular, patchy, or mottled opacity. The former always shows that the

fibres of the lens still retain, to a certain extent, their natural arrangement, however they may be here and there broken down, or otherwise changed, and mixed with granular, earthy, or fatty matter. The latter appearance is a proof that the superficial fibres have been softened down into a pulp, and mixed up with the substances I have just enumerated.

Congenital Cataract appears under four well-marked forms:

1. As a minute dot, of a chalky whiteness, occupying the middle of a clear and dark pupil, and seeming to be situated in the thickness of the anterior capsule. In reality, however, it is a little mass of earthy and fatty matter, deposited in the most superficial portion of the lens itself, immediately within the capsular cavity. These central dots (*Cat. centralis*) are frequently overlooked at birth, and sometimes even remain unnoticed by the patient in after life. They are not necessarily attended with any extension of opacity to the rest of the lens, and are compatible with very useful sight.

2. A more extensive deposit of the same nature is that described by authors as "*Cat. pyramidata.*" It resembles the foregoing variety as to its central position, but is so much larger that it occupies nearly the whole area of the contracted pupil. The deposit is like a little obtuse cone of chalk, the base of which seems to adhere to the anterior capsule, and its apex to project forwards through the pupil. This, however, is not really the case; the opaque mass is imbedded in the superficial anterior portion of the transparent lens, and the capsule is continued interrupted over its apex.

It sometimes happens, both in central and pyramidal Congenital Cataract, that the rest of the lens, instead

of retaining its transparency, is slightly opaque. In that case vision would, of course, be very much restricted, and an operation for the removal of the cataract would be indicated. When lenses of the latter kind are broken up, the little cones usually fall off at the first touch of the needle.

3. The most frequent form of Congenital Cataract is that in which the whole area of the pupil, in its natural state, is occupied by a greyish-white, faintly striated opacity, the striæ converging from the margin of the pupil, to terminate, at its centre, in a dot more white and opaque than the rest of the lens. If the pupil be fully dilated with atropine, the outer part of the space appears perfectly black, or else a few white streaks are seen passing, here and there, across this black area, from the margin of the lenticular opacity, to lose themselves behind the iris. The inexperienced observer would be led to believe that the whole of the lens was opaque, and that its bulk was altogether much less than that of a healthy subject. But, in reality, the clear, black, ring-like portion of the pupil surrounding the opacity is occupied by the peripheral portion of the lens, which is in a transparent condition, save for the isolated opaque radii which traverse it in the manner I have just noticed.

This peripheral transparency frequently continues during adult life; so that a person whose sight is limited to the perception of large objects, so long as his pupils remain in their natural condition, may, by the use of atropine, expose such a ring of clear lens, as will enable him not only to read, but even to follow employ-

ments requiring a very close appreciation of minute objects.*

4. By far the rarest form of Congenital Cataract is that in which a limited deposit occurs among the cortical fibres of the lens, either on its anterior or posterior surface. Such irregularly-shaped patches appear to be of the same earthy and fatty nature as those which have been frequently noticed in adults, and described as opacities of the capsule itself.

A case of this kind, which came under my notice a few years ago, was at that time the only instance in which I had observed Congenital Cataract to be limited to one eye. The opacity was chiefly formed by a patch quite at the back part of the lens; and it therefore appeared to be very deeply seated. It had, also, the faintest possible tinge of yellow or buff. Careful examination, with a fully dilated pupil, convinced me that the dense opacity was really in the lens, throughout which there also extended a very slight, barely perceptible haziness. I accordingly operated, by *Keratonyxis*,

* I have had under my notice for many years a case which strikingly illustrates these remarks. A man about forty years of age has had Cataract in both eyes from birth. The left lens is not only very opaque at its centre, but the peripheral portion is also slightly cloudy. With this eye he can discern large objects, but cannot distinguish type. In the right eye, the area of the pupil, while in its natural state, is also wholly occupied by a pretty dense opacity; but when he uses atropine, a perfectly clear portion of lens is brought into view, and he not only is able to read, but to do the fine work of a watch-finisher, adjusting even the delicate works of Geneva watches. He has used belladonna or atropine during the greater portion of his life, without any impairment of the natural motory power of the iris having resulted.

when the child was six months old; and the case did perfectly well. By a curious coincidence it happened that, while the child was under my care, a case of Congenital Cataract in one eye only, occurred in the practice of one of my colleagues, who had not previously met with an instance of the kind.

If infants who have Congenital Cataract are also the subjects of *hereditary syphilis*, they may be attacked with Iritis within a few weeks of their birth, and adhesions may form between the pupillary margin and the lens, which will prevent the usual effects of atropine being manifested. At the same time the anterior surface of the capsule may become thickened by inflammatory deposit, which will prevent any view of the fibrous structure of the lens.

Congenital Cataract is usually, although not always, attended by an incessant twitching movement of the eyeball, termed "Nystagmus." This, however, is not peculiar to cases of Cataract, but may occur where there has been ulceration, and consequent opacity of the cornea, soon after birth.

Morbid appearances which may be mistaken for Congenital Cataract, are afforded by Scrofulous or Encephaloid deposit in the fundus of the eye. These deposits, if seen at an early period, may be distinguished by their *deep* situation, and their more or less *yellow color*. Nothing but practice will give the student the power of appreciating at a glance the relative distances of opaque objects seated in the transparent media of a patient's eye. To the beginner, a nebula on the cornea, a patch of opacity on the anterior or posterior surface of the lens, and a

deposit on the retina, appear almost on the same plane. The yellow color, also, of scrofulous or malignant deposit is sometimes very faintly marked at first: at a later stage it assumes a golden hue, and in the case of encephaloid disease, vessels may be seen ramifying in the mass.

If, however, a case of the latter kind is not seen until the lens has become cloudy, it may require a careful examination to decide whether the affection be one of Simple Cataract, or of Cataract consequent upon a malignant deposit in the vitreous chamber. In the later stage of malignant disease, the pupil becomes widely dilated and fixed; which is never the case in Simple Cataract.

Obliteration of the anterior chamber, by bulging forward of the iris; immobility of the pupil; a generally diffused cloudiness of the lens; and a yellowish tint, which seems to be imparted by something advancing from behind, are circumstances which should make the observer suspect something more than a mere affection of the lens.

As a rule, too, Congenital Cataract affects both eyes; Encephaloid disease only one. Scrofulous deposit, although it may eventually destroy both eyes, seldom attacks them to the same extent, or at the same time.

Cataract in Children.—Except as a result of injury, Cataract is rarely seen to *commence* during childhood; I mean between infancy and puberty. If opacity diffused throughout the entire lens be met with at that period of life, it is commonly the result of a further cataractous change in an eye affected from birth with the

ordinary congenital disease—a condition which had been overlooked so long as the opacity remained in its original state of development.

And that it may be so overlooked is not at all improbable; for the congenital opacity (confined to the central portion of the lens, and leaving the periphery transparent, in the manner already described at page 221) is sometimes so faintly marked as to be wholly unobserved by the child's friends. When, however, a fresh extension of opacity takes place, and spreads quite up to the extreme edge of the lens, superficial softening and disintegration slowly set in: and the milky, chalky, or mottled aspect, which the pupil then assumes, is sure to attract attention. It far more frequently happens that no such extension of opacity or softening occurs, but that the Congenital Cataract remains up to adult age in its original state (page 222).

I have, however, met with a few cases in which it appeared to me that Cataract, of a peculiar kind, first began to be developed when the patients were about the age of nine or ten years. The children had gone to school at, perhaps, the age of seven or eight, and at first had seen quite well, so as quickly to learn to read. At the end of a year or so their sight began to fail; they could not read, except at a short distance, and even then imperfectly, and could hardly recognize faces across a room. They were supposed to be "growing shortsighted" —if, indeed, their deficiencies received so merciful an interpretation, and did not bring down punishment for their supposed inattention and idleness.

I have notes of several such cases, and on referring to them I find three distinct forms of opacity described.

In every instance, the utmost care and pains were required in the examination; a well-dilated pupil, and light concentrated by means of a magnifying glass, being indispensable.

First form.—An irregularly-shaped patch on the posterior surface of the lens, looking as if it were seated in the capsule itself. This patch has, in most instances, been placed—not in the exis of vision, but at the edge of the lens, extending, however, towards the centre. In one patient, who had a posterior patch of this kind in each lens, I watched the opacity from month to month during a year, without observing any change to take place in it. I then lost sight of the case for a few months, after which time the child was brought with the left lens wholly opaque, and of a bluish-white, "skim-milk" appearance; the other lens remaining as before.

Second form.—The lens dotted throughout with fine white points, disposed in the course of the fibres; the intervening portions of lens being transparent. These points were as minute as if pricked with the finest needle, and the general effect produced was that of a very faint haziness of the pupil. The patients were ten or eleven years old; and they described their dimness and extreme shortness of sight as having been first noticed about a year before they were brought to me.

In breaking up these lenses, by the operation of *Keratonyxsis*, I was struck with their unusual softness; even their central portion seemed as unresisting as the periphery; and the needle passed through their substance as if it had been so much jelly.*

* See a report of one of these cases in the *Medical Times and Gazette*, for June 18th, 1853, p. 631.

The *third form* I have seen in only one patient, a sturdy little country boy, eleven years old. The irides were very active, and the pupils, in their natural state, offered no peculiarity of appearance. With the right eye he could barely discern a difference of shade between a printed and a blank page: with the left he could read large type. On dilating the pupils, and concentrating light on them with a magnifying glass of one inch focus, I perceived the whole posterior face of the right lens to to be covered with very fine opaque lines, closely set together, radiating from the circumference towards the centre, so as to produce the effect of a concave surface, composed of a delicate fibrous membrane. At the centre of this surface, in the axis of vision, was an opacity in the form of a ring, more dense than the rest; the area, however, not being black and clear, but hazy, like the remaining portion of the hinder surface of the lens. The left eye presented somewhat the same appearances, but in a slighter degree; the posterior striæ being wider apart, and the ring-shaped opacity in the axis of vision only indistinctly marked.* The whole of the lens, with the exception of this posterior opacity, was pefectly transparent.

I may seem to be needlessly minute in describing the appearance of these peculiar forms of Cataract—and mere verbal descriptions are unavoidably somewhat dry

* The ring-shaped opacity, in different varieties of form and size, I have seen in middle-aged and old persons. It no doubt consists of earthy and fatty deposit, such as is commonly found in cortical opacity of the lens; but I cannot say on what its peculiar ring-like form depends.

and tedious,—but the affection is so liable to be overlooked, and the patient's prospects in life may be thereby so materially thwarted, that I have thought it right to enter into such details as may enable the student to detect these rare and most delicate forms of lenticular change.

Cataract in adults and old persons.—From puberty to the age of forty, opacity of the lens is rare, except as a result of injury. When it does occur spontaneously, it is *cortical* in its origin; the margin of the lens first exhibiting opaque striæ, which gradually converge as they extend themselves along its anterior and posterior faces. Between forty and fifty, Cataract may still be said to be rather a rare disease; but from fifty to sixty, and so on, up to the later years of life, it is the defect we naturally expect to find when a patient consults us for failing sight.

It is impossible to fix the exact time of life at which that peculiar morbid change takes place in the nucleus, described at p. 216. Perhaps sixty might be named as the age after which it may be expected to occur; although I am perfectly convinced, from repeated and careful examination of patients, that even to extreme old age it is much more common to find marginal opacity beginning while the nucleus is still clear, than to find nuclear opacity beginning while the periphery of the lens remains transparent.*

* In a short paper published in the *Lancet*, in 1852, (Sept. 18th), I stated my belief that ophthalmic writers had been *unanimous* in describing the opacity of Cataract "as beginning at the centre of the lens, and gradually spreading towards the circumference." As

Whether cataractous opacity usually spreads from the centre of the lens towards the circumference, or from the circumference towards the centre, is—as the reader must readily perceive—no question of mere pathological nicety. It has a most important bearing on diagnosis and treatment.

An elderly patient presents himself, complaining of some slight mistiness and indistinctness of sight. The iris may be active; the area of the pupil of natural blackness: Cataract will not suggest itself to the surgeon, if he be prejudiced by believing that it almost always commences in the centre of the lens; and he will probably regard the dimness of sight as altogether of nervous origin. But let him fully dilate the pupil with atropine, and then throw light upon each part of

regards the authors of general treatises on eye diseases, my assertion was undoubtedly correct. But I was not aware, at the time I published my paper, and subsequently a letter in the same journal, (Nov. 13th), that the centripetal extension of cataractous opacity had been so distinctly asserted by MALGAIGNE, in a letter addressed to the President of the Royal Academy of Medicine of Paris (quoted in the *Annales d'Oculistique*, vol. vi. p. 63, 1842): he says—"Toujours l'opacité commence par les couches molles qui avoisinent la capsule, et d'ordinaire vers la grande circonférence du cristallin: dans le plus grand nombre des cas l'opacité étant complète à la face antérieure, et à la face postérieure, le noyau demeure parfaitement clair. Dans d'autres cas plus rares, le noyau prend une teinte brune, se dessèche, devient friable, et est alors opaque veritablement." He adds—"Jamais je n'ai rencontré le capsule opaque."

The much more extended observations of STELLWAG, made with the additional advantages which the microscope affords, have since confirmed the truth of MALGAIGNE'S assertions, although with some limitations and exceptions. The "toujours" in the passage just quoted is too sweeping and absolute.

the lens in succession, by means of a convex glass of about one inch focus; he will perhaps find the whole posterior face of the lens covered with faintly yellow, opaque lines, radiating inwards from the margin, and, along the latter part, grouped together here and there into patches; or these marginal patches may exist at one or two points only, the hinder face of the lens being to a considerable extent clear. This would denote a still earlier stage of the disease. Or again; in addition to opaque patches at the edge of the lens, a few striæ may be traced along the front surface, stopping short of the border of the natural pupil. The anterior position of these striæ can of course be at once recognized by a practiced observer; but it may aid the less experienced to be told that the opaque streaks of a cataractous lens are in themselves white. Those on the anterior surface, therefore, being viewed through colorless media—the cornea and aqueous humor—retain their white appearance; while those behind acquire a yellow cast, from being seen through the still transparent part of the lens.*

In some works, minute directions are given for investigating the *subjective* symptoms of Cataract; that is to say, inquiring as to the various changes of sight which the patients themselves are conscious of. The surgeon need not lose his time in such inquiries. The only way to find out whether a patient has a commencing Cataract is—*to look for it.* A well dilated pupil; a clear, concentrated light; a knowledge of what he is to search for, and how he is to find it—comprise all the conditions

* See Ruete, op. cit. pl. xxxi., fig 3.

requisite for enabling the surgeon to detect opacity of the lens.

It might have been reasonably supposed that the ophthalmoscope would have proved very valuable in clearing up difficult diagnosis of Cataract; but practically we find that the intense light renders *very faint* striæ invisible. Dense opacities appear under the ophthalmoscope as radiating black lines; but in such an advanced stage of Cataract the opacity can be readily seen by ordinary daylight.

The following is the ordinary progress of Cataract in elderly persons. At first, opaque streaks appear at the extreme edge of the lens; most commonly I have observed the lower edge to be first affected. The streaks gradually coalesce into patches, and spread themselves over the posterior face, a few only extending a short distance along the anterior face. The Cataract may perhaps remain in this state for a year, or more; then the whole body of the lens becomes slightly hazy, but not so much so as to prevent the posterior radiated opacity from being recognized. Gradually the opaque streaks advance further and further along the anterior face of the lens, until they appear within the area of the undilated pupil. By this time the general haziness has increased so much, that the posterior face of the lens is hidden from view, even when concentrated light is thrown into the eye; and the opacity, both the linear and the diffused, becomes denser and denser, until little more than the anterior surface of the lens can be seen. Cataract is then complete, and vision commonly restricted to mere perception of light.

As years go on, the surface of the lens usually becomes more and more opaque and white, in consequence of the increased deposit of earthy and fatty matter. The latter sometimes assumes the form of cholesterine, in such large crystals as to give the surface of the Cataract a sparkling appearance, as if powdered with minute particles of gold-leaf. Should a lens in this state become ruptured and dislocated, and sink out of view into the vitreous chamber, crystals of cholesterine are set free, and, by dancing up and down within the pupil, produce the phenomena of "Sparkling Synchysis" (p. 209).

If, as sometimes happens, the superficial softening and deposit of white matter be retarded, the Cataract has a dull, brownish aspect, like clouded horn, and in this state is often extremely difficult to detect.

Occasionally the lens is found of so deep a brown that it is called a "Black Cataract." In very rare instances, however, absolute blackness is met with.*

Fluid Cataract.—In lenses which have become opaque, either from disease or injury, the softening process will sometimes slowly go on until nearly the whole mass has passed into the fluid state. It was to the early stage of this process that the term "Morgagnian Cataract" was formerly applied, in the belief that it was the

* In my first edition I asserted the contrary, but, within a few weeks after the publication of the volume, a Cataract was removed by one of my colleagues, which, when extracted, appeared entirely black. Before the operation, there had been no suspicion of its peculiar nature. It had seemed to be of a deep color within; but several fine whitish lines radiated on its anterior surface, formed, no doubt, by slight earthy deposits just inside the capsule.

"humor"—falsely supposed by MORGAGNI to exist, in the healthy state, between the capsule and lens—which became opaque, and formed the impediment to vision.*

The most uniform characteristic of Fluid Cataract is a total absence of those radiating streaks so evident in ordinary Cataract, where the fibres of the lens, although deprived of their transparency, still retain their natural arrangement.

Fluid Cataract is frequently white, with a faint bluish cast, like milk and water; this tint being either uniform throughout, or irregularly mottled here and there with more opaque patches.

In other cases the lens assumes a dirty-grey color, aptly compared by LAWRENCE to that of "thick gruel."

Sometimes a faint tinge of yellow, and a seeming inequality of consistence, give to a perfectly Fluid Cataract the appearance of curdled cream. In such a case the most practiced eye may fail to distinguish the morbid change from one of a directly opposite character—namely, that in which the solidity of the lens has been increased by earthy deposit. The creamy color is usually a sign of the Cataract having existed in the liquid state for a considerable time.

* It is curious that MORGAGNI himself attributed Cataract to a morbid process the very reverse of this! His own words are—"Tunica [crystalloide] in vitulis etiam, bobusque, sive recens sive non ita recens occisis perforata, pluries animadverti illico humorem quendam aqueum prodire: quod et in homine observare visus sum, atque adeo credidi *hujus humoris secretione prohibita*, crystallinum siccum et opacum fieri fere ut in extracto exsiccatoque crystallino contingit." (*Adversaria Anatomica*, &c., Lugd. Bat. 1741, Adv. vi., p. 90.)

Fluid Cataracts are commonly said to be larger than solid ones, and to manifest their greater bulk by pressing the iris forwards, and lessening the capacity of the anterior chamber. The latter part of this statement is by no means uniformly true; for cases of genuine Fluid Cataract occur in which the iris deviates little, if at all, from a vertical plain; and a fluid lens, even if actually increased in size, may, on account of some alteration in the vitreous body, project backwards, instead of pressing forwards into the pupil.

It is asserted that the opacity of a Fluid Cataract is most marked towards the lower part, in consequence of the gravitation of its denser particles, and that a brisk movement of the eye, by mixing together the contents of the capsule, will at once cause the opacity to become uniformly diffused. This effect of gravitation is, I apprehend, but rarely seen, except by a very practiced observer, and cannot be much relied upon as a means of diagnosis.

A Cataract in a perfectly fluid state may intercept the rays of light more completely than one which is solid; sometimes to such a degree as almost to destroy the power of perceiving light. One must be careful, therefore, in describing a lenticular opacity as "dense," to distinguish between the two senses in which this word may be used; since an opacity may have great density in the sense of being *impenetrable to light*, while yet of the least possible density in the sense of *firmness of texture*.*

* In almost every illustrated work on eye diseases, we find representations of Cataract in its various kinds and degrees, but I know

Traumatic Cataract.—Wounds of the lens not only render the injured portion opaque, but the opacity gradually extends throughout the lens, producing an appearance closely resembling that of a spontaneous Cataract.

The traumatic form is, of course, always "cortical" in its origin, inasmuch as the exciting cause—the foreign body—must begin by acting on the outer surface.

Under peculiar forms of injury, opacity may commence at the same time on the surface and at the centre of the lens.

A woman, shaking out a cloth in which a pin happened to be fixed, jerked out the pin with such force that it struck her on the eye, and pierced the sclerotic about half an inch from the margin of the cornea, entering so deeply that she had much difficulty in grasping it so as to draw it out again. It transfixed the lens from side to side; and when I saw her, two or three days after the accident, the track of the pin appeared like a whitish line, passing quite across the dark area of the pupil. Gradually the whole lens became opaque, and was eventually absorbed; the capsule alone requiring to be removed by operation.

When the capsule is lacerated so that a permanent opening results, the cells and fibres of the lens imbibe the aqueous humor, they become dissolved, and eventually absorbed. It is on this physiological fact that the beautiful operation for removing Cataract *by solution* is founded.

of no figures which show anything beyond the most obvious appearances of the disease: the more delicate effects are wanting, and, indeed, can hardly be imitated by the artist.

If the capsule and lens have been freely punctured with a thorn, or any sharp instrument of considerable size, the greater part of the lens is gradually absorbed, while a certain portion remains, and undergoes fatty and earthy change. The Cataract thus formed acquires, after some years, a flattened disk-like figure, and stands much farther back from the plane of the iris than a full-sized opaque lens. It has also an unequally mottled, dead-white appearance, and sometimes exhibits crystals of cholesterine.

Capsule never becomes absorbed. When lacerated in various directions, its shreds contract, roll up, and shrink together to a remarkable degree. However wasted, therefore, a lens may become after such an injury as I have just described, its remains are always enclosed in capsule, which is thickened on its lenticular side with earthy deposit, and on its outer surface with an inflammatory membranous coating, in the event of Iritis having occurred. In the latter case, too, the pupillary margin will have become more or less united to the capsule, so as, perhaps, wholly to resist the action of atropine.

In *old* traumatic cases, it very often happens that the inexperienced observer fancies he discerns a clear black aperture at some part of the opaque capsule, and wonders, therefore, that the patient has not a considerable amount of sight; whereas the *supposed aperture* in the capsule is really nothing more than a *patch of blackish pigment*, deposited upon it from the hinder surface of the iris. Concentration of light, by means of a convex glass, will greatly assist in detecting the real nature of such patches, which are often extremely deceptive, even to practiced observers.

The shreds of capsule, which remain after the lens has become absorbed in consequence of injury, may exhibit such varieties, in respect of form and degree of opacity, that to enter into minute descriptions of them would be uselessly tedious. Practice will alone enable the student to distinguish between a streak of white opacity on the surface of an otherwise transparent lens, and a strip of opaque capsule stretching across the dark area of a pupil from which the lens has been removed.

Where the lens has been wholly absorbed, in consequence of a well performed needle-operation, or accidental wound, the lacerated capsule gradually shrinks away from the centre of the pupil towards the suspensory ligament, and eventually forms a white ring, which, in the more contracted state of the pupil, is hidden by the iris. Dilatation of the pupil with atropine is, therefore, very often a means of clearing up an obscure case, by revealing the manner in which a lens has been got rid of.

The posterior capsule, which so frequently forms an impediment to distinct vision after a successful operation of Extraction, often requires for its detection a peculiarly close scrutiny, with the aid of concentrated light; so delicate and filmy is its texture, and so slightly does it modify the blackness of the pupil across which it is stretched. And yet, trifling as such a film may appear, it may deprive the patient of much of the benefit of the operation he has undergone, and just make the difference to him of being able to read or unable to read.

I need hardly say that cases of Traumatic Cataract

are sometimes extremely complicated, in consequence of the cornea, sclerotic, or iris, being involved in the injury. The appearance which the corneal wounds present will be found noticed under the head "Cornea" (page 112). The dilatation which they sometimes require, to allow of the escape of a partially dislocated lens, will be treated of when the operation of Extraction is considered. *Sub-conjunctival Dislocation of the Lens* has already been separately described.

CHAPTER X.

DISEASES WHICH INVOLVE ALL THE TISSUES OF THE EYEBALL.

GLAUCOMA; SCROFULOUS, ENCEPHALOID, AND MELANOTIC DEPOSIT.

I HAVE here grouped together several diseases which obviously have no histological connection with each other; but they all present in common certain objective phenomena—such as, for instance, a morbid reflection from the bottom of the vitreous chamber, and, at a certain stage, opacity of the lens; ultimately they affect, in one way or other, all the tissues of which the eyeball is composed.

The reader must ever bear in mind that my object in the present work is not scientifically to describe the *morbid anatomy* of the eye, but to present such a series of pictures of disease as may enable him more readily to recognize its different forms when presented to his notice in the *living subject*.

GLAUCOMA.

This has always been a puzzle to the student of ophthalmic diseases. At one time he hears the term "glaucomatous" applied to a peculiar reflection from

the pupil, which, it is said, appears of a green color;* although he may in vain look for anything like the ordinary green of familiar objects. Then he is informed that γλαυκος means only a "sea-green." In fact, the Greek physicians, who invented the *word* Glaucoma, knew nothing of the *thing* which we now understand by that name. Being ignorant of the anatomy of the eye, they naturally mixed up it diseases together in utter confusion; so that it is almost impossible to understand what they really meant by the terms they employed: nor is it very profitable for us to inquire. We may, for the present, dismiss all questions of etymology, and consider "Glaucoma" as a convenient term, used in a purely arbitrary sense, to imply a form of blindness, attended with peculiar morbid changes in all the various tissues of the eyeball.

Even before the middle period of life, the lens, as I have already mentioned, always acquires a yellow tint, which gradually deepens, until it assumes in old persons a decidedly amber color; and this quite irrespective of any cataractous change.

The fundus of the healthy adult eye is, as we know from ophthalmoscopic observation, of a more or less reddened bluff tint, except where the optic nerve presents its white disk; and the rays of light, reflected from such a surface, and transmitted through the

* "Retinitis—Glaucoma;—the latter term being applicable when the disease has extended to the vitreous body, and occasioned a change from which the humor presents a *green* color." TYRRELL, vol. ii. p. 127. In pl. xxiii., fig. 3, of DALRYMPLE'S work, the artist has acted up to this notion of Glaucoma, and embellished the pupil with a patch of lively pea-green.

yellowish lens, appear to the eye of an observer as a greyish or drab-colored spot. This reflection it is which the inexperienced, or those upon whom experience is thrown away, so often mistake for the opacity of Cataract. Dilatation of the pupil with atropine, by admitting a greater flood of light to the retina, renders the spot still more distinctly visible; and a patient, who may perhaps really require nothing more than a pair of spectacles, is told that he is the subject of "Incipient Cataract."

The student cannot be too soon made aware of the fact—that pure and absolute blackness is not, under any condition, the characteristic of the pupil in elderly persons: a knowledge of this will save him from falling into constant errors of diagnosis. Any whitish deposit on the surface of the retina will increase the intensity of the reflection; and if, at the same time, the contractility of the iris be diminished, and vision impaired, the phenomena of "Glaucoma"—in the sense so commonly attached to the term—will all be present.

A well-marked, greyish, drab-colored, or bottle-green reflection from the pupil of a patient's eye may, then, co-exist with good sight; but if the reflection is accompanied by impairment, or even total loss, of vision, still, the reflection is not the essential sign or characteristic of the disease; nor is the case to be set down as one of *Glaucoma*,—however *glaucous* the pupil may be deemed,—unless other very marked changes be present in the eye.

I will first give a description of the aspect presented by a case of *Glaucoma* (I use the word always in its

arbitrary sense) when *fully developed;* and will next point out the two widely different morbid processes by which results so similar in appearance are produced.

The patient is almost invariably beyond the middle period of life: perhaps between fifty and sixty is the most common age for the occurrence of the disease. It usually affects both eyes.

The globe, instead of having that slight degree of elasticity which it possesses in health, is peculiarly hard, giving to the finger almost the sensation of stone.

The sclerotic, which is often marked with faint dusky patches, is traversed by several large, tortuous, purple veins, emerging abruptly close to the margin of the cornea.* Sometimes there is, in addition, a faintly marked vascular zone.

The cornea, although it may be sufficiently transparent to allow of the iris and lens being well seen, presents a peculiar unevenness of its epithelial surface; so that the lines of a window-frame, instead of being distinctly and sharply depicted upon the corneal surface, appear broken, wavy, and irregular; and the reflected light is dull, like that from a slightly steamy glass.

Sometimes the cornea is decidedly hazy throughout, and occasionally the epithelium is found vesicated in small patches, closely resembling minute drops of water which have run together on a dewy window-pane.

If a good view of the iris and lens can be obtained,

* Sichel; pl. xxv., fig. 3. The tortuous veins of Glaucoma are well represented, but the cornea is clearer, and the iris more sharply defined, than is usual in the disease. The altered condition of these structures has been very well shown by Dalrymple, pl. xxvi., fig. 2.

the former is usually found in close approximation to the cornea; equally dilated all around to a mere ring: or else the pupil is irregularly oval, and quite fixed.

It is commonly stated that the pupil in Glaucoma is always transversely oval. This form, although very often seen, is by no means constant. The fibrous appearance of the iris is lost, and its color, either in parts or throughout, is changed to a peculiar *slaty* tint. Sometimes the veins of the iris are sufficiently enlarged to be distinctly visible to the naked eye.

The lens advances, so as almost to touch the hinder surface of the cornea. It is opaque, sometimes rather milky-looking, and indistinctly striated. Its threefold division is often very well marked; as if, by undergoing maceration in water, it had swollen up, and were about to burst its capsule. The color of the lens varies much. It may be greyish or greenish drab, dirty yellow, or dull orange; and marked with opaque, earthy patches or streaks.

Vision of objects is wholly extinct; frequently there is not even perception of light.

I have said that the morbid appearances above enumerated may be produced in two very different ways. They may have been the slow result of disease going on, with intervals of apparent quiescence, for months or even years; or sight may have become extinct after a few hours of agony, and all the inflammatory changes in the tissues of the eye (except the opacity of the lens) be apparently completed within a few days.

Mere inspection of a completely "glaucomatous"

eye will not enable the surgeon to tell whether these changes have been the result of the chronic, or of the acute, form of disease.

1. The Chronic form begins very insidiously, and is probably set down as "Incipient Amaurosis." The patient complains of dimness of sight, and sometimes—by no means invariably—sees bright flashes or colors passing before him. Dull pain in the eye or in the head may, or may not, be present. In the former case, a faint vascular zone in the sclerotic often attends the onset of the pain. The iris gradually loses its briskness of movement, and the pupil becomes enlarged; not uniformly, but so as to assume an irregular, instead of a circular form. It is sometimes transversely oval, but this shape is by no means so frequent as some writers have asserted.

This state of things may go on for several months, without any very acute inflammation showing itself. Chronic Iritis may then set in, the veins of the iris becoming visible, and the pupillary margin adhering to the capsule at one or two points. The sclerotic zone in that case would, of course, be developed. By this time vision may be lost, or restricted to the recognition of large, well-lighted objects. Then, opacity of the lens begins slowly to show itself; or, perhaps, the cornea first becomes hazy, and its epithelium uneven, so that the increasing Cataract is scarcely perceived. Gradually the lens and iris advance towards the cornea. The large, dark purple veins have, by this time, shown themselves on the surface of the sclerotic; and not until the end of many months, or even of a year or two,

from the first failure of sight, does blindness become complete.

The sequence of morbid changes seem to be as follows: First, in the retina and choroid; going on, perhaps, to serous effusion between these two coats, which causes the bulging forwards of the lens and iris, by pressing from behind upon the vitreous body. Then, congestion and inflammation of the iris and cornea; and, last of all, opacity of the lens, as a consequence of its deranged nutrition.

Of course, in an organ over-filled with blood, rupture of vessels and extravasation of blood are likely to occur; and, therefore, one would expect that such extravasations would take place in the retina and choroid of patients affected with acute Glaucoma. But that these extravasations of themselves constitute the essence of that disease—as has been supposed—is contradicted by the fact of our so frequently meeting with cases of slightly impaired vision, where the iris and cornea appear quite healthy, but where the ophthalmoscope reveals to us a retina patched here and there with extravasated blood. Such cases recover under proper management; the extravasated blood disappears, and the characteristics of Glaucoma,—the hazy cornea, the dilated fixed pupil, and distended veins on the surface of the sclerotic,—never make their appearance.

But even if the essence of Glaucoma really consisted in effusions of blood on the surface of the retina, we should very rarely be able to detect them; inasmuch, as in most cases of Glaucoma, the epithelial surface of the

cornea is cloudy and uneven, and we cannot obtain a clear view of the retina at all.

2. Perhaps the best way for me to describe in what manner the "glaucomatous" changes are induced by *Acute* disease, will be to select two well-marked cases from my note-book.

D. N——, aged sixty-two, a Spitalfields silk-weaver, came to me on the 4th of December, 1848. His aspect was that of a man worn down with pain; his face was pale, his gait feeble, and his pulse weak. Both eyes presented almost the same appearance. The sclerotic was slightly reddened; and in the right eye the veins emerging at the edge of the cornea were enlarged. The pupils were dilated, oval from side to side, and quite fixed. There was no decided opacity of the lenses, but an ill-defined haziness of each pupillary space. The irides had the mottled, *slaty* tint and non-fibrous appearance I have already alluded to; and both bulged forward, so as apparently to touch the corneæ. The corneæ themselves, when the light fell upon their surface, looked very slightly dull, as if minutely granular. The globes were very tender when pressed upon.

There was no perception of light in the right eye. With the left, the whiteness of a sheet of paper could be just recognized. The patient's habits had always been regular and temperate; and he had never had any severe illness, although, like most of his trade, he had for some years past been subject to indigestion. During the summer of 1848 his dyspepsia became worse, and was attended with frequent pyrosis. About the middle

of November he consulted a medical man, who gave him some pills, and ordered him to leave off his daily pint of beer. After taking the pills ten days, he became very severely *salivated*, and the right side of his face especially was swollen and painful. He felt weak in body, and much depressed in spirits.

On the 25th of November, in the evening, while reading, he felt a slight aching in the right eye. He closed the left one, and found he could not then see the flame of the candle. The pain in the right eye became more severe, extending from the eyeball to the orbit and side of the head, and occasionally to the left temple also, so as to prevent sleep all night.

26th: All day he remained in bed, racked with pain, and unable to distinguish the position of the window with the right eye. During the night the pain continued unabated, and the next morning (27th) it involved the left orbit and eyeball, and objects began to appear to the left eye misty, as if surrounded with smoke. No sparks, flashes, or dark spots, ever appeared before either eye. 28th: The racking pain now extended equally over both sides of the head. The sight of the left eye was reduced to merely seeing the glare of the fire, or of a candle; but no definite objects were discernible. The pain continued almost unabated up to the time of his visit to me.

I had not this patient under observation for more than a few days, so that there was not time enough to witness the opacity of the lenses, which, no doubt, ensued, and which would have completed the picture of Glaucoma.

Mr. R——, aged sixty-one, residing on the sea-coast,

came to me on the 12th of May, 1852. Throughout life he had been a remarkably healthy man, and his sight was always excellent. On the 3rd of January, 1852, he went to bed, feeling perfectly well. He was aroused from sleep by an attack of intense pain in the right temple and eye. Next morning the eye was slightly red, and he was not aware of anything being defective in his sight, for he shaved and dressed himself as usual. The pain continuing, he sent for a medical man, who applied leeches to the forehead, and blisters behind the ears. On the 5th, the right eye was found to be quite blind. The patient was at once put under the action of mercury, taking pills four times a day, and rubbing mercurial ointment into the right temple. His mouth became sore, but no improvement took place in the affected eye, and within a fortnight the sight of the other began to fail; and flashes, "like bright swords," darted to and fro before him. All this time the pain continued in both temples, and especially around the orbits; and by the beginning of February, he could only see the flame of a candle, or a fire, with the left eye. No perception of light was ever regained in the right one. His mouth was made *very sore*, and so kept till the middle of February. Blisters were applied to the back of the neck and to the temples. Throughout this treatment he continued to take meat daily. He had never been accustomed to drink either spirits or beer.

When I saw him, all pain had subsided. His temper was cheerful; the action of the bowels regular, and appetite good. He complained only of the vivid and tumultuous dreams which distressed him every night.

The eyes were in the following state: large, purple, venous trunks rambled over the sclerotic, and formed a dusky zone around the corneæ. The latter were dull on the surface, as if minutely granulated. The irides were of a greyish, slaty tint, and quite motionless; the pupils dilated, and irregularly oval, or rather pear-shaped, with the smaller part directed upwards and inwards; their margin here and there indistinguishable, from being folded backwards. Both lenses were slightly clouded, so as to impart a dirty, drab-green hue to the rays reflected from the vitreous chamber. Both eyes had an unnatural, stony hardness; in neither of them was there the slightest perception of light.

On the 31st of May, 1853, Mr. R—— paid me a second visit. No luminous spectra had appeared for some time. The right pupil had still somewhat the form it presented a year previously, but was rather larger. The left was decidedly larger, and more nearly round than before. Each pupillary margin adhered to the capsule of the lens by several bands, blackened with uveal pigment. The lenses were opaque, showing mottled patches, which, more or less, followed the stellated arrangement of the fibres. The opacity was about as dense as that which, in otherwise healthy eyes, would restrict vision to mere perception of light.

As regards the medical *Treatment* of Glaucoma, it is quite impossible to lay down any rules which shall apply to all cases; it must be based upon a careful study of the patient's general state of health, and an avoidance of whatever may seem to have destroyed the due balance of the circulating forces. As a general principle, it may

be affirmed, that the subjects of these insidious and dangerous changes in the eye, are feeble and depressible, and, therefore, bleeding and salivation are *most injurious*. But, except in the very earliest stage of the disease,—which, unfortunately, is very difficult to detect,—the most careful treatment will often prove of little avail.

Treatment of Glaucoma by Operation.—When the first edition of this volume was published, no plan of treatment for Glaucoma had been discovered which could be termed curative; for the cruel bleedings and salivations, which so many patients had undergone, had injured their general health, without restoring sight. The announcement, therefore, that a simple and easy operation could arrest or cure a hitherto uncontrollable disease, was sure to attract general attention. The treatment of Glaucoma, by "Iridectomy," was published by GRAEFE, in the German Ophthalmic Journal, of which he is co-editor;* and was also brought before the Ophthalmological Congress which met at Brussels in 1857. An incision was to be made through the cornea, as close as possible to the sclerotic; a considerable portion of iris to be grasped with a forceps, drawn out, and cut off. When the nature of the operation came to be explained, one could not fail to be struck with the apparent absence of all casual connection between the morbid changes of Glaucoma and the means proposed for arresting them. How was general hyperæmia of an eyeball, and the consequent changes of its tissues, to be overcome by cutting

* On Iridectomy in Glaucoma and on the Glaucomatous Process.—*Archiv für Ophthalmologie*, vol. iii., part 2, p. 456.

out a piece of the iris? No satisfactory explanation as to the *rationale* of the operation was offered. We were told that "intra-ocular pressure" was the cause of all the phenomena of Glaucoma, without any very clear account being given as to what was pressed, or what effected the pressure; and we were assured, that the removal of a piece of iris, by taking off the pressure, would bring about restoration of sight.*

Now, it was obvious that, if the vessels of the eye-ball were over-filled with blood, pressure must be exerted upon all the other tissues, and that the removal of a portion of the iris would, *pro tanto*, lessen the total amount of solid matter contained within the fibrous case of the organ. But, unless the original cause of the hyperæmia were to cease, would not distension of the blood-vessels still go on, and soon reproduce the same amount of "intraocular pressure" as previously existed?

Then, with regard to the forms of Glaucoma to which

* As an illustration of the manner in which "intra-ocular pressure" acts on the retina, GRAEFE brought forward certain cases of greatly impaired or lost vision, in which he detected, by means of the ophthalmoscope, a pitting or indentation of the extremity of the optic nerve; and he assumed that, along with this condition of the nerve, there must be such a pressure on the whole retina as might be expected to impede or destroy its function. But, surely, any intra-ocular pressure, sufficient to thrust the fixed fibres of the optic nerve backward into their sheath, must, *à fortiori*, thrust the moveable lens and iris forwards against the cornea; and yet, in the most strongly-marked case of concave optic nerve I have ever seen, the iris deviated little, if at all, from a vertical plane. These cases of cupped optic nerve appear to me to depend upon atrophy, and consequent shrinking of the nervous tissue, quite unconnected with any mechanical pressure applied to it.

the proposed "new operation" was applicable:—clearly, in old cases, where serous effusion had already taken place to such an extent as to separate the retina and choroid from each other; or where, in addition to this effusion, the lens had become opaque and adherent to the iris,—no removal of "intra-ocular pressure" could be of service. There remained, then, as subjects for the new operation, either those *chronic* cases, in which the lens had retained its transparency, and no general separation of the retina and choroid had taken place; or those recent, *acute* cases characterized by the symptoms I have detailed at p. 248.

The facility with which the operation of "Iridectomy," as it has been called, can be performed, has led to its being practised in an immense number of cases; and were we contented with the array of so-called cures which have resulted, we should, indeed, believe that Glaucoma, hitherto so hopeless a disease, had been brought as much under control as Cataract itself. But a careful criticism will convince us that many of the "cases of acute Glaucoma cured by operation," were simply cases of acute inflammation of the sclerotic, implicating to a slight extent the iris and cornea, and attended with severe neuralgia and impairment of vision; cases which would have yielded to judicious treatment if no *iridectomy* had been performed. A few cases, supposed to be chronic Glaucoma, were probably nuclear Cataract in an early stage, and the removal of a portion of iris, by exposing the still transparent periphery of the lens, improved (of course only temporarily) the patient's sight. Of other instances which have come under my

own observation, where the operation has been unsuitably performed or proposed, I forbear to speak. There remains a mass of cases of Glaucoma, diagnosed by careful and competent surgeons, and skilfully operated upon by them, sufficiently numerous to enable them to draw their own conclusions as to the real value of the "new operation." For myself, I may state that, although I could not recognize as sound the theory upon which the operation was brought forward as a cure for Glaucoma, I tried it in a series of carefully-selected and well-marked cases of the following forms of disease:—"Amaurosis with excavated optic nerve"—as GRAEFE has termed a peculiar morbid condition;—Chronic Glaucoma, where the lens had not yet lost its transparency;—and in cases of acute Glaucoma, characterized by sudden impairment of sight, rapidly followed by inflammation of the eyeball, dilated and fixed pupil, severe neuralgia, and total loss of vision.

In neither of the first two classes did I find—nor had I expected to find—any improvement to result. Nor in the third class was sight restored; but the inflammation seemed to be arrested, and the neuralgia was either very much lessened or it wholly ceased. I cannot, however, attribute this result to the removal of a portion of iris, but mainly to the evacuation of the aqueous humor through the large corneal wound.

SCROFULOUS AND ENCEPHALOID DEPOSITS.

Scrofulous deposit within the globe, going on to total destruction and atrophy of the organ, occurs chiefly to infants and young children. It is in similar subjects

that Encephaloid deposit is most common, and the two products, so essentially different from each other in their histology and ultimate results, present, at a certain stage, almost similar external appearances.

Both in the Scrofulous and the Encephaloid disease, the first symptom noticed by those who have the care of the child is a yellowish, golden, or buff-colored reflection from the pupil, which in certain lights seem to shine like a cat's eye. Perhaps, also, the affected eye is tested, and found to be blind.

In this early stage it is very difficult for the surgeon to pronounce positively on the nature of the case. He finds a more or less dilated pupil; and, on looking through the still transparent lens toward the opaque and yellowish surface of the retina, he observes this structure to be thrust forward in an irregularly lobulated form, and overspread with enlarged vessels, ramifying in various directions over the uneven surface.

In a more advanced stage of the disease these deep-seated changes are still more readily seen, in consequence of the dilated condition of the pupil; the iris being reduced to a mere ring. The yellow deposit slowly* advances, until it appears almost to touch the hinder surface of the lens.

Up to this point the patient seems to suffer no pain, and there is little, if any, increase of vascularity about

* The reader will find a description of the manner in which this yellow deposit may appear *suddenly* to acquire a very rapid development, although no actual increase may have occurred, by referring to a case published by Mr. CRITCHETT, in the *Lancet* (March 4th, 1854). It is extremely interesting, and will repay a careful perusal.

the eyeball. Gradually, however, the second well-marked stage occurs; the lens becomes cloudy; so that, instead of a clear view of the vitreous chamber being obtained, nothing is seen of the morbid deposit but the indistinct, yellowish reflection which it imparts to the lens. The latter body becomes more opaque, and is slowly thrust forwards against the iris and cornea. Irritability and watering of the eye, with redness of the sclerotic and conjunctiva, now set in, and the child is out of health, fretful, and restless.

Lastly, the eyeball becomes enlarged; the cornea opaque; and the scleortic bulges at one spot, as if matter were pointing there, or becomes doughy and soft in several parts at once. The chief prominence usually occurs just above the upper margin of the cornea. This third stage of the disease is commonly attended with severe pain.

Thus far it will have been hardly possible, I believe, for the most experienced surgeon to pronounce with certainty as to the real nature of the disease—whether it be *Encephaloid* or *Tubercular*. Most commonly, in either case, the globe bursts, the fluid contents escape, and usually the lens also is expelled; and for a time the patient is almost wholly relieved from pain.

In some scrofulous cases, however, the eyeball, having enlarged up to a certain point, does not burst, but begins slowly to diminish, until eventually it presents almost the same wasted appearance as results from the evacuation of the humors.

Scrofulous disease, after destroying one globe, will sometimes, within a short period, attack the other, and thus reduce the patient to total blindness.

The after-progress of the disease soon affords proof of its real nature. If it be *Scrofulous*, a long-continued discharge takes place from the opening, and then the coats of the globe gradually collapse, and ultimately form a pale, soft nodule, puckered here and there into deep fissures, and frequently presenting some shrunken remnant of almost transparent cornea.

If, however, the disease be *Encephaloid*, a soft, pulpy, vascular fungus soon sprouts forth from the opening which had given vent to the humors of the globe, and rapidly enlarges, having all the well-marked characters of an open cancer. The profuse fœtid discharge dries here and there upon the surface of the tumor, so as to give it almost the appearance of a piece of sponge; and the separation of these crusts is attended with more or less hæmorrhage. Eventually the patient dies, either from malignant deposits in the viscera, or from the drain which the tumor occasions, and the repeated attacks of bleeding from its substance.

I have said that *Encephaloid* deposit in the vitreous chamber chiefly occurs in infants and young children. It is, however, met with in adults, but in them is commonly more or less mixed with *Melanoid* deposit.

Melanosis, when it first begins to form within the vitreous chamber, may be unattended with pain or general inflammation of the globe. The patient, perhaps, is first alarmed by the appearance of bright colors, or luminous figures, when in the dark, and afterwards discovers that one eye is defective. It is remarkable to how great an extent one-half of the retina will retain its function, when the other half is completely displaced by melanotic deposit between it and the choroid, so as

to form a distinct, rounded mass, projecting from the floor or lateral wall of the vitreous chamber.

Before the invention of the ophthalmoscope, it rarely happened that Melanosis, commencing within the cavity of the eyeball, was detected in this early stage of its progress. It was not until the tumor had distended and thinned the sclerotic, so as to exhibit its peculiar dark color, or had ruptured the coats of the globe, and sprouted forth through the aperture, that the real nature of the disease was recognized.

Of course the diagnosis has always been comparatively easy in those cases where the deposit commenced on the conjunctival surface of the eyeball.

Some years ago I had the opportunity of observing the early stage of melanotic deposit within the vitreous chamber; and I the more readily revert to the case, inasmuch as, at the time, believing the tumor to consist of an effusion of blood, I described it as such in a paper in the *Lancet*. It is, I think, the duty of every man who has *published* an error of diagnosis of this kind, to take the earliest fitting opportunity of correcting and explaining it. Those who have had the largest experience will best understand how readily such a mistake might formerly be made before the invention of the ophthalmoscope, in spite of every care on the part of the observer.

"Mrs. C——, aged fifty-one, consulted me Oct. 9th, 1849. About the beginning of August she had been attacked with intense neuralgia throughout the fifth nerve on the right side, which for three nights almost

deprived her of sleep. For some time after this attack she used to feel languid, and in the evening was sometimes quite fatigued; but in other respects she seemed pretty well, her appetite being good, and bowels regular.

"Towards the end of August she used to notice, when in bed, bright colors passing in continuous streams before the right eye; by day she saw well with it, and could even read. Two weeks later, on closing the left eye, she found she could only see parts of objects with the right. At the time of her visit to me her general health was pretty good; she no longer saw colors passing before the right eye, but there was occasionally a dull, aching pain in the globe. The left eye exhibited nothing remarkable, except that the iris was prominent, and almost in contact with the cornea. The pupil acted, but not very briskly, and the sight was good both for near and distant objects.

"In the right eye there were no signs of inflammation, but the sclerotic had a dirty, yellowish, or faint olive tint, a little lighter than that seen in the first stage of staining with nitrate of silver. The pupil was rather dilated, and unaffected by light. She saw pretty well all objects placed below the level of the eye; even the type on a printed page was recognized as black lines; and by throwing the head well back she could see a name across the street, as a white streak on a black ground. On looking at a person's face, on a level with hers, she only saw the chin, the other features being hidden by a dark cloud, which seemed always hanging over her head.

"In a certain light I noticed an indistinct, dull red or

reddish-brown glow from the bottom of the eye. I fully dilated the pupil with atropine, and then a clot of blood became distinctly visible behind the lens, at the bottom of the vitreous chamber. The mass was hemispherical, and its summit, which rose as high as the middle of the pupil, had a slightly greyish tint, while its anterior slope was of a decided red. It appeared to consist of an effusion of blood beneath the retina, which, being thereby raised from its natural position, formed a thin greyish investment to the smooth rounded surface of the clot." *

After some time the patient returned to the country, and I did not see her again until the autumn of 1853. She was then in a miserable state of health; so thin and haggard that I hardly knew her. The eye had assumed all the unmistakeable signs of Melanosis. It was nearly double its natural size, knobby and irregular in shape, full of large tortuous veins, and the site of the cornea was occupied by a soft, pulpy mass, of a purple-brown color.

The patient had melanotic tumors, of various sizes, scattered over the surface of the body; particularly on the breast, thighs, and abdomen: and it was evident that the abdominal viscera was also affected with the same disease. I was surprised, therefore, at receiving another visit from her so lately as in the summer of 1854. The eyeball was then nearly as large as an

* *Lancet*, January 28th, 1854. The supposed clot was in fact a deposit of melanotic matter. In the present day the ophthalmoscope would enable one in such a case at once to detect the real nature of the disease.

orange; and the other tumors about the body had increased in proportion. She died early in 1855.

I have already mentioned how difficult it often is to discriminate, at an early period of disease, between *Scrofulous* and *Encephaloid* deposit in the vitreous chamber. But there is a class of cases which, to judge by their results, seem to belong to neither of these two forms, and yet exhibit appearances so similar to them as often to deceive the most practiced observer.

In illustration of this I will quote a curious case from my note-book.

George Sindell, aged four years, a pale, rather unhealthy-looking child, but free from any outward sign of scrofulous disease, was brought to me, on the 19th of November, 1849, by his mother, whose attention had been drawn to a peculiar appearance in the pupil of his left eye. There was no redness or enlargement of the globe, nor any defect in its movements; but the vitreous chamber, instead of its natural blackness, presented a pale yellow reflection. Having largely dilated the pupil with atropine, I threw additional light through the aperture, by means of a convex glass, and at once brought into view a tumor, which occupied the greater part of the fundus of the eye. It was of a buff color, divided by deep fissures into several lobes, and overspread with the ramifications of numerous blood-vessels. The retina at the outer part of the globe presented little change of structure.

The child had had scarlatina during the summer, but was in pretty good health at the period of his visit to me. In the early part of the following month he had measles.

On January 7th, 1850, he was brought to me again. The lobulated mass at the fundus of the eye was little changed, but the outer part of the retina was now dotted over with granular masses, of the same buff tint as the larger tumor. During the months of February and March, the child's health became slightly deranged; he was frequently restless at night, his appetite was capricious, and bowels irregular. In the beginning of April, the pupil, which had previously differed little in size from that of the healthy eye, became widely dilated and fixed, affording, without the aid of atropine, a full view of the morbid deposit. I made repeated and careful examinations of the case, and pointed out to others its chief points of interest.

About the middle of May, the lens, which hitherto had been perfectly transparent, began to acquire a slight haziness, and to advance towards the cornea. As the haziness increased, the fundus of the eye became of course hidden from observation, but its yellowness still imparted a peculiar tinge to the lens. At this period a very slight vascular zone began to show itself in the sclerotic; but it disappeared after a few weeks, leaving, however, the communicating veins below the cornea somewhat enlarged.

In January, 1851, I again saw the child, and found his health still pretty good, although he had latterly lost flesh. I ordered that the same strict attention to his diet, which I had from the first enjoined, should be persevered in, and that his bowels should be regulated, as heretofore, by occasional doses of Hydr. c. Cretâ. Liq. Cinchonæ being given twice a day as a tonic. The

length of time during which the case had now been under observation, without any marked change having taken place in the eyeball in respect of increased vascularity or inflammation of its coats, made me very uncertain as to the real nature of the disease. At first I had felt convinced of the deposit being either encephaloid or scrofulous, and I had anticipated the usual destructive effects of those diseases.

I lost sight of the case until November, 1854. Five years had elapsed since I first saw the patient, who was now a tall boy of nine. The eye—which had lost all perception of light—when carefully compared with its fellow, appeared very slightly enlarged, but it did not show a trace of vascularity or irritability. The cornea was perfectly clear, the iris of healthy texture, and of its natural brown color. The pupil was immovable, and dilated, but by no means to its fullest extent. The area of the pupil was occupied by the flattened and collapsed capsule, containing apparently some remains of lens; the whole formed a chalky-looking disc, such as one often sees to result from a punctured wound of the lens, which has been followed by absorption of the greater part of its tissue. The opaque capsule was not in the plane of the iris, but stood back at a considerable distance from it. The mother could give no satisfactory information respecting the progress of the boy's case since I had lost sight of him, nearly four years previously; nor could I ascertain under what conditions the complete cessation of all morbid action in the eye had occurred.

The *Treatment* of Scrofulous and Encephaloid de-

posits within the globe, consists either in their complete removal, by extirpation of the globe itself, or in the employment of such medical and dietetic means as may, for the longest possible period, support the patient's general health, and in that manner retard the progress of the local disease. For we may lay it down as a rule in the treatment of so-called "malignant" diseases, that the more we are able to invigorate and support the general vital powers of the patient, the slower is the growth of the local disease, and the less tendency has it to involve surrounding tissue.

First, then, as regards removal of the disease by *operation*. Extirpation of the eyeball is so easily performed, and it so naturally suggests itself as a means of completely taking away every morbid product which may be contained within the organ, that we cannot wonder at the readiness with which it was undertaken and recommended by the surgeons of former days.

No doubt many of the eyes "successfully" removed by them were affected, not with *encephaloid*, but with *scrofulous* disease, which, as I have said, at a certain stage of its progress, so closely resembles the former.

The means of discriminating between these two deposits, which the microscope now affords the surgeon, will bring to the test the real value of extirpation in those cases in which it may henceforward be employed. I cannot here go fully into the question as to whether the operation should be resorted to in cases of well-ascertained encephaloid disease; but I may just observe, that in no class of operations for the removal of malignant growths are the statistics more unfavorable than in those relating to the eye.

In speaking of the *medical* treatment of encephaloid disease, I must briefly allude to the earnest manner in which TYRRELL, in his "*Practical Work*," urges the efficacy of mercury.

The histology of fibrinous, scrofulous, and encephaloid deposits is, at the present day, too well understood to allow of our accepting his theory of their being mutually interchangeable; and a careful analysis of his cases (vol. ii. pp. 165-185) will, I think, convince us that in no instance was real "malignant disease subdued," however much it may have been delayed in its course, by the treatment he employed. For nothing can be more true than his assertion, that "the local disease makes most rapid progress when the general power is much reduced:" and the converse of this is equally true—that by strict attention to the patient's diet, and constant efforts to regulate and maintain his health by tonic medicines and pure air, the advance of the disease may sometimes be retarded to a remarkable degree.

In proof of this, I will quote a case which is necessarily rather long, inasmuch as it traces the progress of encephaloid disease from a very early stage of its development until the death of the patient; but it is instructive, as showing how much the local progress of malignant disease is aggravated by anything which depresses the general system; and at the same time it illustrates the insidious way in which encephaloid deposit first begins, and the probability of its being then overlooked. It shows, also, how long a patient may live after the disease has been unmistakeably established, and so far helps us to understand how patients may

be benefited, and the malignant disease apparently "checked," under this or that special treatment.

Catharine Willis, aged eight years, was brought to me on the 12th of April, 1847, having, it was said, lost the sight of the right eye from a blow with a skipping-rope, a fortnight before. The eye looked perfectly healthy; all its movements were free; the pupil was natural, and contracting equally with the left. There was no pain, nor any trace of vascularity or ecchymosis in any part of the organ. Still the patient declared she could not see even the light.

I used atropine, and dilated the pupil, without detecting any morbid appearance within the globe; and I began to suspect that the blindness was feigned. The ophthalmoscope, which would have cleared up the whole matter, did not then exist.

Three days later, I again applied atropine, and obtained a much greater dilatation of the pupil than on her former visit. Some opaque threads were now seen floating about in the vitreous humor. At the upper, outer, and front part of the globe, near to the roots of the ciliary processes, lay a somewhat rounded mass of pale yellow substance, apparently about the size of a coffee berry; and beside it I noticed a bright red mass, of about the same size, which looked like a clot of blood. I employed the "catoptric test" to ascertain whether the lens were *in situ*, and observed its two images quite plainly.

The child's general health was pretty good, but her bowels were inclined to be costive, and her appetite was sometimes capricious. I therefore enjoined a very plain

diet, and ordered occasional small doses of Hydr. c. Cretâ, and some Liq. Cinchonæ twice a day. Her health soon became very good, but no material change in the deposit within the vitreous chamber could be detected. The surface of the eye-ball remained without a trace of inflammation.

I lost sight of the child in January, 1848. On the 19th of June in the same year she was brought to me again, and I found that a considerable change had taken place. There were several large venous trunks on the sclerotic, and a slight vascular zone around the cornea. The lens had become a little cloudy throughout, and towards the middle of its anterior face there was a faint stellated opacity. When the pupil was dilated with atropine, the yellow reflection could still be seen, although its brilliancy was somewhat dulled. The child complained of headache and pain in the eye, which came on at intervals of a week or ten days.

Three months before the last date she had had scarlatina very severely, so that she was not expected to survive, and on her recovery she, for the first time, complained of pain in the eye.

The use of Liq. Cinchonæ was resumed, and a mild purgative given about once a week. Her health rather improved, and she sometimes remained a fortnight without headache.

"August 17th: The lens is more opaque, and there is an irregular, chalky-looking patch on its anterior surface. The pupil is now dilated and fixed. The sclerotic veins continue to be numerous, large, and purple; but there is no enlargement of the globe itself.

October 12th: There had been no headache for the last six weeks until yesterday, when acute pain shot through the head. The appearance of the eye is unchanged. To continue the occasional purgative, and take Syrup Ferri Iodidi ʒj thrice daily.

November 2nd: Headache again last week.

January 18th, 1849: The body of the lens is rather more cloudy, and the irregular opaque patch near its centre is more strongly marked. The deposit in the vitreous chamber is evidently much increased in quantity; for, when the light falls on the eye from above, a bright yellow reflection is cast upwards from the bottom of the globe through the still translucent part of the lens. The whole sclerotic has a congested, purplish look: the veins are larger than heretofore; the iris (which has been long since immovable) is diminished to a narrow ring. The child looks pale, and is unnaturally susceptible of noise.

March 10th: After several weeks' freedom from pain, the headache has again become severe. 31st: The sclerotic, where it adjoins the outer part of the cornea, is more vascular than elsewhere, and protrudes, as if thrust forward by the deposit within. April 9th: Pain in the head has been intense and frequent since last visit. The lens is more opaque. 23d: Much severe pain. The lens now quite touches the cornea. May 21st: A small clot of blood is lying between the cornea and the lens. June 4th: The lids have been much swollen within the last week, and there has been great pain in the eyeball. 30th: There is severe pain in the head, and increased swelling of the lids. The patient sleeps little, moans much, and refuses food.

Shortly after the above date there was almost complete cessation of pain, and for some time the disease seemed to be at a stand.

August 6th: The globe generally is more livid and vascular, and the prominence at its upper and outer part is rather larger. Another small effusion of blood has taken place between the iris and cornea.

October 8th: All the symptoms of the last date are much aggravated. The attacks of pain now persist for three or four hours together. The child's appetite has fallen off, and she sleeps badly.

November 19th: She has lately been taking small doses of hyoscyamus, and has rested better: her bowels are regular, and her appetite is good. The pain is almost confined to the eye, and only occasionally extends to the head. The cornea is still almost clear, but is flattened and widened out.

December 10th: The cornea has given way at its lower part. 17th: The conjunctival surface of the globe is red and velvety; a thick scab extends across it, and hides the cornea. The lids are purplish. 31st: The eye projects between the lids to the size of a walnut, and is covered with a crust of dried secretion, which completely hides the sprouting, fungous mass. There is a little pain in the eye, and none in the head. The child sleeps well, and has a good appetite, and regular bowels.

January 21st, 1850: Within the last week, bleeding from the tumor has occurred. The child is in constant pain, and refuses food."

From this period the tumor steadily increased in bulk. Its surface constantly discharged a fœtid sanies,

which dried into brown flakes, and their separation was frequently followed by oozing of blood. Powdered alum was always at hand to be sprinkled on the bleeding spots. Chlorides were used in solution to correct the fœtor of the discharge, and every care was taken to preserve cleanliness as much as possible. Nourishing food was given as the stomach could bear it; hyoscyamus, when there was much restlessness. The child gradually became thinner and weaker, and the following is my last note of her case.

"August 27th, 1850: She is wasted to mere skin and bone. Her intellect is clear, except when occasional paroxysms of intense pain in the head occur. The tumor of the eyeball is as large as a man's fist, and is covered with a dry, sponge-like crust. Another tumor, the size of a small orange, projects from the front of the neck on the right side of the median plane. The right ear is partly sunk, and hidden in a third tumor, which has not yet given way; but in front of the ear, and filling up the space between it and the ocular tumor, the skin is purple, and tightly stretched over a fourth tumor, rounded, soft, and pulpy, and as large as an orange."

Frequent and extensive hæmorrhage now occurred, and the patient died on the 10th of Septemper. I was absent from town at the time, and am indebted to my friend and colleague, Mr. POLAND, for notes of the *post-mortem* examination, which he kindly performed.*

The points in this case to which I would chiefly direct the reader's attention, are the following:—

The duty of making a thorough local examination of

* Appendix, Case D.

every case of blindness, without being led away by the account given by the patient; the blow said to have caused the loss of sight, was but the accident which led to the discovery of the real danger:—the length of time true encephaloid deposit may exist in the vitreous chamber, without causing any marked symptoms, provided the general health be kept in order; it was nearly a year from the time I first saw the case, before attacks of pain were complained of; the aggravation of the disease dating from the attack of scarlatina:—the increase of pain which occurs in the eye as soon as the lens is pushed forward against the iris and cornea, and the lull which follows the first rupture of the globe:—the long period which may elapse from the first development of the disease to the death of the patient; in this case it was nearly *three years and a half* from the time the deposit was first detected until it produced a fatal result, and probably the deposit had commenced at least six months before the child was brought to me for advice. There are perhaps few cases of extirpation of the globe for encephaloid disease in which life has been prolonged for more than two years after the operation.

Are there any cases, then, in which an operation is to be resorted to? This question has been answered in the negative by many high authorities; but I think there are exceptional cases in which the encephaloid deposit is so completely unconnected with the optic nerve itself, and confined within the limits of the eyeball, that removal of the latter may free the patient from all the encephaloid deposit which, up to that time, has been developed in the system. (See Appendix, Case E.)

CHAPTER XI.

DISEASES OF UNCERTAIN SEAT.

MUSCÆ VOLITANTES—LONG SIGHT—SHORT SIGHT—INABILITY TO DISTINGUISH CERTAIN COLORS.

A STRICTLY anatomical arrangement of diseases, such as I have endeavored to adhere to throughout the present work, necessarily excludes certain defects of sight, the exact pathology of which is at present unsettled; and I have therefore grouped together, in a purely arbitrary manner, the various affections enumerated at the head of the present Chapter.

MUSCÆ VOLITANTES (*Scotomata.*)

Unlike the diseases hitherto described, which all offer visible phenomena to the surgeon's observation, the floating spots termed *muscæ* are seen only by the patient himself, and constitute what are called *subjective* phenomena. They are just as real, and are the effect of as definite physical causes, as those which give rise to the opacity of Cataract, or the effusion of Iritis; but the position of the minute bodies which cast their moving shadows on the retina is such, that they have hitherto eluded demonstration in the living subject: nor have they been identified by *post-mortem* research.

Perhaps there is no affection of the eye which gives rise to greater disquietude, than do these so-called *muscæ*

to those who suffer from them. Patients often bear with them for years before seeking the surgeon's advice; and very commonly refer, in the meantime, to some encyclopædia or medical treatise for an explanation of their annoyance. In such works they probably find fresh sources of alarm; for "muscæ," in most of the more popular works of the kind, are vaguely enumerated among the earlier symptoms both of Cataract and Amaurosis. It is highly important, therefore, that the surgeon should be able to discriminate between those *floating* spots, which, although in themselves irremovable, are quite compatible with excellent sight, and those *fixed* spots, or disks, which are the effect of isolated portions of retina being insensible to light—a condition not only the source of present impairment of sight, but probably indicating the commencement of some more extended and serious affection.

The term "muscæ" seems very ill-chosen, for I have never heard patients themselves compare the translucent filaments, globules, and granules, which sail across their field of vision, to "flies." Short-sighted persons are those most liable to *muscæ volitantes*, and I have hardly ever met with an exception to this rule. Intelligent and observing patients have always described them to me as follows:—

They have usually first noticed them when between twenty and thirty years of age. During several years the spots have appeared to increase steadily in number. This, of course, is really the case up to a certain point, but much of their apparent multiplication is due to the patient's acquiring, by practice, a greater power of ob-

serving those which move on different planes. If the eye be directed towards a clear sky, or a bright cloud, and then kept steadily fixed, the spots will appear to sink slowly downwards, just as ropy particles would do in a liquid which had been shaken and then allowed to rest. A brisk movement of the eye instantly whisks the little bodies about in various directions, and then, as soon as the eye is steadied, they again slowly sail across the field of vision.

When the attention is closely fixed upon any object, the muscæ are not seen—the patient, as it were, looks *through* them; but if, while regarding some distant object, he chances to alter the adjustment of his eye, and catches sight of some of the *muscæ*, he involuntarily begins to notice them, and in a moment his whole field of vision becomes more or less troubled with the floating particles.

In reading or writing, he does not find that the denser spots ever hide the word or line he is looking at; they keep dodging along a little above or below the line, constantly threatening to hide it, but never really doing so.

If the patient places his head so that he looks vertically downwards upon a well-lighted white-surface (as the field of a microscope, for instance), the bodies may, with a little management, be kept so steady as to allow of their being thoroughly examined. They consist, for the most part, of beaded filaments, some nearly straight, others twisted and bent, or massed together into loose knots. The elements of which they are composed are globules, varying much as to size and regularity of form, and highly refractive. The filaments are sometimes seen

slowly to bend and straighten themselves, and a whole group of them, sufficiently aggregated together to appear of a greyish or light drab color, may be frequently seen to turn so as to present itself in a foreshortened position. This proves that the bodies move freely in a fluid medium, and are not situated (as some have supposed) upon the front surface of the cornea. That such is not their seat, is additionally proved by the fact that they are not in the least affected by the movement of the lids. If, while the eye is kept fixed, and the bodies are being carefully watched, the lids are briskly moved, no effect whatever is produced in the form or motion of the bodies. They are also distinctly visible, in a strong light, *through* the closed lids, and are then just as free in their movements as when the lids are separated.

MACKENZIE details a most interesting series of experiments, which he made on his own person, to determine the real seat of *muscæ volitantes;* and we are fortunate in having before us the conclusions of so accomplished an observer.* He considers it proved that *floating* muscæ, such as I have been describing, are the effect of shadows cast upon the retina by minute bodies moving in front of, and almost in contact with, it; and he shows the fallacy of the opinion (held by TYRRELL and others), that these *moving* spots could be caused by pressure exerted on the retina by varicose choroidal vessels. No doubt such pressure may, and does, produce the appearance of dark spots on the field of vision, but these would only be seen to move when the eye itself was moved;

**Practical Treatise*, &c., 1854, p. 951. The experiments were first published in the *Edinburgh Med. and Surg. Journal*, No. 164, 1845.

whereas the *floating* muscæ now under consideration move freely in various directions, while the eyeball is at rest.

In speaking of floating muscæ as not being necessarily forerunners of any serious eye disease, it must of course be understood that they may precede or accompany such affections. All I would enforce is, that the spots do not stand to the amaurotic or other changes in the relation of cause and effect. Old bloody or plastic effusions within the vitreous humor may appear to the patient as moving objects in the field of vision; but a careful observer can hardly confound them with the peculiar bodies I have been describing.

With regard to their cure, I believe we are, at present, wholly incompetent to make any useful suggestion. I have met with patients who had gone through every form of treatment—local and general bleeding, mercury to salivation tonics, iodine—together with every form of drops and lotions, and all without the slightest benefit. The best comfort a surgeon can give to a patient distressed with *muscæ volitantes*, is the assurance that they are not symptoms of any serious disease of the eyes, that they are irremovable, but quite compatible with excellent and lasting sight. I have had patients under observation for ten or twelve years, who, during that period, have been troubled with muscæ in the highest degree, and whose sight is now as acute and good as it was when they first began to notice the spots.

SHORT-SIGHT (*Myopia*).

I am not aware of any external appearances in the eyeball itself by which this peculiarity can be detected.

It is popularly believed to depend upon an excessive convexity of the cornea; but a careful examination of a few short-sighted persons will suffice to disprove this, for they will not be found to differ materially from long-sighted persons, as to the curve of their corneæ. Indeed, one has but to notice the nearly flat cornea of the short-sighted fish, and the convex cornea of the far-seeing bird of prey, to be convinced that other parts of the eye must be chiefly concerned in the condition termed *Myopia*.

The treatment of shortness of sight consists, as is well known, in the use of concave glasses, of such a focus as will cause distant objects to appear distinct, without diminishing them.

If a patient can see small objects only by bringing them very close to the eye, and yet is not helped by concave glasses, a careful scrutiny of the crystalline lens should be made, to determine whether a very slight amount of opacity may not exist in that structure.

At page 199, I have alluded to a remarkable white crescent adjoining the optic nerve, which is seen with the ophthalmoscope in nearly all cases of decided Myopia. It is difficult to understand the connection between the crescent and shortness of sight. We cannot suppose the former to be itself the *cause* of the latter, but their co-existence is very remarkable, and deserves farther investigation.

LONG-SIGHT (*Presbyopia*).

The Greek term as applied to this affection is very ill-chosen: for the inability to adjust vision to small and near objects, is by no means an exclusive result of old

age. It is occasionally met with in young persons—even in children—and is a frequent consequence of exhaustion of nervous and muscular power from over-application. It is no more the effect of flatness of the cornea than short-sight is the result of too great convexity of that part. (See the remarks on so-called "Impaired Vision," p. 185.)

The remedy for too long sight—or rather, for the inability to discern near objects—is the employment of slightly convex glasses, of such a focus as will just compensate for the defective adjusting power of the eye.

INABILITY TO DISTINGUISH CERTAIN COLORS.

The defect upon which this strange congenital peculiarity depends, is probably situated—not in the eye itself, but in that portion of the brain to which the impressions of light are ultimately conveyed. A very interesting case I had under my care would seem to confirm this view.

A remarkably intelligent little girl was suddenly attacked with dimness of vision, which, within a few hours, amounted to almost total blindness. The cause was evidently referable to disordered circulation in the brain. For some time after the patient had perfectly recovered the power of distinguishing minute objects, so as even to read small type, she used to confound red, and its compounds, with their complementary colors.

Ophthalmic writers have exerted their ingenuity to devise a suitable Greek (or Greek-like) name for this condition. The following list comprises some of their combinations: *Achromatopsia*, *Chromato-pseudopsia*, *Chro-*

mato metablepsia, *Chromato-dysopsia*, *Chromato-pseudoblepsia*, *Dyschromatopsia*.* Most of them, independently of their uncouthness, are objectionable, as implying difficulty or inability to *see colors;* whereas the real defect in question is inability to *discriminate* between *certain* colors. I would add to the list, as a suggestion, the word *Acritochromacy* (Ακρῖτοχρωματία); it supplies the meaning we are in want of, and is tolerably pronouncable. It admits also of a good adjectival form—*Acritochromatic*.

The reader will find much information on this subject in some papers by Dr. Wilson, published in the *Monthly Journal of Medical Science* (Edinburgh, July, 1854, p. 1), under the title, "On Chromatopseudopsia, or Color Blindness.

* Of all the unfortunate inventions of pathological nomenclature, the word *Daltonism*, as applied to this functional defect, seems to me one of the worst. The late eminent chemist, Dalton, was, to a remarkable degree, deficient in the power of discriminating between certain colors, and he published his own case in the *Memoirs of the Literary and Philosophical Society of Manchester*, for the year 1798 (vol. v., p. 28). But it seems an indignity to the memory of such a man to connect his name in this way with a mere physical defect. We would surely wish to remember our great men for their mental excellences, not for their bodily imperfections; for those endowments whereby they surpassed others, not for the infirmities shared in common with them. Dalton should be immortalized as the propounder of the "atomic theory," not as the man who mistook red for blue.

CHAPTER XII.

THE LACHRYMAL APPARATUS.

This Apparatus—consisting, as it does, of the lachrymal gland and its ducts, the puncta and canals, the lachrymal sac and its nasal duct—is composed of structures so delicate, and changes apparently so trifling are sufficient to destroy the nice balance which ought to subsist between secretion and excretion, that extreme care is requisite in forming a correct diagnosis of lachrymal diseases, as well as much caution in treating them. An over-fondness for surgical manipulation is almost certain to exasperate some of their simplest forms into life-long annoyances.

Watering of the eye (*Epiphora*), under one form or other, is the usual symptom which induces the patient to seek surgical aid. Probably, in some cases, this may be due to an actual over-activity of secreting function in the lachrymal gland itself, but it is most frequently the result of some obstruction in the excreting apparatus. If the puncta be wholly impervious, of course the tears must trickle over the cheek as fast as they are secreted. If the puncta or canals be contracted, or strictured, a less complete overflow will take place: if the obstruction be in the nasal duct, the tears, passing freely into the sac, will accumulate there, and form a more or less considerable swelling (*Mucocele*), or they may give rise to inflammation and even abscess. Many of these diseases

of the sac, attended with muco-purulent secretion, were vaguely denominated by the older surgeons *fistula lachrymalis;* and this term is still very popularly applied to them. I shall hereafter explain, however, wherein fistula lachrymalis really consists.

When a patient applies to us, complaining of habitual watering of the eyes, we must first notice whether there is any displacement of the puncta. In the healthy state, these little apertures face towards the globe, and are in contact with its conjunctival surface, so that to bring them into view it is necessary to draw the margin of the tarsus slightly away from the eyeball. If, in consequence of Chronic Ophthalmia, the conjunctival lining of the lids has become considerably thickened, the edge of the tarsus is sufficiently everted to cause the openings of the puncta to face upwards, or even forwards; and in that case they can no longer act as capillary tubes in taking up the tears, which, in consequence, trickle over the edge of the lower tarsus. Or the puncta, still retaining their natural position, may have become so completely obliterated, in consequence of long-continued inflammation, that we may be unable to trace their original position.

If, however, the puncta appear to be free, and in their natural situation, and yet no tears can be made to regurgitate through their openings, when the finger is pressed upon the sac, just below the tendon of the orbicularis muscle, we may suspect some obstruction to exist in the canals themselves. To test this, a fine probe ("punctum probe") must be passed along them. This is a manipulation in which the greatest care and gentle-

ness are required, on account of the delicacy of their lining membrane, any rupture or abrasion of which would be followed by stricture, or, if the membrane were extensively torn, complete closure of the canal might ensue. The student must bear in mind the abrupt turn which the canal makes at a short distance from the punctum. In passing a probe into the lower one, for instance, the instrument should be allowed to pass almost vertically downwards for about half a line, and then turned inwards towards the nose, in which direction it will pass —provided it meets with no obstruction—until it strikes against the inner wall of the lachrymal sac. In practiced hands, a fine probe without a bulb may be used with advantage when the canal is very narrow, but the beginner should never trust himself to employ any but a bulbous-ended instrument; and even this, as I have said, must be carried forwards in the most guarded and delicate manner. It was formerly recommended to carry on the probe through the lachrymal sac and nasal duct into the nose, so as to dilate any stricture that may exist in those parts; but the instrument employed is, of necessity, so slender, that it cannot be guided with any certainty or precision through so long a passage; and injury to the lining membrane of the sac is almost certain to follow such fruitless attempts. If the obstruction in the sac or nasal duct be complete, and the canals and puncta be free, firm pressure of the finger just below the tendon of the orbicularis muscle, will cause the contents of the sac to escape at the puncta: but if the passage into the nose, although narrowed, be pervious, steady pressure in a direction downwards, and a

little backwards, will commonly overcome the resistance of the stricture; the firm swelling caused by the distended sac then suddenly yields, and the fluid passes into the nostril.

In the same way that chronic thickening of the conjunctiva will induce constriction of the punctum, just so will a similar condition of the lining membrane of the nostril cause obstruction or closure of the *outlet* of the nassal duct. Various attempts have, therefore, been made to dilate from below strictures of the duct and sac, by introducing sounds from the nostril; and tubes have been passed in through the same channel with the object of injecting astringent or stimulating fluids into the cavity of the distended and inflamed sac; but these attempts have ended in disappointment.

I have already partly described the appearance of that distension of the sac which is attended with chronic inflammation of its lining membrane. The fluid which escapes from the puncta, when the sac is pressed, may assume the various appearances of tears thickened with clear mucus, tears mixed with little curdy flakes of a yellowish or creamy color, or a fluid which seems to consist almost wholly of pus.

If care be taken by the patient frequently to empty the sac into the nostril by pressure, the disease may remain for years almost stationary; under some catarrhal attack, however, or from some other cause, it may happen that this chronic affection of the sac suddenly changes its character: pain is felt in the part; the lids become red and puffy—sometimes to such an extent as to assume an erysipelatous appearance, and wholly to

prevent the patient separating the tarsi. In this state the swollen sac feels hard and unyielding, and even slight pressure over it causes extreme pain.

If allowed to run on, this inflammation ends in suppuration within the sac: the abscess discharges its contents by bursting just below the tendon of the orbicularis muscle, and the opening in the skin sometimes remains fistulous, allowing the tears which may pass through the puncta into the sac to escape on to the surface of the cheek, thus constituting a true *fistula lachrymalis*. When all inflammation has passed away, and the redness and swelling which attended the bursting of the abscess have disappeared, the fistula narrows to such a small aperture that, were it not for the tears which slowly distil from it, the opening would hardly be perceptible. It is about the size of a pin-hole, and, except that it does not project above the surface of the skin, almost resembles one of the puncta themselves.

The *Treatment* of Distension of the Lachrymal Sac, from chronic thickening of its lining membrane or stricture of the nasal duct, is very tedious. Injections of various fluids, either through the puncta or through the nasal duct, were formerly highly recommended, but have now fallen into disuse. The introduction of a *style*, to be permanently worn in the canal, is a step which should never be resorted to so long as any probability remains of restoring the passage by milder measures. The remedy I have found most serviceable is a little oval blister, about half an inch long, placed directly over the sac. This may be repeated every fortnight or so, according to the state of the skin; and

the plan, to be efficacious, must be persevered in for several months. Astringent drops may be used at the same time, but they can reach the sac only in very small quantities, and much diluted with the tears, by passing through the puncta and along the canals. Before using them, therefore, the patient should endeavor to empty the sac completely, by pressing his finger upon it in a downward direction.

When Acute Inflammation of the Sac comes on in the manner I have described, the best application is warm water-dressing. Poultices are apt to irritate the skin of the lids, especially in children. Continued warmth and moisture are sometimes so effectual that, within twenty-four hours, not only do the redness and swelling of the lids wholly disappear, but the swollen membrane of the sac is so much relieved, that gentle pressure suffices to empty its contents into the nose, and the case returns to its chronic condition. If the swelling continues unchanged, it must then be freely opened, and treated like a common abscess.

Endless varieties of surgical treatment have been devised for curing the chronic distension of the sac, or the stricture of its duct: pads, adjusted by means of springs or screws; catgut, introduced into the nasal duct through an incision in the anterior wall of the sac, strings of greater thickness being used as the canal would admit of their passage; metal tubes, which were intended to be healed in and quietly to occupy the sac and duct, but which Nature, with her dislike to foreign bodies, always rebelled against, and dislodged either upwards or downwards; styles, which should allow of

the tears passing along them and so reaching the nostril;—all these contrivances have been tried, and, with the exception of the last, pretty generally abandoned. The chief objection to the style (apart from its unsightly appearance) is that it requires management and care such as very few patients indeed can, or will, bestow upon it. They neglect to remove and cleanse it regularly, and when it sets up some irritation (as it occasionally will do) they probably remove it altogether, and are unable to replace it. These and other reasons had induced me many years ago to abandon its use.

Mr. Bowman* has devised a very simple and useful operation, which, in many instances, suffices to cure troublesome Epiphora, while, at the same time, it affords a new and ready access to any obstruction that may exist in the course of the lachrymal canal. If, in consequence of chronic ophthalmia, or from any other cause, the lower *punctum lachrymale* has become displaced, so that, instead of facing towards the globe, it is directed upwards or forwards, the tears will run over the edge of the tarsus. In such cases a small probe is to be passed along the whole course of the *canaliculus*, and held steady there, while a fine, sharp-pointed knife is run along the upper surface of the probe as far as the caruncle, so as completely to lay open the *canaliculus*, and thus, as it were, carry its orifice backwards to the point where the tears accumulate.

This little operation requires much care and nicety, and is facilitated by using a probe grooved to within a short distance of the end, so as to prevent the point of

* *Med. Chir. Transactions* for 1851, p. 338.

the knife slipping to one side.* For several days after the incision has been made, a probe must be passed along its track, to prevent the lips of the wound growing together.

If a stricture exists in the lachrymo-nasal canal, it may be reached through the now enlarged orifice of the *canaliculus*, through which a probe of suitable size is to be passed till its point is felt to strike against the inner wall of the sac. The probe is then raised into a nearly vertical position, and its point is very carefully carried forwards until it meets with the stricture, through which it is to be passed until its point reaches the floor of the nostril. The frequency with which the probe is to be used depends upon the nature of the stricture.

I would especially warn those who, from this slight sketch of the operation, may imagine that it is easy of performance, and that the subsequent cure of stricture in the lachrymo-nasal duct is to follow almost as a matter of course, to be very careful how they attempt either one or the other manipulation. The passage of an instrument through a stricture in the lachrymo-nasal duct demands even more care and skill than the passage of an instrument through a stricture in the urethra; and those who have seen much practice will bear me out in saying that by far the greater part of obstinate and dangerous cases of the latter kind are due to bad surgery, rather than to original disease. The student must bear in

* An ordinary extraction knife may be employed; but I have found a more convenient instrument in one of the small, narrow-bladed knives originally invented by Sir Wm. Adams for his now obsolete operation of cutting up the lens.

mind that the walls of the lachrymal sac and nasal canal are composed of extremely brittle and fragile bones, and that the rough introduction of a probe may either break some of these, or tear away the delicate and vascular membrane which covers them. Besides, as the canal is a bony tube, all thickening of its lining membrane must take place concentrically; and therefore any undue violence, by setting up inflammation, is sure to increase, instead of lessening, the cause of stricture.

Even when all possible care and skill have been employed, cases of stricture of the lachrymal passages are often extremely tedious; for they may be complicated with great dilatation of the sac; caries of the surrounding bones; or false passages, resulting from former errors of treatment.

A very rare affection of the lachrymal passages consists in a deposit of the earthy salts contained in the tears, so as to form a calculus. *Dacryolithes* is the name given to these concretions. They have been found in the canals, and in the sac itself. Watering of the eye, repeated attacks of inflammation in the sac, or swelling and suppuration about the canal, and pain when the part is pressed upon, will be the more obvious symptoms. A probe carefully passed into the canal, or through it into the sac, would detect the presence of the concretion, which must be cut down upon and extracted.

Another cause of irritation of the lachrymal passages, is the intrusion of a *detached eyelash* into one of the canals. The hair enters at the punctum, and passes on as far as the abrupt bend which the canal makes at about a line's distance from the opening. Here it is ar-

rested; its point protruding to a greater or less extent, and irritating the conjunctiva and semilunar fold. The symptoms induced are a pricking and itching about the inner canthus, attended with redness of the conjunctiva. If the eyelash be short, its point will protrude so little beyond the punctum as to make it very difficult of detection. During ten years I noted down the cases in which I had removed eyelashes from the puncta, and found them to amount to fourteen—eight being from the upper, and six from the lower aperture. In two of the latter instances I was myself the patient.

CHAPER XIII.

THE EYELIDS.

The variety of tissues entering into the formation of the Eyelids, of course subjects them to a great variety of diseases; but inasmuch as the tissues for the most part resemble those found in other parts of the body, and do not present the peculiarities which distinguish the structures of the eyeball itself, there is no occasion, in a work like the present, for treating diseases of the eyelids with that minuteness of description which is absolutely necessary when treating of morbid changes in the cornea, the iris, and the lens.

The *orbicularis palpebrarum* muscle is subject to a spasmodic twitching of some of its fibres, usually those spread over the lower lid, producing a visible quivering of the skin of the part, popularly termed "the live-blood." To some persons of an irritable nervous system, it becomes teasing from its frequent recurrence. It is commonly the effect of intestinal irritation, especially that produced by ascarides; and a purge, followed by a little tonic medicine, quinine or iron, suffices to put an end to the annoyance.

The upper lid may droop, so as to interfere with vision by obstructing the greater part of the pupil; or it may fall so as to come into close contact with the lower lid, and render the eye altogether useless. To the latter condition the term *Ptosis* (πτῶσις) is applied;

and as it is the effect of a gradual or sudden loss of power in the levator palpebræ muscle, it will be spoken of under the head of *Paralysis of the third nerve.* In some patients who have a congenital drooping of the lids, there seems to be no power of raising them, except by putting into action the occipito-frontalis muscle. The skin of their lids does not present the transverse fold which, in the natural state, is seen to correspond more or less with the upper surface of the eyeball; but the lid, from the eyebrow to the tarsus, is smooth and unwrinkled. The forehead, on the contrary, is furrowed by the frequent compensating action of the occipito-frontalis. It is possible that in some of these cases the levator palpebræ muscle may be altogether wanting.

The term *Epicanthus* has been applied to a slight deformity, sometimes observed in children, which consists in a crescentic fold of redundant skin at the inner corner of each eye, partly or wholly concealing the caruncle. If, in after life, the bridge of the nose becomes prominent, this fold of skin, to a certain degree, disappears. It has been proposed to remedy in early life this little deformity by pinching up and removing a vertical fold of skin on the median plane just between the eyebrows, and bringing the wound accurately together.

If the tarsal margins of the lids turn inwards against the surface of the eyeball, the rubbing of the eyelashes on the conjunctiva causes, as may well be imagined, constant irritation and distress. This turning in, whether of the whole or of a part of the lid, is termed *Entropion.*

It is met with, especially in elderly persons, as a result of Chronic Inflammation of the palpebral conjunctiva, such as follows neglected or maltreated Purulent Ophthalmia. The curvature of the upper tarsus may become so much increased that the whole range of eyelashes turn backwards against the globe. No doubt this curving of the tarsus is often aggravated by the long-continued application of solid nitrate of silver and sulphate of copper to a granular conjunctiva; and if, in such cases, we evert the upper lid, a pale, smooth cicatrix will be found occupying its deep concavity. Injuries to the eyeball from lime, acids, &c., also produce contractions of the conjunctiva, which may draw inwards a part or the whole of the ciliary margin of the lids.

Inversion of the lower lid is not uncommon in old persons, in whom the skin is loose and the tarsal cartilage flaccid. Under some temporary irritation of the eyeball, the fibres of the *orbicularis palpebrarum* are put into frequent action, so that on some occasion the lower tarsus becomes tilted quite against the eyeball; this irregular action is repeated until, at last, the lid becomes so rolled upon itself that both the cilia and tarsus are completely hidden from view, and the border of the lid is formed by the common integument. In these extreme cases of Entropion, the irritation is much less than in those in which the inversion is only to a slight degree. For, in the latter instance, the points of the cilia are brought into direct contact with the globe, whereas in the former case the tarsus rolls over so completely that the points of the cilia are buried in the fold of palpebral conjunctiva, and consequently do not come into contact with the globe.

Occasionally one meets with *Spasmodic Entropion* of the lower lid in children the subjects of irritable Ophthalmia, and this inversion of the eyelashes greatly increases their distress. Contractile collodion applied to the skin of the lid, counteracts the tendency of the part to turn in, and gives time to other remedies to subdue the irritability which had given rise to it.

Inveterate cases of Entropion in old persons can be radically cured by removing a suitable portion of the skin of the lid, together with the fasciculus of muscle beneath it, and then accurately uniting the wound with sutures. It is a matter of much nicety exactly to calculate the extent of skin to be taken away, and of course the removal of too large a quantity would produce a deformity of an opposite kind,—namely, eversion, or *Ectropion*. If the tarsus be so morbidly curved that removal of skin will not suffice to draw the eyelashes away from the globe, the whole row may be dissected off.

In Ectropion, or turning outwards of the lid, the palpebral conjunctiva is always more or less reddened and uneven; recent inflammatory cases presenting a florid and villous surface, while chronic cases have a more congested and coarsely granular aspect.

In Purulent Ophthalmia of infants, and in Scrofulous and Irritable Ophthalmia of older children, the swollen lid may become suddenly everted, either by the spasmodic action of the *orbicularis palpebrarum*, or by the efforts of those who are endeavoring to examine the eye. The appearance thus produced frequently gives rise to much alarm; but as the inflammation subsides, the deformity gradually disappears, without requiring any operation.

This, however, is not the case in the chronic forms of Ectropion, which is slowly produced either by granular thickening of the conjunctiva following Purulent Ophthalmia, or by the contraction of cicatrices in the adjacent skin, resulting from burns, ulcers, disease of bone, &c. These deformities are so various, and require such manifold forms of operation (which can hardly be made intelligible without the aid of figures), that I must refer the reader to the *Practical Treatises* of MACKENZIE and WALTON,* where drawings are given both of the deformities and of the operative plans for their cure.

When isolated groups of eyelashes grow irregularly, so as to turn against the surface of the globe, the disease is called *Trichiasis*. It is sometimes difficult to decide whether a case of displaced cilia should be distinguished by this term, or by that of *Entropion*. The former term, however, is properly limited to those cases in which, while the general outline of the tarsal cartilage is natural, the eyelashes are displaced in consequence of small cicatrices about their roots, as in the disease known by the name of *Tenea Ciliaris*, which affects the edge of the tarsus. Sometimes three or four fine eyelashes have their points directed against the globe, or even a single hair will grow in this direction, while all the rest maintain their natural position.

I had a woman under my observation for many years who suffered from a form of Trichiasis, resulting from the peculiar nature of the hair themselves. They were

* *On Operative Ophthalmic Surgery*, 1853. In this work the reader will find several well-executed figures of Entropion and Ectropion, with the appearance of parts during and after the operation.

almost white, very fine and weak, and twisted together almost like the fibres of singed wool. They got tucked under the margin of the tarsi, and gave rise to considerable irritation. The hairs of her eyebrows and head had much the same character as the eyelashes.

If only a few hairs are displaced, the removal of the entire row must not be resorted to, but the offending ones must either be carefully plucked out from time to time, or the entire group removed by dissecting out the little portion of lid, external to the tarsus itself, in which their roots are implanted, and uniting the edges of the skin-wound. Where a single hair, or two or three hairs, are faulty, it has been recommended to inoculate the bulbs with tartar emetic in powder, or to destroy them with a red-hot needle, set in a ball of metal to preserve the heat.

To draw out eyelashes by the roots seems a very simple matter, and yet there are few surgical manipulations in which skill and a well-made instrument are so much needed.

Most of the cilia-forceps one meets with are so made that they cut through the hair, instead of merely grasping it firmly; and I need not say that a stiff, broken stump causes infinitely more pain to the patient than the fine, natural point of an unbroken hair (see *Plate* at end).

INFLAMMATION OF THE LIDS.

The eyelids are of course subject to œdema, erysipelas, abscess, and the various forms of inflammation which attack other parts of the common integument; and I have already alluded to the redness and swelling which espe-

cially attend acute inflammation or suppuration of the *sac* in cases of obstructed nasal duct. There are, however, a few forms of inflammation which demand notice, on account of their presenting peculiarities of appearance, or being distinguished by special names.

A stye (*Hordeolum*) begins as a small, red, tense swelling, at the very edge of the lid, close to the root of one of the eyelashes. At first it is chiefly troublesome by its itching. As it increases, the lid becomes stiff and painful, and in some cases assumes throughout a considerable degree of redness and swelling, so that the eye becomes completely closed. In a few days, matter begins to show itself at the most prominent point of the stye; the skin gives way; a small quantity of pus and and sloughy areolar tissue escape; the redness and swelling of the lid subside; and the part gradually resumes its natural appearance.

Styes are very common in scrofulous and delicate children, and comparatively rare in adults. Except a slight puncture through the cuticle, with the point of a lancet, when the pus is pointing in a large stye, no incision or handling is necessary or advisable; warm water-dressing, and frequent fomentation, comprise all the local treatment. The patients are, as I have said, almost always out of health, and require attention to the bowels, careful diet, and tonics.

I observed, when speaking of *Trichiasis*, that one of the commonest causes of this displacement of the eyelashes was *Tinea Ciliaris*. This disease,—termed also *Ophthalmia Tarsi* (MACKENZIE), *Psorophthalmia*, *Lippitudo*, *Tinea Palpebrarum*, is too often neglected in its

early stage, when alone it is curable; and the surgeon is not appealed to until many of the hairbulbs have been irreparably destroyed, and others distorted and inverted (*Trichiasis*). Or the case may be neglected until all the hairs, except perhaps a straggling one here and there, have disappeared, and the edges of the lids, red, shining, and partly everted, give to the patient the most repulsive aspect. It is useful to distinguish by different names that condition in which active disease is still going on at the roots of the eyelashes, and that in which they have been destroyed, and the lids reduced to the state I have just described; and we may restrict the term *Tinea Ciliaris* to the first condition, and call the second *Lippitudo.*

We rarely have an opportunity of seeing *Tinea Ciliaris* in its early, pustular form; for the little pustules which are scattered along the margin of the lids soon break, and the discharge exuded from them forms crusts, which cling about the eyelashes, and, in severe cases, almost hide them from view. If the disease is suffered to run on unchecked, it continues for years to infest the roots of the hairs, until the tissues which secrete them are totally destroyed. Then, when all disease is at an end, and the last remaining crusts have fallen off, the edges of the tarsi, instead of presenting sharply beveled edges, appear rounded off, the skin and conjunctiva being gradually blended together into one smooth, red, shining cicatrix, in which neither Meibomian orifices nor cilia can be traced. Very commonly, the puncta lachrymalia have also become closed, and the tears, in consequence, trickle over the cheek, and produce a constant irritability and blinking of the lids.

The chief difficulty in treating cases of *Tinea Ciliaris* arises from the age of the patients, and their unwillingness to submit to the necessary discipline. Constant attention is required to prevent the accumulation of crusts, which should be carefully washed off night and morning. Hospital patients frequently derive but little real benefit from the ointments prescribed, in consequence of these preliminary cleansings being omitted: the salve is roughly smeared over a thick accumulation of crusts, and perhaps, at the same time, some fragments of the latter are forced into the eye itself, together with some of the stimulating ointment.

Of course, it is useless to apply the ointment anywhere except upon the very surface of the minute sore; and, to ensure this being done, every particle of crust must previously be removed. The ointment must then be neatly penciled in wherever a raw surface can be detected. Where this careful manipulation cannot be ensured, it is better to prescribe a lotion, as that can hardly fail to reach the seat of the disease, if it be used often enough. The Unguentum Hydrarg. Nitratis, Ung. Hydrarg. Nitrio-oxydi, or Ung. Zinci Oxydi, much diluted with *fresh* lard, are the salves in common use; and a solution of Acetate of Lead in distilled water, (gr. ij—iv ad ℥j) is perhaps the best form of lotion.

In the worst forms of *Lippitudo*, the surgeon can do but little to remedy the unsightly appearance. A stick of nitrate of silver, lightly brushed over the very edge of the lids, will sometimes render them less irritable; and if the tears can no longer be taken up, in consequence of displacement of the puncta, these apertures

may be slit in the manner suggested by Mr. BOWMAN (p. 285).

The Meibomian follicles—which pour out upon the edge of the tarsi a greasy matter, to prevent the tears running over, and to cause them to flow onwards to the inner canthus and puncta—sometimes become slightly obstructed at their orifices, and then the secretion becoming solidified, forms a minute granule, looking like a grain of sand upon the edge of the tarsus. If it projects sufficiently to touch the conjunctiva of the globe, it produces slight irritation, and gives the sensation of a small foreign body in the eye. A touch with the end of a probe is sufficient to remove it.

A small *Abscess* may form in the Meibomian follicle itself. It usually is met with in the lower lid, commencing with a small patch of vascularity in the palpebral conjunctiva, close to the free border of the tarsus. After some time, there appears in the centre of the red patch, a yellow dot, evidently produced by a minute quantity of pus, just beneath the conjunctiva. If the part be punctured with a lancet, and the scoop of a fine probe introduced, the exciting cause of the suppuration—a little nodule of stearine—may be turned out, and all irritation at once ceases.

PHTHEIRIASIS.

This term is employed to denote the breeding of *crab-lice* among the eyebrows and eyelashes. The affection must be extremely rare, at least in this country; for among the thousands of patients who have come under my care at the Ophthalmic Hospital, Moorfields, I have

seen but a single case of the kind; and I know of three cases only which have been observed by my colleagues.* It is possible, however, that some may have been overlooked, on account of the strong resemblance such cases bear to the slighter forms of *Tinea Ciliaris*.

The patient I saw was a healthy-looking child, four years of age, well fed, cleanly in general appearance, and perfectly free from vermin in other parts of the body. The eyelids, also, on the right side, were free from disease. Those on the left were very slightly reddened at the edges; the cilia presented a powdery appearance, and their roots seemed to be clogged with such yellowish-grey and brown crusts as are met with in early cases of *tinea*. These crusts (as they seemed to be) were very small, and might easily have been passed by, as presenting nothing uncommon. Their beaded form made me look more closely, and I then recognized their real nature from the movements of the insects. I placed some under the microscope, and identified them as crab-lice (*Phthirius*, LEACH), a species perfectly distinct from the common louse (*Pediculus*). They appear to thrust in their heads beside the roots of the cilia, and by means of the sharp claws, with which all their legs, except the first pair, are furnished, hold on so firmly that they cannot be dislodged without much difficulty. The child had been troubled for many weeks with these creatures, which, however, had not invaded even the eyebrow on the same side.

I ordered Unguent. Hydr. Ammonio-chloridi to be

* From one of these the drawing was taken which appears in DALRYMPLE'S work, pl. vi., fig. 6.

smeared upon the eyelashes every night, and this seemed to destroy such of the insects as I had not been able to dislodge with the forceps.

TUMORS.

The following are met with in and upon the eyelids:—

1. *Cysts* (connected with the tarsal cartilages) which have been variously designated as *Chalazion* (MACKENZIE), and as *Encysted tarsal tumor* (TYRRELL).

2. Solid growths on the skin, termed by TYRRELL *glandiform*, and by MACKENZIE *albuminous* tumors, but which seem to be identical with *Molluscum*.

3. Little watery bags, found in old people along the cuticular edge of the lid.

4. *Warts*, differing in no respect from those in other parts of the body.

5. *Nævi materni*, which likewise offer nothing peculiar.

6. Strong, fibrous, subcutaneous *Cysts* (containing epithelium and hairs), which are almost invariably found at one spot, namely, the outer extremity of the hairy eyebrow.

1. The *Cystiform Tumor* of the tarsus is very common. It may occur singly, or there may be several cysts at the same time, and in both lids. When small, they are hardly recognizable except by the touch, as the skin over them is quite unchanged. They feel like half a hemp-seed, or half a pea, fixed by its flat side to the tarsal cartilage, and presenting its convexity to the skin, which may be slipped freely over it in every direction. It seldom exceeds the size of a large pea, except

in the case of suppuration taking place within its cavity.* If the lid be everted, the part to which the tumor is fixed will be recognized by the tarsus appearing to be thinned, so as to present a slightly dark spot, around which the conjunctiva is rather vascular. These cysts may remain of a moderate size throughout the patient's life, and cause no inconvenience; but sometimes they suddenly inflame and enlarge; the skin over them becomes reddened, and at last gives way, and allows a small quantity of pus to ooze out, and a thin sanies then continues to drain from the aperture. More frequently it is the conjunctiva which gives way, and then a little red, soft, fungous mass gradually protrudes, which, by being continually pressed against the eyeball, becomes flattened out into a button or mushroom shape.

If these cysts are small, and do not inflame, it is needless to meddle with them. If, however, they acquire such a size as to become observable, or if they inflame and suppurate, they must be treated as follows:—the lid being everted, a little crucial wound is made through the conjunctiva and thinned tarsus into the cavity of the cyst, with a lancet or cataract knife: a little serum and pus escapes; then a scooped probe is passed into the cyst, and twirled about in various directions, so as to empty out all the accumulated epithelium, which looks almost like half-melted size. Blood fills the cyst, and makes it as large as it was before the incision. The

* Dalrymple; pl. iv., fig. 2, shows very well the appearance of a full-sized Cystiform Tumor. The drawing must have been made from a case in which suppuration had begun; otherwise, the skin would be of its natural color.

patient may be assured, however, that this swelling will gradually subside. It will be necessary to break up the contents of the cyst, and prevent closure of the opening, be re-introducing the probe every second or third day for, perhaps, a fortnight. By that time the walls of the cyst will have come together, and nothing will remain but a slight thickening, just perceptible by the finger applied to the skin of the lid.

2. The little masses termed by MACKENZIE *albuminous*, and by TYRRELL, *glandiform tumors*, are met with in children, on the lids, the alæ of the nose, and near the angles of the mouth. Those about as large as a hemp-seed are smooth, shining, and slightly reddened; when they attain to the size of a small pea they are whitish, and exhibit at the apex a little opening, through which a milky fluid exudes on pressure.* The most effectual way to get rid of them (though it appears rather a rough and barbarous process), is for the surgeon to secure the child's head between his knees, to split all the little tumors through with a lancet, and then to nip out the contents of each between his nails. The appearance of the mass is very similar to that of a fragment of pancreas, or salivary gland.

3. The little, thin, *watery bags*, about the size of a hemp-seed, which are found along the edges of the lids in old persons, are hardly worthy of notice. They may, if thought desirable, be removed by snipping off their prominent part with scissors.

* DALRYMPLE; pl. iv. fig. 3. A good representation of these growths, which, however, are rarely seen of such large size.

4. *Warts* may be treated in the same manner, and the wound touched with nitrate of silver.

5. *Nævi* of the lids differ in no respect, as regards appearance, from those found in other parts of the body. They only require more careful treatment, on account of the importance of avoiding, as much as possible, any extensive loss of skin; as a large cicatrix might induce Ectropion, or some other deformity. Subcutaneous ligature, therefore, or the introduction of probes coated with fused nitrate of silver, must be preferred to including any considerable portions of skin within the ligature, or extensively applying escharoties. I have seen injections of alum cause sloughing of the lids and great subsequent deformity.

I have recently had a case under my care in which the injection of a solution of tannin has answered extremely well. A young lady was brought to me with a nævus upper lid, about as large as a small hazel-nut. I was told it had been twice operated upon by the introduction of "threads steeped in acid," and that much inflammation and sloughing followed. Indeed, there was a considerable cicatrix of the skin near the outer canthus. The apex of the swelling was near the free margin of the lid; on everting the latter, a small, red bunch of veins, about the size of barley-corn, was seen projecting through the tarsal cartilage. The nævus seemed to be formed almost wholly of veins, the larger trunks of which could be felt through the skin, just below the supra-ciliary ridge.

I enclosed the whole substance of the lid in a "ring-forceps," and thus completely isolated the nævus from

its parent veins. Then, I punctured it with a very small narrow knife, and cut up its tissue subcutaneously. The nævus of course collapsed when emptied of blood, and I next threw in, with an ANEL'S syringe, a saturated solution of tannic acid in water. After a short pause, I relaxed the pressure of the ring-forceps, and allowed the current of blood to return and come into contact with the injected fluid.

The inflammation which followed produced a good deal of swelling and hardness of the lid, but the only slough was a mass about the size of a small pea, which came out, like the core of a boil, at the little wound.

The last time I saw the patient, seven weeks after the operation, the cure seemed to be complete. The form of the lid was just like that of the sound eye; but there was a good deal of livid discoloration beneath the skin, the result of extravasated blood. No trace remained of that small portion of the nævus which had perforated the tarsal cartilage.

6. I am not aware of the reason why the strong *fibrous cysts*, containing sebaceous matter and hairs, which form beneath the skin of the eyebrow, should almost invariably be found to correspond to its outer extremity; but such is the case. I believe they are usually congenital; at least, I have seen them of considerable size in infants of four or five months. They cause a prominence of the skin, the color of which, however, is quite unchanged. They are to a certain extent moveable upon the edge of the orbit, and the skin seems to be slightly adherent to them at one point. They vary from the size of a large

pea to that of a hazel-nut. When dissected out, they are found to be composed of a strong fibrous cyst, with a smooth lining membrane; and the cavity is filled with white, greasy matter, interspersed with hairs. In a cyst removed from an infant of five months, I saw these hairs still attached to the lining membrane. In older children and in adults they are always loose. I removed from a woman, between thirty and forty, a cyst, the skin over which had become so much thinned as to have assumed a slightly blackish hue. In endeavoring to dissect out the cyst I punctured it, and there escaped a quantity of perfectly clear, yellowish oil, into which all the sebaceous matter secreted seemed to have been converted. When the cyst was removed, nothing was found within it but some detached hairs, loosely curled together, and as strong and dark as those of the head.

INJURIES.

The appearance of an *Ecchymosis* of the lids—popularly a "black eye"—is too familiar to require description. As regards the best mode of treatment, I know of none equal to that handed down by the traditions of pugilism, consisting in the application of a poultice formed of the scraped root of the black bryony (*Tamus communis*), mixed with linseed meal or bread crumbs. This produces a stinging sensation in the skin, and effects a very speedy disappearance of the effused blood.

Emphysema of the Lids may fitly be spoken of in immediate connection with Ecchymosis, for both very frequently arise from the same cause—namely, blows from the fist; indeed, I have never seen Emphysema

occur in any other way. Shortly after receiving such an injury, the patient happens to blow his nose, and is surprised to find the eyelids suddenly puff up, so that he is unable to separate them. The swelling is unattended with any redness of the skin, and, on pressing the part with the fingers, the surgeon at once perceives the peculiar crackling of air effused into areolar tissue. It resembles the sensation we experience in compressing a portion of healthy lung between our finger and thumb.

The cause of this *Emphysema* is rupture of the lining membrane of the nose, with fracture of the lachrymal, or perhaps the ethmoid, bone; and, until the fissure has closed, the Emphysema is apt to recur if the patient blows his nose. If he abstains from doing this, the effused air soon becomes absorbed without any special treatment.

I need not enter into any particular description of *Wounds of the Eyelids;* for they differ in no respect from wounds of other parts of the integument, and offer no difficulties of diagnosis. I would only allude to the importance of securing the nicest and most accurate adaptation of cut surfaces in parts so open to observation. The fine and yielding nature of the skin of the lids, and its rich supply of blood, offer peculiar facilities for obtaining close and smooth union of wounds by means of fine sutures, in applying which the greatest care must be taken to avoid any irregularity and puckering of the cut edges.

Carcinoma commencing in the lids is a rare disease. If it be already far advanced when the surgeon is first applied to, extirpation would hardly be attempted. If

recognized in the early state, as a small, hard, tubercular mass at the margin of the tarsus, a V-shaped portion of the lid may be removed.

Epithelial Cancer chiefly affects the skin just over the lachrymal sac, extending from the inner canthus downwards over the nasal bone, having the appearance of a shallow ulcer, with an irregular outline, and everted borders; its surface being pale, with a scarcely perceptible amount of secretion. Chloride of zinc, applied as a paste over the entire surface of the sore, but especially upon its margins, very effectually destroys the growth; and it may be repeated as often as any part of the border appears inclined to extend itself. Strict attention would of course at the same time be paid to the general health of the patient.

CHAPTER XIV.

THE ORBIT.

DISEASES OF PARTS SURROUNDING AND ACTING UPON THE EYEBALL.

In the present Chapter, parts very dissimilar, as regards their structure and functions, are grouped together; but inasmuch as, in a healthy state, they all either *support* or impart *motion* to the Eyeball, any morbid change in them, or any tumor in their immediate neighborhood, must cause *displacement* of the organ, or *impairment of its mobility;* and these are the symptoms which, in orbital diseases, first attract the notice of the surgeon.

PROTRUSION OF THE EYEBALL.

(*Proptosis oculi;—Exophthalmos;—Ophthalmo-ptosis.*)

It must be self-evident that this cannot take place to any great extent without the sight becoming impaired by the stretching of the optic nerve. Both globes may, however, appear somewhat too prominent, in consequence of an overgrowth of fat in the orbits. I have seen a similar overgrowth occur in the lids.

A more marked deformity is that which is met with chiefly in feeble and hysterical women, in whom the eyes appear much too large for their sockets. The tarsi can be brought completely together, and the eyes

themselves can be freely moved in all directions. The equal amount of prominence in both eyes, and their unimpaired function, both of sight and movement, would do away with any suspicion of orbital tumor.

The cause of this deformity is obscure. Atony of the recti muscles might produce a certain amount of prominence, but is hardly compatible with such free motion as usually exists; and a shortening of the *levatores palpebrarum*, such as would account for much of the seeming prominence, would hardly allow of complete and easy closure of the eyelids. As far as I have seen, the deformity is never cured.

I may here notice an apparent, rather than a real, displacement of the eyeball, which is the result of accident, and which gives rise to much alarm in those who witness it for the first time. It consists in the complete lodgement of the upper lid behind the greatest convexity of the globe.

If a patient, in whom the eyeballs are naturally prominent, and the eyelids flaccid, or in whom some small orbital tumor may slightly thrust the globe forwards, be too forcibly examined by the surgeon, anxious to explore the upper surface of the sclerotic, it is possible that the tarsus may suddenly slip over the greatest convexity of the globe, and become fast locked behind it. This is probably the accident which is mistaken for Dislocation of the eyeball itself, in those cases, so often *heard of*, in which the friends of the patient assure us that "his eye was knocked out of the socket, and hung on his cheek, and that it was put in again, and he saw as well as ever." A wire speculum

(PELLIER'S) or a bent probe, will enable the surgeon to lift up the tarsus from behind the globe, and restore it to its place.

The Eyeball may be slowly displaced by various morbid growths—*Hydatids*, *Cancerous deposit* within the cavity of the orbit, or *Exostosis* from its walls.

At first the globe becomes gradually protruded in a direction corresponding to the position of the mass which is acting upon it, and as the tumor increases, the globe becomes immovably fixed in the orbit. It is sometimes possible to pass in the little finger between the globe and the bony walls surrounding it, so as indistinctly to explore the position of the tumor; but the extent of such exploration is necessarily so limited, that it requires great tact and pains to form any diagnosis.

As might be expected, bony growths are the slowest in producing displacement of the globe, and encephaloid tumors the most rapid. Hydatid cysts may sometimes be recognized by their elastic feel, and a puncture with a fine exploring trochar may render their nature evident, and induce the surgeon to make an incision for their removal, which he would not be inclined to do if a bony or cancerous mass were detected.

Abscess in the areolar tissue of the Orbit is most commonly a sequel of erysipelas or fevers; it may, however, occur as a result of injury, such as the entrance of a foreign body. Some prominence and loss of mobility of the eyeball; redness of the conjunctiva, and infiltration of the areolar tissue beneath it, with marked redness and swelling of the lids, and, ultimately, fluctuation, are the distinctive signs of Orbital Abscess; and the com-

parative rapidity with which these signs follow each other, at once distinguishes suppuration from the growth of tumors.

Until the occurrence of fluctuation, the diagnosis of inflammation of the orbital areolar tissue is obscure; and the incisions which some writers advise to be made, before suppuration has plainly shown itself, seem very unsafe, when we consider how closely the eyeball is surrounded with muscles and nerves, which it would be dangerous to wound, and which could hardly escape such deep punctures as are recommended.*

Chronic Abscess in the Orbit may occur as a result of caries, or necrosis; in which case a probe, passed into the opening through which the pus has been evacuated, will detect the denuded bone.

Orbital Abscesses, even of the more acute and phlegmonous kind, so commonly occur in debilitated and depressed subjects, that opiates and moderately nutritious diet will be much more frequently indicated than bleeding and abstinence. Tonics and stimulants—such as bark, wine, &c., are frequently required to a considerable amount, in those cases in which free suppuration has followed the opening of the abscess.

The various faulty positions of the eyeball which are comprised under the general head *Strabismus*, may be due either to a morbid condition of some of the ocular muscles, as regards associated action, or to paralysis of the nerves supplying them.

* Tyrrell says (*Practical Work*, &c., vol. ii., p. 206),—"I do not hesitate to make deep and free punctures, either between the eyelids and globe, or through the eyelids."

The reader will do well to call to mind the distribution of these motory nerves:—

The *third* goes to the levator palpebræ, the superior, inferior, and internal, recti, and the inferior oblique, muscles; and to the iris, through the medium of the ophthalmic ganglion. The *fourth* supplies the superior oblique muscle; the *sixth*, the external rectus.

A patient presents himself, unable to lift the upper lid. We raise it, and expose the globe, which we find more or less abducted, so that the cornea, instead of holding a middle position, turns outwards towards the temple. By his own efforts the patient can direct the eye still farther outwards; but neither upwards, downwards, nor inwards. The pupil is immovable, and somewhat dilated.

If, with both eyes, he looks at objects placed on that side of him towards which the eye is abducted, they appear single; while those in the opposite direction appear double. When the affected eye is used by itself, objects are seen singly, although less distinctly than with the sound eye.

The function of the *third nerve* is suspended, that of the *sixth* retained; and therefore the external rectus muscle, to which the latter nerve is distributed, having no active antagonist, draws the eye outwards. Such are the appearances in a case of *total paralysis of the third nerve.*

Another patient presents himself with "*Internal Strabismus*," one eye being turned in towards the nose. The movement of the lid is natural; he can direct the affected eye upwards or downwards, and can, perhaps,

with an effort, still farther increase its inversion. The pupil is of natural size, and active. If, with both eyes, he looks at objects on that side of him towards which the eye is inverted, they appear single; if he looks in the opposite direction, they appear double. He is the subject of *total paralysis of the sixth nerve.*

It is not necessary that *all* the branches of the third nerve should be paralyzed at the same time, or in an equal degree. There may be no falling (*Ptosis*) of the upper lid, and only a very slight abduction of the eye-ball, the power of the internal rectus being weakened,—not lost. Or, the superior or inferior rectus alone may be affected, and the iris may perfectly retain its mobility.*

Or again, the *third* and the *sixth* nerves may *both* suffer at the same time. In that case, when the surgeon raises the lid, he finds the pupil dilated and fixed, and the cornea in a perfectly central position, from which the patient cannot, by any effort, move it in the slightest degree.

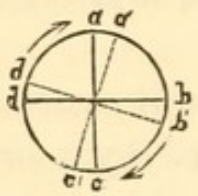
The Oblique Muscles.—The reader will remember that the inferior oblique muscle is supplied by a branch of the *third nerve;* consequently, when the whole of that nerve is paralyzed, the action of the inferior oblique ceases; and the superior oblique, which receives a special nerve of its own,—the *fourth,*—having no longer any active antagonist, rolls the globe on its antero-posterior axis,—or rather on an axis the poles of which correspond to the centre of the cornea and of the optic nerve.

* Paralysis of the motory nerves of the iris has been spoken of under the name *Mydriasis.*

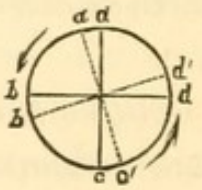
In like manner, when the *fourth* nerve alone is paralyzed,—which sometimes occurs,—the inferior oblique, being uncontrolled by the superior, rotates the eye in the opposite direction. In either case, the result is double vision; the image seen by the affected eye being, at the same time, oblique.

Figure B illustrates the change of position which the right cornea of a patient would undergo in consequence of simple paralysis of the fourth nerve. The inferior oblique muscle, being unimpaired, would rotate the cornea, so that the points at its circumference, *a*, *b*, *c*, *d*, would shift to *a′*, *b′*, *c′*, *d′*.

The action of the obliqui muscles is, as I have just observed, to roll the eyeball upon its antero-posterior axis; the objects of these movements being to ensure that, during lateral inclination of the head, the vertical diameter of one eye should be kept always parallel to the other.



A



B

If, then, we look at the right eye of a patient (A), in whom the third nerve on that side is totally paralyzed, while the fourth nerve has retained its function; and if we imagine his cornea to be marked with two straight lines intersecting each other at right angles opposite the centre of the pupil, — we shall find that whenever he makes an ineffectual effort to depress the eye, it is

slightly rolled upon its axis, by the superior oblique muscle, in such a manner that the points *a*, *b*, *c*, *d*, would assume the positions indicated in the diagram by *a'*, *b'*, *c'*, *d'*.* This muscular action cannot be kept up, but may be frequently repeated with a short, twitching motion. If such a patient looks at a near object with both eyes, a large letter in a book for instance—say a T—at such an angle that it appears double, the image perceived by the affected eye will be inclined from the perpendicular, so as to be seen by him thus ⊤, and it is only by inclining his head toward his shoulder that the image can be made to appear parallel to that perceived by the sound eye.

Paralysis of the fourth nerve (superior oblique muscle) rarely occurs alone; but I have met with a few cases in which it appeared to me to exist independently of any other nervous derangement. The diagnosis of such a case requires a great deal of careful investigation, for little or nothing is to be learnt by a mere casual inspection of the eye; and unless the patient is intelligent and able to appreciate the surgeon's object in making his experiments, little insight into the real nature of the disease is afforded.

One of the most useful aids to diagnosis is obtained by desiring the patient to trace over with a pencil the two images of the letter or mark (T or +) which may

* I had frequent opportunities of making this experiment with a patient in whom the third nerve was wholly, and the sixth partially, paralyzed, in consequence, I believe, of thickening of the dura mater about the outer wall of the cavernous sinus. The fourth nerve seemed, in some way, to have escaped injury.

have been selected as a test. It is evident that the vertical line of the mark will suggest to the patient the same kind of obliquity, whether the paralysis exist in the *right inferior* oblique, or the *left superior* oblique muscle.

The defect of vision arising from palsy of the obliqui is very evident when the patient fixes his attention on some straight line on the ground; for instance, the edge of the curb-stone in the pavement, or of a gravel walk. In each instance he sees two paths; one in its true position, the other forming with it an angle more or less acute.

To determine the exact pathology of these paralytic affections of the orbital nerves, a very careful and patient course of inquiry is needed. Chronic changes in the brain itself, or in the dura mater; the growth of tumors in either of these parts; disease of bone; all these processes may give rise to *slow*, and eventually total, paralysis of one or all of the nerves which enter the orbit. Their functions may be *suddenly* suspended in consequence of apoplectic effusion, or other injury to the brain; or the paralysis may be as complete, and as sudden, and yet may eventually pass away without the slightest impairment of function remaining; the cause having been rheumatic inflammation of the fibrous tissues immediately surrounding or investing the nervous trunks. The whole history of this case must be well weighed, before the surgeon can make up his mind to which of the causes I have enumerated he is to attribute the paralysis; and I need not say how deplorable a mistake may be committed by his overlooking, or misinterpreting, obvious and important symptoms.

Strabismus.—Although most of the forms of paralysis affecting the orbital nerves produce mal-position of the eyeball, the term "Strabismus" is commonly restricted to those cases in which over-action of one of the recti, or enfeebled action of its antagonist, has become *habitual.*

A "squint" is a deformity too familiar to require much description for enabling the student to recognize it. It may be best defined as a want of parallelism in the visual axes, when the patient endeavors to direct both eyes to an object at the same time.

The most frequent form of squint is that in which one cornea is steadily directed to the object, while the other turns in towards the nose. If, in such a case, the sound eye be closed, the other immediately rights itself, and assumes a proper direction, becoming again inverted as soon as its fellow is reopened. This constitutes a case of *single internal*, or *convergent*, Strabismus.

A rarer form is that in which one eye is habitually directed outwards—*external*, or *divergent*, Strabismus. Here, too, the faulty eye assumes a proper position whenever the other eye is closed.

Double internal Strabismus rarely exists: in most of the cases which at first sight appear to be of this nature it will be found, on careful examination, that the inversion is *alternating;* first one eyeball, and then the other, being directed to an object.

Double external Strabismus is still more uncommon.

An eye which habitually squints, if separately examined, will usually be found defective as regards vision. This inequality frequently exists to a remarkable degree;

so that, while the patient can read the smallest type with the habitually straight eye, he can with the habitually squinting one barely distinguish a printed from a blank page.

It sometimes happens, but very rarely, that the sight of an eye thus habitually squinting, is almost perfect.

The cause of the Strabismus is often very obscure. It usually shows itself during early childhood, and in many instances can be traced to the irritation of the brain which attends teething. Intestinal irritation, with development of worms, is a very frequent accompaniment of that partial squint which alternates from one eye to the other. An opacity near the centre to the cornea, will sometimes cause the eye gradually to turn inwards, as if Nature were making an effort to bring the clear portion of the cornea into use. Extreme shortness of sight, also, frequently induces Strabismus, by the constant muscular effort which the patient employs to make both eyes converge to small and near objects.

The *Treatment* of Strabismus will, of course vary with the cause. The removal of intestinal irritation; the use of tonics; abstinence from fine and trying work; the employment of glasses, to correct *myopia;* all these, and many other means, might be enumerated, as likely to remove a Strabismus which is temporary, or which occurs only when the eyes are used in some particular manner.

Before resorting to any operation, every possible care must be taken to ascertain that no organic disease is going on in the brain or orbital nerves; that there is no tumor in the orbit, mechanically interfering with the

movements of the eyeball; that the squint does not result from mere paralysis of the muscle which is the antagonist of that towards which the eye is turned; and that the retina possesses a considerable amount of visual power.

The use of the ophthalmoscope should always be resorted to before an operation is performed. For some years past I have examined in this way nearly all the cases of Strabismus which have come before me, and have detected a great variety of morbid changes in the deep tissues. In some instances, these changes were so considerable as to put all hope of improving vision quite out of the question, and yet no external sign of disease existed, except the faulty position of the eye. In most cases of single Strabismus, there was marked impairment of sight in the squinting eye, and the ophthalmoscope showed the optic nerve to be smaller than natural, and of an oval form, the long axis of the oval being more or less transverse. I believe, therefore, that, in the large majority of cases of confirmed squint, the mal-position of the eye is the result of morbid changes in the optic nerve itself.

The operation for the cure of squinting, by division of the recti muscles, was, on its first introduction, so extravagantly praised, and so indiscriminately practised, that, by a natural reaction, the current of opinion has, to a considerable extent, turned against it; and the numerous cases in which it has failed to do good, or has even produced a deformity worse than the original one, are brought forward to prove that all surgical interference is mischievous.

Without entering into minute details, I would state generally, that the cases in which division of the internal rectus tendon produces the most satisfactory results, are those where the inversion was considerable, and not intermittent; where it had been of considerable duration—lasting, perhaps, for three or four years; where it was limited to one eye, and that always assuming a proper position as soon as the other eye was closed.

When both eyes appear to be affected with *Strabismus*, and to turn inwards, it becomes a question, which eye ought to be operated on. Various optical tests have been suggested, to enable the surgeon to decide this point; but it usually happens that a patient, when subjected to any of these tests, is so anxious and embarrassed, that he becomes very liable to a sudden increase of Strabismus in the eye which, on ordinary occasions, would be affected in the slighter degree; and from this cause the experiment may fail to infallibly determine the question. I believe the best rule is, to watch attentively which eye squints in the more decided manner, when the patient uses both eyes in his ordinary way, and to operate on that in which the distortion predominates.

Reserving for a future Chapter all description of the operation itself, I may here notice an appearance which a patient may present some considerable time after its performance. The operated eye, even if not strongly turned outwards by the preponderating action of the abductor, projects in a peculiarly unsightly manner, and has little or no power of adduction.

On close inspection, it will be found that the semi-

lunar fold and caruncle have almost disappeared; and these parts are sometimes so little visible, that the eye very much resembles an artificial one. This unpleasant appearance is caused by a too extensive separation of the conjunctiva from the sclerotica having taken place in the attempt to expose the tendon.

OPERATIONS.

In the following remarks concerning some of the more important Operations practised on the Eye, I have endeavored to confine myself to such a general description as may render the principles upon which they are founded intelligible to the student, rather than to give him minute directions for every manipulation which their accurate performance demands.

There are so many points of detail to be borne in mind during the Extraction of a Cataract, or the formation of an Artificial Pupil, that almost every case becomes a study in itself. The most labored written instructions will never suffice to form a skillful practitioner, nor confer that presence of mind, and readiness to take advantage of circumstances as they arise, which, although required in every branch of Operative Surgery, are yet pre-eminently necessary in that connected with the Eye.

In Mackenzie's learned work, the reader will find accounts of nearly all the operations at different times suggested or practised in this country and abroad; and I shall, for the most part, limit myself to a description of those which personal experience has led me to prefer.

All details respecting the instruments themselves, I have reserved for the *Explanation of the Plate* at the end of the volume.

CHAPTER XV.

OPERATIONS FOR CATARACT.

THERE are three principal methods of removing an opaque lens from the axis of vision:

1. By thrusting it in such a manner from its natural position that, although left in the eye, it may not prevent the rays of light passing uninterruptedly through the pupil to the retina. This, the earliest of all Cataract Operations, is termed *Depression*, or *Couching;* the lens being pressed down into the vitreous humor.

2. By removing the lens bodily out of the eye, through a wound made for that purpose in the cornea: *Extraction.*

3. By taking advantage of the peculiar facility with which Nature, under certain conditions, dissolves and absorbs the entire substance of the lens; the Operation for *Solution*, or *Absorption:* termed also, from the modes of performing it, *Division* and *Discission.*

OPERATIONS OF DISPLACEMENT.

DEPRESSION. RECLINATION.*

Before the earlier part of the eighteenth century, while Cataract was supposed to be an opaque membrane

* The terms *Keratonyxis* and *Scleronyxis*, applied to needle-operations, merely designate the structures—cornea or sclerotic—through which the instrument is passed.

in front of the lens, surgeons were quite consistent in practising *Depression;* for such a membrane, when once pushed fairly away from the pupil, would not be likely to set up irritation. And when the real nature of Cataract came to be known, operators readily persuaded themselves that even so bulky a body as the lens could, by skillful manipulation, be so placed that it should not press upon, or interfere with, any of the delicate tissues surrounding it.

To pass a needle through the sclerotic or cornea, until its point arrives at the upper edge or the front surface of the opaque lens, which is then pressed downwards, or backwards and downwards, and embedded in the vitreous humor—appears a real triumph of surgery; so instantaneous is the benefit conferred by the operation, and so trifling the pain of its performance. The patient is in a moment restored to sight; and the minuteness of the wound seems to obviate all risk of after-inflammation.

And, doubtless, *Depression*—or the modification of it termed *Reclination*—would be a very perfect operation, if one could ensure the Cataract being conducted to the position so neatly depicted in diagrams, where it reposes in the vitreous humor, quite out of the way of the pupil, and close to, but never touching, the retina or the ciliary processes. But how is the Cataract to be so placed *in reality?* Even if the sclerotic were as transparent as the cornea—so that the surgeon could watch the point of his needle throughout every stage of the operation—how could he deposit the lens precisely in the position I have alluded to? Or, if he succeeded in leaving it just

in the very spot he had intended—below the pupil and yet above the retina—how could he ensure its remaining there? And if it sank downwards, so as to come into contact with the retina, or rolled forwards against the ciliary processes and iris, would it not act as a foreign body, and set up irritation, which would be almost wholly beyond control?

The various mishaps that attend the operation of *Extraction* are evident to every bystander; but, in *Depression*, provided the Cataract disappears from the pupil, all seems to have gone well. The mischief that may have been inflicted on deep-seated structures cannot be detected; and it is only in the course of weeks, or months, that a train of symptoms sets in which, long after the operation, may terminate in utter loss of sight.

No doubt cases occur in which *Depression* perfectly succeeds; but I would most earnestly warn the student, who may have been struck with the showiness and apparent ease of the operation, against supposing that it is a sort of safe substitute for the perils of *Extraction*.

The true test of the two operations is this:—"What, at the end of the year, will be the condition of patients who have undergone the one or the other form of operation?" "Who will have the better sight *then?*"

The Operation.—"Depression," properly so called, consisted in thrusting the lens directly downwards; but it is evident that a body so bulky could hardly be made to descend vertically below the level of the pupil, without endangering the retina. It was, therefore, recommended to press the lens in a direction downwards, backwards, and outwards, so that it should *recline* with its

anterior face directed upwards. This modification of the ancient operation is termed *Reclination;* and it has, in its turn, been altered in various ways.

The patient is usually seated, and the surgeon sits facing him. An assistant, standing behind the patient, steadies his head, and raises the upper lid with a wire elevator. A needle, either straight or curved at the point, according to the fancy of the operator, is thrust through the sclerotic, at a short distance from the outer margin of the cornea, and a little below its equator. When the point has fairly entered the cavity of the eye, it is carried on behind the iris, until it becomes visible in the area of the pupil, which has been previously dilated with atropine. The needle is then steadily pressed against the lens a little above its centre, so as to force it to quit its natural situation, and to sink down into the vitreous humor, until it assumes the position I have mentioned; namely, with its anterior surface directed upwards, its posterior surface downwards—near to, but not touching, the retina—and its lower edge also towards, but not in contact with, the ciliary processes: a state of things, I fancy, much more frequently to be seen in diagrams than in practice.

From the relative position of the iris and lens, it seems all but, if not quite, impossible to pass a needle between them without wounding either one or the other; and in carrying the instrument across the pupil, the capsule is almost always opened, and usually a still more extensive rupture takes place in the attempts to displace the lens. No doubt this breaking up of its tissue contributes very much to the success of the operation, which becomes in

that way a mixed one of "Displacement" and "Solution." If, in consequence of old disease, the suspensory ligament of the lens has been loosened, the entire Cataract, enclosed in its capsules, may possibly sink at the first touch of the needle; especially if the vitreous body have undergone a change in respect of increased fluidity.

But if the hyaloid membrane and vitreous body be strong and healthy, they may offer great resistance to the reclination of the lens; and various plans have been suggested for preparing both structures, by some preliminary manœuvres, for their changes of situation. By some it has been proposed to carry the needle, as soon as it has pierced the coats of the eyeball, to the back of the lens, for the purpose of lacerating the posterior capsule; then to lacerate the anterior capsule, and not until after this to attempt the displacement of the lens itself. Others, finding that the elastic vitreous body resists the passage of the lens through it, pass the needle to the spot where it is intended that the lens should be lodged, and there prepare a bed for it, by breaking up the cells of the vitreous body. These manipulations are more easily described than performed. When the point of an instrument is "out of sight," it is apt to be "out of mind;" and especially, in the attempt to prepare a soft place in the vitreous for the lens to lie in, there must be the utmost risk of scratching up with the needle the ciliary processes, and the retina itself.

The difficulty of displacing the lens by mere pressure, has induced some operators to advise *transfixing* it with a needle, which is to be disengaged by giving it a rotatory motion; after the lens has been deposited in the

appointed spot. The danger of injuring surrounding structures seems to attend this plan to even a greater extent than attends the others I have mentioned.

The objections which apply to all the various forms of *Displacement of a Cataract*, are so strongly stated by MACKENZIE, that I cannot do better than conclude this Chapter with an extract in his own words:—"The principle on which the operations of *Displacement* are founded, is essentially bad. As well might we expect to lodge an entirely foreign body within the eye, and yet no continued irritation take place, no disorganization follow of the delicate textures with which it remained in contact, and no interruption happen to the function of the organ, as that the lens could be pressed into the vitreous humor, and lie there close to the retina, and the eye continue healthy, and vision be preserved. Reclination or Depression is to be thought of only when some insuperable objections exist to Division and Extraction. I assign them this low rank in the scale, not because the lens is apt to re-ascend after being displaced—for that I consider as rather a favorable event, from the chance it gives of the Cataract dissolving after its re-ascension—but because chronic inflammation within the eye, dissolution of the hyaloid membrane, and amaurosis, are, I believe, the almost invariable results of a Cataract of any considerable bulk continuing undissolved in the situation assigned to it by displacement."*

* Op. cit. Fourth edition, p. 835.

THE OPERATION BY SOLUTION, OR ABSORPTION.

This is also termed—especially by foreign writers—the operation by "Discission," because the lens is said to be cut up into several small portions. Little knives even have been invented for effecting the complete division of the lens. Such a violent proceeding, however, if it could be accomplished, would be quite improper, and opposed to the true principle of the cure by Absorption, which is essentially a slow and gradual one. If from a recently dead subject we take a lens, and, holding it steadily in one hand, try to cut it through with a sharp knife, we shall be able to appreciate the extreme difficulty of making a similar division of a Cataract in the living eye. For the lens is maintained in its natural position by very delicate tissues, little capable of offering resistance to a cutting instrument; while it is at the same time surrounded by structures which are sure to take on inflammation if rudely pressed upon or contused.

The operation of Solution or Absorption is, perhaps, the most beautiful and perfect in the whole practice of surgery. It is based, as I have already observed, on the principle that, if the capsule be lacerated so as to expose the tissue of the lens itself to the macerating action of the aqueous humor, the cells and fibres of the lens gradually imbibe the fluid, become broken up and dissolved, and are then absorbed so completely that, at the end of a period varying according to the consistence of the part and the age and vigor of the patient, every vestige of lens has disappeared. The capsule, on the

contrary, never undergoes absorption. When divided, it shrinks, rolls upon itself, and retracts, so as to leave large spaces vacant which it had previously occupied, and thus an appearance of its absorption is produced; but these points of marked difference between the two structures must never be forgotten during the consideration of Cataract, and the operations for its cure.

I have said that the rapidity with which the lens undergoes absorption depends upon its consistence, and upon the age of the patient. In fact, provided the constitution be vigorous, it is quite possible to effect the absorption of a Cataract in an old person, even up to the age of seventy. But inasmuch as Cataract usually exists in both eyes in such persons, the slow process of absorption is found to be wearisome and inconvenient, and liable to be interrupted by inflammatory attacks; and as the operation requires to be frequently repeated, the more rapid one by Extraction is greatly to be preferred.

The operation by Solution is to be invariably chosen for infants and children. It is also suited for adults with Cataract in one eye only, who can therefore, without inconvenience, await the slow result of the operation. Cataracts which have undergone softening until they have assumed a perfectly fluid condition, must of course be *absorbed*, as their *extraction* is impossible.

Position of the Patient.—During the operations of Solution, Extraction, and Artificial Pupil, he should lie upon the couch, so arranged that the head may be very little raised above the level of the body. Infants and unruly children must be securely swathed from the chin

to the feet, with a round towel or folded sheet. The surgeon either sits or stands behind the patient, and commands the globe and upper lid; an assistant depressing the lower one. In infants, a spring speculum, of a suitable size and strength, is very advantageous for holding the lids apart.

The needle (*Plate*, fig. 1) is passed through the cornea, near its outer margin, and carried onwards until the point reaches the middle of the pupil, which has been previously dilated with atropine. Then the capsule is punctured near its centre, care being taken not to thrust the instrument deeply into the lens, for fear of dislocating it from its position. The opening in the capsule is then enlarged to such an extent as the surgeon may deem prudent; the working of the needle being at first confined to the superficial layers of the lens at the centre of the pupil, and gradually extended from that point towards the circumference.

In the congenital Cataracts of infants, very free use may be made of the needle, as regards the breaking-up of the tissue of the lens. I have even seen the entire lens shell out of its capsule, and fall into the anterior chamber, without any bad consequences resulting; the lens becoming very rapidly absorbed, and not requiring a second operation, except perhaps for the removal of some portion of the capsule. Such an accident in an adult, especially in an elderly person with a firm lens, might require its speedy extraction, as the only means of warding off the onset of a destructive inflammation.

It is impossible to lay down any precise rule as to how often, and at what intervals, these needle opera-

tions ought to be repeated. A single operation may, as I have just said, suffice for the complete absorption of the lens; while, in an elderly person, the needle may be re-applied to it every six weeks or two months; and even then, a year or more may elapse before a perfectly clear aperture through the centre of the Cataract is obtained; and if attacks of inflammation occur to interrupt the absorbing process, even longer intervals must be allowed. For while, in a young subject, the lens rapidly imbibes the aqueous fluid, and becomes pulpy and flocculent throughout, a much slower change takes place in old lenses; only just that quantity which is crumbled off at each operation seems to be absorbed, and then no appreciable advance is made until a fresh portion of the dense tissue is dug out with the needle.

It is a besetting error of inexperienced operators to suppose that the cure will be hastened in proportion to the amount of lens they can break up at one time; but, except with young subjects, the very reverse is the case. The great rule to be observed is,—not to *oppress* the eye with more broken-up tissue than the absorbing power of the organ is capable of removing rapidly; otherwise, the little fragments act as foreign bodies; inflammation is set up, and all absorption is at once checked; the sclerotic and conjunctiva become injected; there is pain in and around the eye, with weeping, and considerable intolerance of light; the aqueous humour is turbid, and the iris discolored; the cornea appears hazy, and its surface dull and "steamy."

In such a case, the eye may be lost by chronic in-

flammation, unless it be forthwith relieved from the broken-up lens which is oppressing it. This may be done by making an incision near the margin of the cornea, and introducing a small scoop or *spatula*, so as to allow the softened portions of lens to escape with the aqueous humor. An operation of this kind, if resorted to in time, may restore the whole eye to a healthy condition; the inflammatory symptoms rapidly subsiding, and the iris and cornea resuming their natural aspect.

This evacuation of the whole mass of broken-up lens may be necessary soon after the first operation, if the needle has not been too freely used on that occasion; or it may be required at a later stage of the case, in consequence of the tissue of the lens rapidly imbibing the aqueous humor, and thus swelling up so as to acquire a great increase of volume.

There is one form of Cataract — the *fluid* form — which always requires something more than a simple laceration of the capsule; for retention of the milky fluid within the anterior chamber produces peculiarly distressing nausea and vomiting, attended with neuralgia.*

If, when the capsule is first punctured with the needle, a jet of milky fluid bursts forth, and mixes with the

* This vomiting, which often ensues when only a small portion of a lens beginning to undergo the *fluid* change passes into the anterior chamber, is the more remarkable, as it is rarely caused by the dislocation of a *firm* lens into that cavity; although the latter accident may set up inflammation, and cause the most intense pain. Neither does vomiting occur in young children after the ordinary operation for Congenital Cataract, even when a considerable escape of milky fluid follows the puncture of the capsule.

aqueous humor, so as totally, or in part, to conceal the iris, the cataract needle should be gently withdrawn, and a broad cutting needle (*Plate*, fig. 2), such as is used for opening the cornea in making an artificial pupil, at once passed in at the same spot; and, by turning it on its axis, the whole of the fluid may be evacuated.

OPERATIONS ON OPAQUE CAPSULE.

After the whole of the lens has become itself absorbed, the pupil still remains, to a greater or less degree, obstructed with capsule. This may form a mere ring, concealed when the iris is in its natural condition, and only becoming visible when the pupil has been artificially dilated; but more commonly it also stretches across the central portion of the pupillary space.

There are no manipulations which require more judgment and care than those for removing such filmy obstructions. The two chief points to be observed are,—to make the aperture in the capsule central, so that it may correspond to the axis of vision; and to avoid isolating any portions by detaching them from the rest of the membrane. Loose shreds of this kind, when set floating by careless management, are ever afterwards a source of annoyance both to the patient and to the surgeon. Lastly, the division of the capsule is to be made with the least possible disturbance of the vitreous body behind it.

Every movement of the needle should have some definite object. It is useless to make stabs and plunges at portions of detached capsule, in the hope of *depressing* them by some lucky hit; for their buoyancy will almost

always cause them to return to their former position, as soon as the needle is withdrawn. Delicate bands, stretched tightly across the pupil, may be divided in the middle, and then each half will retract towards its fixed point, and leave the area free.

When a single needle is employed to tear through a portion of capsule, it sometimes happens that the delicate membrane yields and stretches, instead of tearing, and, after each attempt, the surgeon is mortified at seeing it return to its former situation. It is in such cases that it is so efficacious to use two needles at once, as suggested by Mr. Bowman.* There is hardly any filmy expansion, or hair-like band, that may not, by this expedient, be divided.

The lids being held apart with a spring speculum, the surgeon has both hands at liberty, and he separately introduces the needles through the cornea, until their points reach the area of the pupil. He then, according to the nature of the obstruction, either makes in the centre of the membrane a small hole, and then enlarges it, by drawing the points of the needles in opposite directions—or cuts, twists, or tears through some band or filament which had been holding together the margins of the pupil, and obstructing its area.

The young operator, who may feel inclined to underrate the difficulty of skillfully using two needles at once, ought to be warned that it requires much previous practice on the dead subject to acquire the power of keeping the attention properly fixed on both instruments; and in the living subject the difficulty is greatly increased

* *Medico-Chirurgical Transactions*, 1853, vol. xxxvi. p. 315.

by the movements of the eye. Unless great care be taken, the needles may be sunk too deeply into the vitreous body, or thrust against the iris, or allowed during some sudden roll of the eye, to slip out of it altogether, before the object of the operator has been attained.

If the rules which I have said should guide the surgeon in effecting the absorption of a lens be strictly adhered to, namely:—to attack a Cataract at the centre, and always to work the needle steadily from that point towards the circumference; and to be satisfied with slow progress, without attempting to break up a large mass of lens at the earlier operations: and if, in like manner, he carefully avoids isolating and setting loose any portions of capsule, he will rarely find it necessary to employ any other instruments than needles, for obtaining a perfectly clear and useful pupil.

But if a case has already been unskillfully operated on, and the needle used roughly, and without any determined or settled aim, it may happen that the entire capsule, containing some small remains of white lens-matter, has become crumpled up, and rolled into an opaque mass, which is either held fast in the midst of the pupillary space by two or three delicate bands, or is attached by a solitary filament, which allows it to float and sway to and fro with every movement of the eye. In such a case, the entire mass of capsule must be drawn out of the eye. To effect this, an incision of suitable size is to be made in the cornea, near its edge, and a fine forceps introduced, the points being kept closed until they have reached the capsule. They are

then opened; the capsule is seized, and withdrawn by gentle traction, sufficient to make the retaining filaments give way.

Of late years, a beautiful instrument, the "cannula-forceps," has been invented, which requires only a very small incision to be made in the cornea, and is in all respects preferable to every other contrivance for withdrawing such isolated portions of capsule as I have just been describing. (*Plate*, fig. 7.)

THE OPERATION OF EXTRACTION.

The absorption of an opaque lens in an old person is so slow a process—in consequence both of the peculiar structural change in the nucleus of the Cataract itself, and the diminished rapidity with which interchange of material goes on in advanced life—that a more rapid removal of the opaque body becomes desirable. While, therefore, special circumstances may induce the surgeon to use the needle on patients beyond fifty, or even sixty years of age, he will, with the majority of them, find it advisable to employ *Extraction*.

The leading points to be observed in this operation are:

To make a crescentic incision through the cornea, sufficiently large to afford an easy exit to the lens:

To take care that the line of incision shall be at such a distance from the sclerotic as to ensure both edges of the wound being of genuine corneal tissue; for wounds of the true cornea, provided their edges are in accurate apposition, have a peculiar readiness for

uniting, which is not equally shared by that extreme marginal portion which blends with the sclerotic:

To lacerate the anterior capsule freely, so as to allow of the lens readily escaping through the rent when pressure is made on the globe:

To apply this pressure in such a way that the lens may slowly turn on its transverse axis, and present its upper margin, first at the pupil, and then at the corneal wound.

When we consider that the object is to dislodge and press out the lens, and at the same time to avoid pressing out any portion of the vitreous body, it must be evident that extreme care and delicacy of handling are necessary. The surgeon must regulate his pressure with a nicety which is hardly possible, unless he has the globe under his sole management.

The best *position for the patient*, therefore, is to lie upon a high couch, with his head alone slightly raised; and the surgeon, sitting or standing behind him, can then control the movements both of the upper lid and of the globe. Formerly, the patient was always seated on a chair, the surgeon sitting opposite to him; and this is still very generally the custom on the Continent. In such a mode of operating, however, the patient's head rests against the breast of an assistant, who stands behind him, and at the same time has charge of the upper lid. But in this way it is impossible for the patient's head to be kept as immovable as when resting by its own weight on a firm cushion; nor can a second person, however careful, be trusted to control, by gentle pressure, the movements of the patient's eye. What

anatomist, about to commence a minute dissection, would allow the preparation to be held in the hands of an assistant, instead of placing it on a table?

The difficulty in making the section of the cornea in the Operation of Extraction, arises from the fact that the knife has to be carried across a cavity (the anterior chamber) filled with a fluid ready to spirt out at the smallest opening which the blade of the instrument may leave unguarded. The moment such an escape of fluid takes place, the pressure of the elastic contents of the globe forces the iris forwards over the edge of the knife.

The sawing motion of a common knife is therefore unsuited for making the corneal section, inasmuch as each to-and-fro movement of the blade would permit a fresh escape of aqueous humor, or inflict a wound on the iris when that structure had come forward to fill up the place of the lost fluid.

Hence arises the necessity for having a blade which regularly increases in width and thickness from the point to the heel. Such an instrument, if steadily carried on in one direction, completes the wound at a single thrust, while its wedged shape prevents the aqueous humor escaping too soon, and thus lessens the danger of wounding the iris.

It would be very unprofitable to enter here into a description of the various Cataract knives which have, at different times, been invented. One operator after another has endeavored, by alterations in the shape of the blade, to overcome the special difficulty which has most beset him; but ophthalmic surgeons are now pretty generally agreed that the knife which goes by the name

of BEER'S knife, is, with certain modifications, the most useful, and that no mechanical contrivance can obviate all the difficulties attending the Operation of Extraction. (See *Plate*, fig. 6.)

Having raised the upper lid, by placing his fingers against the edge of the tarsus, the surgeon confides the lower lid to an assistant, who draws it downwards, and keeps it fixed by making pressure against the malar bone. This he must take especial care to do, and not in the slightest degree to press upon the eyeball. The surgeon may control the movements of the eye, by lightly placing the tip of one finger against the sclerotic, just above the cornea, while the other rests against the inner side of the globe. To do this safely, requires the greatest tact and care, for as soon as the knife has transfixed both sides of the cornea, all pressure must cease, and it must at no time be greater than will just suffice to enable the operator to make his puncture and counter-puncture with certainty. Firm pressure, kept up until the section is completed, will almost inevitably cause the lens to be violently ejected with a gush of vitreous humor.

The surgeon introduces the point of his knife on the equator of the cornea, a short distance in front of its junction with the sclerotic, and, carrying it steadily across the anterior chamber, brings it out again at the corresponding spot near the inner margin of the cornea. In making this thrust, the edge is directed towards the upper margin of the cornea, so that, when the section is completed, a semilunar flap is formed.

This upper section has been found to possess so many advantages, that the lower one is now scarcely ever employed.

It must be the surgeon's chief object to give the knife a steady onward pressure, so that the blade may constantly fill up the wound it is making. If he in the least withdraws the knife, or rotates it on its axis; or if he attempts too soon to cut out, instead of completing his thrust,—a jet of aqueous humor takes place at that portion of the wound which is no longer filled by the blade, and the iris instantly folds over the edge; one of the most troublesome occurrences which can attend the operation. Every care, however, on the part of the surgeon, will not always suffice to prevent this loss of aqueous humor; for so ready is the fluid to escape, that, if the sides of the knife be unevenly ground, sufficient space may exist between the blade and the edges of the wound, to allow of the fluid finding its way out.

When the iris has fairly come over the knife, the surgeon may sometimes disengage it by laying his finger on the front of the cornea, and making pressure in such a direction as may cause the iris to slip back again behind the edge of the instrument. Careful pressure on the cornea must then be kept up until the knife has been fairly carried through it, and until the section is almost completed.

But the operator may find it impossible wholly to disengage the iris from his knife, and a portion of the upper margin of the pupil may be cut away. This, of course, causes a slight bleeding into the anterior chamber, which obscures a view of the parts during the after stages of the operation; but the lens usually escapes readily through the artificially enlarged pupil, and, except the after deformity, no permanent bad result necessarily

follows the accident. It sometimes happens, however, that a *fold* of the iris is cut through; the consequence of which is, that there is a hole through the iris, just above the true pupil. When this occurs, the surgeon must divide the band of iris between the two apertures, so as to lay them into one, before proceeding to lacerate the capsule, and attempt the extraction of the lens.

Those who have seen little of eye operations, are apt to imagine that the section of the cornea, if well made, must needs be a quick and showy performance. The very reverse of this is commonly the case; and while a careless, off-hand operator may complete the corneal flap, at a single rapid plunge, bringing out the knife he hardly knows where, and, perhaps, at the same moment squeezing out the entire lens, with more or less vitreous humor; the painstaking and really skilful surgeon may dwell upon the section, and seem to be over-slow in completing it, whereas the sole cause of delay has been a well-founded desire to prevent the too sudden escape of the contents of the globe.

As soon as the corneal flap has been completed, the upper lid is allowed gently to fall, and the surgeon proceeds to the second stage of the operation—the division of the anterior capsule.

After a short pause, he very carefully raises the upper lid again, and surveys the wound. If he finds it too small, he must enlarge it by passing a little, narrow, blunt-ended knife, or scissors, under the flap, to the outer angle of the wound, and carefully dividing the cornea close along its margin, in a downward direction.

This enlargement of the original wound is often very

difficult, on account of the slight resistance offered by the loose flap of cornea, and the irritability of the eye, which the surgeon dares not attempt to control by pressure. No difficulty, however, should deter him from making the wound sufficiently large, before he attempts to press out the lens. For if, while the opening in the cornea is too small to allow of the lens easily passing through it, pressure be made on the globe, the hyaloid membrane will most probably give way, and a portion of the vitreous humor will escape; whereupon the lens, instead of presenting at the section, sinks down into the space left by the lost fluid. When this accident occurs, the surgeon must at once desist from all pressure on the globe, and pass in a fine, sharp hook, through the gaping wound and pupil, to the hinder surface of the lens, which must be drawn out as quickly and lightly as possible. Sometimes it is better to pass in the *scoop*, instead of the hook; but, whichever instrument be employed, it must be placed *behind* the lens, otherwise this body will be driven still deeper and farther back into the vitreous humor.

When it has been ascertained that the wound is of proper size, the curved needle (formerly termed the *Cystitome*) is slipped under the corneal flap, care being taken not to entangle it in the iris; and when its curve is fairly in the pupil, the handle is rotated, so as to turn the point against the capsule of the lens. Some writers give very precise directions as to the manner in which the capsule is to be divided—one recommending a crucial incision, while a second tells us to make a series of cuts crossing each other at right angles, so that the

lines of incision may include a number of lozenge-shaped interspaces—instructions, I fancy, rather difficult to follow, even if the eye were not a living and moving one; but very unlikely to be executed upon a patient in the same regular manner as they are figured in the author's diagram.

In tearing through the capsule, the surgeon must take care that the rent extends quite across the area of the pupil; and, provided this laceration is sufficiently ample, he need not trouble himself about unattainable niceties of incision. This part of the operation requires a careful eye and a light hand, otherwise the lens itself may be displaced, and the capsule left unbroken.

The needle having been withdrawn, the lid is again allowed to fall, and the surgeon prepares for the third stage of the operation—the removal of the lens.

It is a fatal error to suppose that this is to be accomplished by main force; that the eye may be squeezed, no matter in what direction, if it be but squeezed hard enough. The real object of the pressure is to make the lens first turn on its transverse axis, so that its upper edge may be presented a little forwards. To accomplish this, the concavity of the scoop (*curette*) is laid against the sclerotic, a little below the inferior margin of the cornea; and while moderate pressure is made at this spot, the point of the forefinger of the other hand is placed on the upper part of the globe, a little above the section; then, by a carefully regulated, alternating pressure in these two situations, the lens is made slowly to turn, and to present its upper edge at the pupil. The lens continues to advance through the

pupil, and then begins to protrude at the corneal wound. It is evident that, as soon as the greatest diameter of the lens has passed through this aperture, the rest will be inclined rapidly to follow; and therefore, if the surgeon does not very carefully moderate his pressure, the lens will suddenly start out, and very probably be followed by a gush of vitreous humor. According to the size of the corneal wound, and the degree of superficial softening which may have taken place in the Cataract, will be the amount of soft matter the lens will leave behind, in passing out of the eye. A small lens will escape almost entire through a large wound; while, if the wound be small, and the lens bulky, and much softened on the surface, a considerable quantity of lens-matter will remain in the pupil and about the lips of the wound. If undue violence be employed, the lens, still enclosed in its capsule, may, as I have said, be suddenly shot out on the patient's cheek, with a large portion of vitreous humor.

Inasmuch as union of the corneal wound—upon the rapidity of which so much of the success of the operation depends,—cannot take place if any foreign matter be allowed to remain between its margins, all soft lens-matter which may have stuck there must be removed with the scoop (*curette*). The iris, which very frequently protrudes, can be best returned to its position by means of the small *spatula*. It is unsafe to dip into the pupil with the scoop for the purpose of removing every vestige of the Cataract. The capsule cannot be removed by such means, and a free use of the instrument is very likely to rupture the hyaloid membrane,

and cause a loss of vitreous humor. Provided the lips of the corneal wound are in perfect apposition, and the iris is in its proper place (which may be known by the position of the pupil), the capsule, and small portions of lens-matter entangled in it, may safely be left for future removal, after the wound is healed, and all irritation gone by.

If there has been a gush of vitreous humor at the moment the lens passed out, the lids must be instantly closed, and a short pause allowed before any attempt is made to see what has become of the corneal flap. Any prolonged examination, or full exposure of the eye in these cases, can only lead to fresh escape of vitreous humor. The surgeon, therefore, must content himself with gently raising the upper lid by the eyelashes, sufficiently to allow of his ascertaining whether the flap has been doubled down, as is frequently the case. If he is sure this displacement has not occurred, he must be satisfied, and not wait, in the vain hope that the wound will close; for the constant tendency of more and more vitreous humor to escape will render any close adjustment of the flap impossible. He must at once close the eyelids, and apply the bandages or plaster.

However favorably cases of this kind may terminate, there always remains a deformity of the pupil. The aperture is large, and drawn up to the wound; and the upper portion of the iris (when the upward section has been made) seems to be altogether lost.

The most unfortunate accident that can attend the operation of Extraction—for it certainly destroys all hope of sight—is *Hæmorrhage into the vitreous chamber.*

It now and then happens that—although the corneal section may have been perfectly well made, and every due precaution taken—a gush of vitreous humor (or of watery fluid which has in part replaced it) occurs at the moment the lens escapes through the wound. Within the space of a minute or two the patient complains of severe pain in the eye, and blood soon appears oozing from between the lids. This oozing does not occur until the whole cavity of the eyeball has become filled with blood, and the eye for ever destroyed as an organ of vision. In some instances, the hæmorrhage sets in later—several hours, perhaps, after the operation.

In all these cases we must assume the existence of some diseased condition of the deep-seated tissues; either old effusion between the choroid and retina, or a change of structure in the choroidal vessels themselves.

Such, very probably, is the cause of a similar hæmorrhage which often follows the removal of staphylomatous projections of the globe, which have been attended with long-continued inflammation. As soon as the more prominent portion of the Staphyloma has been cut away, the pent-up aqueous humor and serum, and, perhaps, the diffluent vitreous body, rush out through the wound; and this sudden removal of pressure from the enlarged choroidal vessels causes them to give way. In two cases of this kind, I found the whole retina enveloping the large clot which had been forced out of the eyeball; a proof that the hæmorrhage which had detached the retina must have had its source behind that structure.

THE AFTER-TREATMENT OF CASES OF EXTRACTION.

This is a subject so extensive, that I should far exceed the limits I have proposed to myself were I to devote to it as much space as its importance deserves. A few remarks, however, appear absolutely necessary.

The prevalent belief—that *all* operations for Cataract are likely to be followed by "Inflammation"—is, of course, unqualified in the popular mind, by any definite notion as to what is the nature of this "Inflammation;" why it arises, or what parts of the eye it involves; and many of those who are commencing the study of eye diseases, have equally vague notions on the subject. Let us, then, examine a little into what takes place in an eye after Extraction has been completed. We will suppose that the structure of the organ, with the exception of the lens, was in a healthy condition, and that the operation has been properly performed. What has been done?

A clean cut has been made through rather less than half the circumference of the cornea; the lens has been gently squeezed through the pupil and the wound; the aqueous fluid has escaped; the iris is in contact with the hinder surface of the cornea, the cut edges of which are in exact apposition; the upper lid lies smoothly against the wound and keeps all steady.

Within a few hours, provided the nutrition of the patient's body be in a healthy state, adhesion takes place between the cut edges of the cornea. As this union becomes firm, the aqueous humor is retained; it once more fills the space between the cornea and iris,

and defends the latter from the pressure of the parts behind. The slight irritation to which the iris had been subjected, by the passage of the lens through the pupil, passes off; and in a longer or shorter time, according to the constitution of the patient, the extra quantity of blood, which had been carrying reparative material to the wound, ceases to be sent thither; and the cure is complete.

This is just what happens in *accidental* cuts of the cornea. If the patient be at the time in a good state of health; the cut a clean one, and unattended with contusion; no iris or other substance interposed between its edges; and if the eye be carefully kept at rest, and secluded from the action of light and other irritants, the wound heals in a few days, just as if it had been inflicted *secundum artem*. But let a similar accident befall an old feeble person, or one reduced to feebleness by want, or inflamed by intemperance—and let the two first patients be bled, and put on low diet, while the third continues his indulgence in alcohol—what will *then* be the result? Non-union of the wound; total or partial slough of the cornea, and a series of morbid changes in the adjacent tissues; in short, loss of the eye, as far as sight is concerned.

Now, let us apply these facts to a case of Extraction, treated as all such operations were treated thirty or forty years ago, and as certain works of established reputation advise us to treat them in the event of pain being felt in the eye soon after the operation.

If the operative proceedings have been properly conducted, and all has gone well, in the manner above de-

scribed, Nature knows how to heal the wound. She will not send thither more blood than is needed; and when the work is completed, the extra supply will cease. If, on the other hand, the iris has been forced into the wound, there is at once a mechanical hinderance to its quick union, and we must wait until, by a slower process, the effused lymph has agglutinated the iris to the separated edges of the cornea. If vitreous humor has been lost, the corneal wound may gape, instead of falling together, and its lips are kept asunder by the remaining vitreous body which is attempting to escape.

Now, what can *bleeding* do in such cases? Can it dislodge the iris from between the lips of the wound? or can it prevent the vitreous body from bulging where it meets with least resistance? We might just as well expect, by copious bleeding, to dislodge a piece of muscle that was lying between the ends of a fractured bone, and preventing their union.

Extraction of Cataract is an operation performed on those who are past the middle period of life. No doubt, among such persons, several are to be found who are plethoric, too much filled with blood, over-fed, over-stimulated with alcohol. They require to be "toned down," and brought into a more healthy state by a well-regulated plan of diet, for some time *before* an operation is begun, not bled just *after* it is ended, and thus put into an unnatural condition at such a critical period.

But, independently of *prolapsus iridis*, non-union of the corneal wound results from the same cause which prevents the union of a flesh wound, or of a broken bone,—namely, the depression of the patient's nutritive

functions below the proper standard of vigor. To keep an old or feeble person upon "slops" for several days after Extraction—for fear inflammation should set in—is surely contrary to common sense, and to all analogy in sound surgical practice.

It is to Mr. Tyrrell that the profession is chiefly indebted for the introduction of a more rational and simple mode of treating patients, after Extraction and other operations on the eye; and the student who wishes to follow up this important subject, will find much valuable information in the second volume of that author's *Practical Work*. His views on excessive depletion are so much in accordance with those generally entertained at the present day, that I should not have devoted so much space to the subject, did we not find, in works still held to be of authority, such advice as the following:—that, within a few hours after the operation of Extraction, a quantity of blood should *always be abstracted, whether pain come on or not;* that, "from four to eight hours after the operation, unless pain has come on sooner, blood is again to be drawn from a large orifice;" and yet again, "if pain should come on afterwards, or continue:" and that, for the first five days after the operation—while the patient is being drained of blood in this manner—his diet is to consist of "nothing but gruel, tea, arrow-root, and panada."* One need not be a surgeon to foresee the probable condition of a wound under such discipline as this. If a patient be thus weakened, pain of a neuralgic character is sure to come on, and each successive drain will be followed by a fresh attack.

* Guthrie; *Lectures on the Operative Surgery of the Eye.* Second Edition, 1827, p. 347.

Having occupied so much attention in explaining what the after treatment of Extraction cases ought *not* to be, I can devote comparatively little space to the consideration of the treatment they really demand; for so much depends upon the constitutional peculiarities of the patient, and the minute varieties of appearance which the wounded parts may present, that to do full justice to the subject would require the publication of a large number of cases, with much detail respecting the events of the operation.

The following is, therefore, but an outline of what ought to be done. As soon as the surgeon has satisfied himself that the wounded parts are in a proper position, he allows the lids to be gently closed, without permitting any such trials of sight as may safely be made after removal of opaque capsule, or the formation of an artificial pupil. When the media of the eye have just been disturbed, and the pupil is still encumbered with shreds of capsule, and perhaps minute fragments of lens, objects must necessarily appear to the patient in a state of distortion and confusion, by no means likely to inspire him with hopes of ultimate recovery. The assurance of the surgeon, that all has gone well, and that, to restore good sight, time and patience only are wanted, will go much further towards tranquilizing the patient's mind than any premature experiments.

Both eyes are then covered with blinkers of folded linen, which are kept in place by a bandage passing round the head. Some surgeons, especially on the Continent, apply strips of plaster to the lids, to ensure their being kept closed; but this, I think, is unnecessary; for, during the first two or three hours after the opera-

tion, the patient is glad enough to keep the eyes shut; and after that time, the natural secretion has usually so agglutinated the lashes, that he cannot, even if he would, separate the lids.

After the operation, it is well for the patient to remain quietly on the couch for some hours. When in bed, the best position for him is to lie on the back, but this is by no means to be insisted on, if it becomes irksome. That position is really the best which is most comfortable, and likely to induce sleep.

As regards diet, patients should not be deterred from taking a nutritious meal a suitable time before the operation is performed; and a moderate quantity of easily digested animal food should be given on each following day. Old and feeble persons will require to have meat finely minced, or some other nourishing form of animal food, in moderate quantities, and at proper intervals, on the very day of the operation. In respect of stimulants, it is impossible to lay down any absolute rule. Those habitually accustomed to take wine, beer, or spirits, must by no means be wholly debarred from them at a time when the nutritive powers of the body are called upon to form new material for rapidly repairing a breach of surface. In short, the surgeon's object must be carefully to regulate both food and stimulants according to the patient's previous habits; neither keeping him too high nor too low, but as near as possible up to the ordinary level of healthy vigor.

A narcotic is sometimes needed on the first night, and in some restless persons, especially those accustomed to opiates, the dose may require repetition; but these

cases form the exception, not the rule; loss of appetite and nausea are so apt to follow the use of these drugs, that they should never be given without manifest cause.

Of course the patient is to be thoroughly waited upon during his confinement, so as to be spared every unnecessary movement or exertion; and tapes passed around his wrists from the sides of the bedstead will be a useful check upon sudden movements of the hands during sleep.

The precaution of giving some opening medicine a day or two before the operation, will prevent the necessity for teasing the patient with purgatives during the first few days after it. Old and feeble persons are sometimes seriously prostrated by being purged on the second or third day, when it is so important that the healing process should be steadily advancing.

The daily cleansing of the lids requires caution: the object not being to prevent the eyelashes sticking together, even if that were practicable, for their agglutination forms the best safeguard against the patient's prematurely opening the eye. The lower lid and cheek are to be washed with warm water, but the upper lid must on no account be touched, for under its shelter lies the corneal wound, sudden pressure on which would produce great suffering, and might even cause its slightly-formed adhesions to give way.

The progress of the wound is to be judged of by the condition of the lid and quality of the secretion, and by the patient's feelings. If he complains only of an occasional pricking and a sensation of grit; and if this can apparently be traced to the slight involuntary movements of the eyeball against the lid; if the uneasiness

subsides, day by day; if the upper lid is free from redness and swelling, and the secretion consists of tears alone, or is mixed with a little of the natural mucus of the conjunctiva, the surgeon may entertain the best hopes of a good union taking place. An increased feeling of grit in the eye, coming on after the lapse of three or four days, would make him suspect that the section had yielded, and that some *prolapsus iridis* had occurred.

The most unfavorable symptom is a bright redness and swelling of the lid, which sometimes appear on the second or third day after the operation, accompanied with a yellow puriform discharge. This state of things is commonly ushered in by a restless night, with headache, and the patient is much depressed, both in body and mind. When the eye is examined, the ocular conjunctiva is found injected, and so œdematous that it overlaps the corneal margin (*chemosis*). The cornea itself is opaque and yellowish throughout, so that perhaps no trace of the iris can be discerned. The wound is gaping, and iris bulges into the wound; eventually the whole cornea softens, the flap sloughs, and the eyeball shrinks.

I have now and then seen this hopeless state of the eye come on after an operation which had been perfectly well performed, and when the surgeon had every right to expect a most successful result. In such cases there has probably been some degeneration of tissue in the blood-vessels supplying the globe, and a weak condition of the heart itself.

After the operation, the number of days that should be allowed to elapse before the eye is examined, may

vary according to circumstances. If the patient be healthy, and there have been no pain in the eye, or other bad symptom, the wound will often be found, even on the third day after the operation, perfectly united. In aged or feeble persons, the fourth day is quite soon enough for an examination; and whenever there has been any loss of vitreous humor, so that the process of healing has been retarded, the fifth will be the earliest day on which the eye can be prudently exposed. Indeed, a wound which, on the fourth day after the operation, is going on perfectly well, will be all the better for another day or two of rest, while it often happens that a premature exposure sets up irritation, and, if the union be not firm, favors the subsequent yielding of the wound, and prolapse of the iris.

Should the redness of the lids, attended with puriform discharge, come on in the way I have described, within the first two or three days, the surgeon should examine the eye just so far as to obtain a view of the lower part of the cornea, and ascertain whether it is becoming infiltrated with pus, which may be done without exposing the wound itself.

An eye, examined on the fourth or fifth day, may present any of the following appearances, with various modifications:

1. The cornea may be clear, with the exception of a little hazy line along the edge of the wound; the aqueous humor may be re-secreted, and the plane of the iris vertical; the pupil may either be clear, or filled with a flocculent mass of capsule or lens-matter, according as the lens has come out clean, or has rubbed off its softer,

cortical substance, in its passage; vision may extend to the recognition of large objects, such as the fingers of a hand; or, in consequence of the obstruction still remaining in the pupil, may be limited to mere perception of direct and reflected light. Some little redness of the sclerotic and conjunctiva will, of course, be present in every case, however favorably the healing process may have gone on; but the condition I have just described, may be regarded as most satisfactory and encouraging.

2. The appearances may be similar to those above noticed, with the exception of the iris being in contact with the hinder surface of the cornea. This arises from one or other of the following causes:—either the wound, although sufficiently united to keep the cornea in perfect position, may not have become so consolidated as to be perfectly *water-tight*, and the aqueous humor may therefore escape as fast as it is formed; or this fluid, which seems to be secreted chiefly from the posterior aqueous chamber, may be pent up there by the obstruction in the pupil, and so thrust the iris forwards against the cornea. In the former case, keeping the eye uninterruptedly closed for two or three days, and giving the patient, at the same time, a little more stimulus or tonic, if his powers appear flagging, will consolidate the wound; in the latter case, the iris will slowly recede, in proportion as the lens-matter in the pupil becomes absorbed, but will not, perhaps, quite resume its vertical position, until the capsule shall have been broken through with the needle.

It occasionally happens that, although the corneal wound, when examined on the fourth or fifth day, appears

well united, it subsequently gapes a little at some point, and allows a small portion of the iris to prolapse, so as to displace the pupil.

3. The eye may be found in the following state:— The cornea clear, its section gaping, and blocked up with prolapsed iris; the latter having been forced into the wound subsequently to the operation, and no attempt at union between the two structures having occurred, in consequence of the irritable, and at the same time feeble, condition of the patient. In such cases, the parts, on the fourth day after the operation, appear almost as if the wound had been just inflicted. Much chronic inflammation is sure to follow, probably attended with neuralgia. Such an eye should not be examined except when absolutely necessary; indeed, it is sometimes good practice to keep the lids uninterruptedly closed for five or six days after the first examination, provided their healthy appearance, and the absence of puriform secretion, give assurance that the healing process is steadily advancing.

4. Still more unfavorable than the appearance just described are the following:—A gaping section and prolapsus iridis, as in the case above described; but a cornea hazy throughout, so that the iris and pupil cannot be clearly discerned; the cut edge of the cornea being thickened, opaque, and *creamy;* the sub-conjunctival areolar tissue infiltrated with serum, and the conjunctiva itself reddened and elevated (*chemosis*).

These local changes have generally been preceded by pain in the eye and head, restlessness, and depression. Extreme care and watchfulness are necessary to carry a

patient through a case of this kind. Narcotics may be required at night, and bark and ammonia are almost sure to render good service in keeping up the patient's appetite, and restoring his flagging circulation. His diet will require the strictest attention, that a sufficiency of nourishment may be taken into the system without oppressing it; but with all the surgeon's efforts, it will often happen that, after months of irritability and wearing pain, these cases terminate in closure of the pupil, with wasting and softening of the globe.

I may remark that, although it is so important, after all operations of Extraction, to defend the patient from strong light for several days, there is no necessity for shutting up windows, and drawing curtains closely around the bed, if the patient's eyes are bandaged in the manner I have described. Very moderate shading of the room is sufficient, and thorough ventilation is most beneficial, for, by duly aërating the patient's blood, the healing process is accelerated. Indeed, one great advantage of operating during the finer season of the year, consists in the patient being enabled, within a fortnight or three weeks, to go into the fresh air. Nothing tends so much to prolong the Chronic Ophthalmia which sometimes persists for many weeks after the cornea has healed, as *over-coddling;* while careful exposure to the fresh air, during genial weather, will often remove every trace of the affection.

A prolapsus iridis, remaining after the greater part of the section has closed, is always a source of irritation; but it should not hastily be meddled with, for in healthy subjects it usually wastes and dwindles away

soon after the other portion of the wound has become thoroughly consolidated. When, however, instead of diminishing, it becomes distended by the aqueous humor into a vesicular projection, it may be punctured with a broad cutting-needle; as soon as the fluid has escaped, the little prominence collapses, and it may then be lightly touched with a fine point of nitrate of silver. A few applications of this kind usually suffice to flatten down the prominence, and to consolidate the wound. If a case be not well watched until the wound has become thoroughly consolidated, it may even happen that a minute aperture in the prolapsus, not larger than the section of a human hair, becomes fistulous, and through this the aqueous humor gradually distils. After such a fistula has existed for some months, the whole cornea will have become hazy, and vision be irreparably lost.

I need hardly describe that, after a patient has been deprived of his lens by operation, an artificial substitute is necessary for distinct vision: a deeply convex glass ($2\frac{1}{2}$ in., $2\frac{3}{4}$ in., or 3 inches focus) being employed for near objects—in reading or writing; and one less convex (3 or 4 inches focus) for objects at a distance.

"*Linear Extraction.*"—This ill-chosen term has been applied to an operation which was first devised by GIBSON in 1811; modified a few years later by TRAVERS; and then laid aside, as the true principles which determine the absorption of the lens *in situ* became better understood. The operation has lately been revived in Germany, and re-imported into this country.

GIBSON advised that *soft* Cataracts should be freely broken up with a needle, and that, *after inflammation*

had subsided,—say in three or four weeks,—a small corneal incision should be made, and the remains of the broken-up lens removed with the scoop. Now, if such a broken-up lens do not, in the course of three or four weeks, set up inflammation, it is probable that inflammation will not occur at all; and the fragments, if left alone, will all be absorbed in the course of some months. But if the lens should have been broken up too freely, and the fragments are causing inflammation of the iris and cornea, the surgeon ought not to wait in the hope that the inflammation may subside, but should at once make a small opening in the cornea, and allow the fragments which are causing the inflammation to escape.

"Linear Extraction" seems to be an application of GIBSON'S operation to just those very cases for which he considered it unsuitable. A hard lens cannot be thoroughly broken up with a needle or similar instrument, and its firmer portions can be got out through a small corneal incision only after much manipulation and irritation of the eye. In the ordinary operation of Extraction, too small a corneal wound is one of the most common causes of failure; and "linear extraction," applied to any but softened cataracts, seems to involve just the same difficulties. I have seen some lamentable instances of eyes lost after so-called "linear extraction," which I have no doubt would have been saved, if treated by the same operators, on the slower plan of Solution *in sitû*, or Extraction by a large corneal wound.

CHAPTER XVI

THE OPERATION FOR ARTIFICIAL PUPIL.

THIS term may be understood to signify, not only the formation of a new aperture in the iris, when the natural pupil has become obliterated, but also any operation performed on the latter for the purpose of changing its size or position.

1. *The formation of a new aperture* becomes necessary whenever an extensive wound of the cornea—such, for instance, as that inflicted in the operation of Extraction—has been followed by a large prolapsus of the iris, which has obliterated the pupil by drawing its margin into the cicatrix. A similar obliteration is produced by extensive loss of corneal substance; such as attends Gonorrhœal and severe Purulent Ophthalmia, and various forms of mechanical and chemical injury. Occasionally a new aperture may be formed, with the most striking benefit, in cases where, in consequence of Iritis, the margin of the natural pupil has become adherent to the capsule of the lens, and the area of the pupil filled with a layer of old inflammatory deposit, the cornea remaining healthy, and the periphery of the lens itself preserving its original transparency.*

2. *The natural pupil requires to be artificially enlarged, or displaced*, in cases similar in kind to the

* See Appendix; Case G.

foregoing, but differing from them in the degree of obliteration.

a. Where, for instance, a portion of the pupil having prolapsed, the rest still remains free, but is overshadowed by the cloudy edge of a corneal cicatrix, with which the greater part of the pupillary margin is identified.

b. Where the iris and pupil are in a perfectly normal condition, but are more or less completely hidden by a dense central opacity of the cornea.

Cases in which the pupil becomes blocked up with a film of inflammatory deposit, and, at the same time, diminished to a mere point, after extraction of a Cataract, might properly be considered under the head of *Artificial Pupil;* but they have already been spoken of among the operations on "Opaque Capsule" in a preceding Chapter.*

In determining which form of Artificial Pupil operation is to be preferred, in any of the cases above enumerated, the presence or absence, the transparency or opacity, of the lens must be taken into serious consideration.

In some of the instances alluded to in the latter portion of *par.* 1, and at *a* of *par.* 2, *ante*, the lens is very commonly absent, having escaped through the ulcerated or sloughy opening in the cornea; but this is not always the case, and the reader will at once perceive how much more care must be required in removing a portion of iris from before a transparent lens (any injury to which

* See also Case H. in the Appendix.

would produce Cataract), than in removing a similar portion after the lens has been lost.

Without entering into those minute points which individual cases may offer for consideration, I will just mention a few general rules which should guide the surgeon in operating for Artificial Pupil.

1. In most cases it is undesirable to operate when the other eye is sound.

2. An Artificial Pupil should not be attempted in an eye which has lost all perception of light:

3. Nor where inflammatory action is still going on, or has only very recently subsided.

4. Great care must be taken not to mistake for true cornea the semi-transparent fibrous tissue which sometimes overspreads the iris in the condition termed *Staphyloma.*

5. The history of the case must be minutely inquired into, to ascertain the presence or absence of the lens.

6. The pupil should be made as nearly central as possible, provided the cornea in that situation be sufficiently transparent.

7. If the artificial pupil be clear and well defined, a small aperture is better than a large one.

The rule, to inflict upon the parts as little violence as possible,—which holds good of all operations,—is peculiarly applicable to those for Artificial Pupil; for they are always performed on eyes that have already suffered from inflammation, and sometimes to a very considerable extent.

Where only a very narrow strip of cornea has retained its transparency, it is especially important that the iris

should be reached through a very small corneal wound; because the opaque cicatrix, which every such wound necessarily gives rise to, takes away so much space from the patient's limited field of vision.

There are three principal ways of making an Artificial Pupil; by *Laceration*, by *Incision*, and by *Excision*.

I mention the first only to express my disapproval of it, as a rough, clumsy, and unscientific proceeding. It is commenced by making an incision in the cornea, through which a sharp hook is passed into the anterior chamber as far as the ciliary margin of the iris. When the point of the hook has reached that spot, it is stuck firmly into the iris, and then, by slight traction, the iris is torn away from its attachment, to such an extent as may be desired. The hook is then disengaged, and withdrawn from the eye.

A pupil of this kind is often difficult to make, and usually very inefficient when made. Its position—so far from the axis of vision—is the very worst that can be chosen; its form and dimensions cannot be regulated with any certainty; the vessels and nerves of the iris are torn just where they attain their largest size. In short, one has but to examine a case of accidental separation of the iris from the ciliary ligament,—such as occasionally follows a blow on the eye,—to be convinced how very imperfectly a pupil in this situation can answer the purposes of the natural aperture.

The Operation by Incision is founded on the readiness with which the fibres of the iris, if put upon the stretch, will retract on being divided. It is most easily performed, therefore, in those cases in which the entire

pupillary portion of the iris has prolapsed through a wound of the cornea, and subsequently become adherent to the cicatrix.

It would be unsuitable where the iris had suffered much from inflammation, as, in that case, the fibres of the part would have lost their retractile force; and it would be dangerous where the lens was still *in sitû*, for the instrument would almost inevitably inflict an injury on that body, and so produce a Traumatic Cataract.

The operation is performed by passing a broad cutting-needle, or very small knife, through the cornea, and between it and the iris; then the edge of the instrument is turned towards the part to be divided, the point is thrust quite through the iris, and its fibres severed to such an extent as may be desired.* If the instrument be not extremely sharp, and dexterously used, the iris, in the attempt to cut it, may be so dragged as to cause its ciliary attachment to give way.

MAUNOIR'S method of dividing the iris with scissors, in addition to other difficulties, has the defect of requiring a large corneal wound to be made before the scissors can be introduced; and, however simple it may look in a diagram, to make a V-shaped incision in the iris, any one who has tried to do so on the dead subject, will have found that even the finest and sharpest scissors cannot divide, with precision, such a flabby and yielding tissue as the iris becomes the moment the aqueous humor has escaped.

From what I have said, it is evident that the operation by *Incision* is applicable to only a limited class of

* Appendix; Case I.

cases, and most of these can be still more advantageously treated by the *Excision* of a portion of the iris.

For the means of accomplishing this in a far safer and better way than had previously been done, we are indebted to Mr. TYRRELL; and of all the suggestions for the improvement of ophthalmic surgery which are to be met with in his *Practical Work*, none has so well borne the test of experience as the use of his "blunt hook."*

With certain modifications of construction, this† is the instrument I generally prefer for drawing out a portion of the iris in the operation by Excision, even where the lens is absent; where it is *in situ*, and transparent, the blunt hook is almost the only contrivance that can be used without great risk of wounding the capsule, and so producing Cataract.

It is so important to prevent the premature escape of the minute quantity of aqueous humor which still remains in some cases of old injury to the cornea, that all unnecessary pressure on the globe must be avoided. The lids, therefore, should be held apart with a spring speculum, and the eyeball steadied by pinching up with a broad-bladed forceps a small fold of the ocular conjunctiva.

The surgeon, having carefully planned the position in which the Artificial Pupil can best be made, with the broad cutting-needle penetrates the cornea, close to its junction with the sclerotic. By using the cutting edges of the needle, the little wound may be widened to such an extent as will permit the hook to be easily passed in

* See Plate, fig. 8. † See Plate, fig. 9.

and out; and, with due care, the greater part of the aqueous humor may be retained until the hook has actually entered the aqueous chamber. Its employment there will be regulated by the circumstances of the case.

If the natural pupil has become wholly obliterated—in consequence of its entire margin having prolapsed into a breach of surface in the cornea—it may be found advisable to take advantage of the moment when the cutting-needle is first passed into the anterior chamber, to pierce the iris; so as to obtain a hold for the hook;* but if a special form of the latter instrument be adopted (see *Plate*, fig. 10), it may be thrust through the iris without any preliminary puncture having been made with the needle.

As soon as the hook is firmly fixed in the iris, the handle of the instrument is to be rotated, so that the convexity of the short, bent part of the hook may face forwards, or towards the cornea. This turn must be given to the instrument in every form of its application; for, otherwise, when it is being brought out, its point is almost sure to catch in the corneal wound.

The hook, with a portion of iris in its hold, having been slowly and gently withdrawn through the wound, an assistant, with a pair of fine scissors, cuts through the iris, close to the hook, if only a moderately-sized pupil be needed, or close to the cornea, should a larger one be desirable.

Lastly, any portion of the iris which may hang in the wound, is to be returned into the aqueous chamber, by

* Appendix; Case J.

means of the little spatula. In this way the iris is restored to its natural plane, and the corneal wound, being freed from any obstruction, rapidly heals.*

In cases where the greater part of the pupillary margin is blended with a corneal cicatrix, but where a small aperture still exists, a free edge is of course presented to the hook, and the withdrawal of a portion of iris becomes comparatively easy.

If both iris and lens be in their natural condition, and the obstruction to vision be owing to a central opacity of the cornea, the surgeon's object will be to remove such a portion of the margin of the pupil as will cause its area permanently to extend beyond the edge of the opacity. As the lens is transparent, great care must be taken in so hooking the pupillary margin as not to tear the capsule; otherwise, opacity of the lens will be produced, and *Cataract* added to the difficulties of the case.

TYRRELL'S blunt hook, with a shortened bend (*Plate*, fig. 9), will suffice to form almost every kind of Artificial Pupil. By employing it, the quantity of iris to be removed can be regulated with much more precision than is possible by introducing a forceps into the anterior chamber, although, in some special cases, the "cannula forceps" may be used with advantage. (Appendix; Case L.)

All *sharp* hooks are open to the objection of being difficult of removal from the eye, after they have done their work in seizing the iris. Their use in cases such

* Appendix; Case K.

as I have just described, where the lens is still *in sitû* and transparent, is obviously contra-indicated.*

Mr. CRITCHETT has very recently proposed an operation, which he terms "Iriddesis," [Iridodesis?] as suitable to a limited class of cases; as, for instance, where prolapsus iridis has occurred, and so much of the pupillary margin has been drawn into the cicatrix as to reduce the area of the pupil to a very minute aperture; or, where the whole pupil has been displaced towards the extreme edge of the cornea, and overshadowed by an opacity. A puncture is made through the cornea, sufficient for the introduction of a cannula-forceps; a small portion of iris, near its ciliary attachment, is grasped, drawn out through the wound, and tied there with a

* I cannot exclude from this objection even the ingenious "needle-hook" constructed by my colleague, Mr. BOWMAN. It is described by him, in the *Medical Times and Gazette* of January 10th, 1852, as the basis of "A New Method of Operating." It, however, exactly resembles a "hook needle" invented by Mr. WATSON, of Edinburgh, and figured in his *Compendium of the Diseases of the Human Eye* (third edition, 1830, plate xviii, fig. 18); where he speaks of it (p. 431) as a "small needle having a portion removed from its side near the point, so as to form a hook. This instrument is intended to be introduced through the cornea, for the purpose of laying hold of, and pulling out a portion of the iris, without previously making an opening in the cornea." In a note, at p. 372, Mr. WATSON adds—"The same instrument (only of a larger size), I was much surprised to find, since the publication of the last edition of this work, delineated in a tract by BEER, published in 1799, which he used to extract the lens from its capsule, in cases of Cataract." Rather, to extract the capsule after the lens had been removed.

Of course Mr. BOWMAN was no more aware of his operation having been anticipated by Mr. WATSON, than the latter was aware of BEER's inventing a "needle hook" thirty years before the *Compendium* was published.

very fine ligature. This transforms the pupil into a long slit. A second portion of iris is then similarly tied in a suitable position, and the elongated pupil assumes a triangular figure, its natural margin being uninjured, and its motory power, therefore, in some measure, retained. (*Ophthalmic Hospital Reports*, vol. i., p. 220, 1858.)

I have hitherto made no attempt to lay down any general rule as to the *direction in which an Artificial Pupil ought to be made;* for all the cases I have described present such peculiarities, in the relative extent and position which opaque and clear cornea bear to each other, as must determine the situation to be chosen for the newly-formed aperture.

There are, however, certain cases in which the surgeon has a free choice as to its situation; the whole cornea being transparent, while the natural pupil has become contracted, and closed up with opaque deposit, in consequence of old iritis. I have alluded to such cases in an early part of the present Chapter. Considerable differences may exist among them, as to the condition of the lens; which, in some instances, may be wholly opaque, while, in others, it may be simply overlaid by the opaque deposit in the pupil, and transparent throughout the rest of its extent.

In examining these eyes under the influence of atropine, we may possibly detect some minute, dark spot at the edge of the pupil, which may afford proof of a space, however small, existing between the iris and the capsule. This space may be just sufficient to admit the point of the blunt hook, and its situation may determine the direc-

tion in which the iris ought to be drawn out. Otherwise, I prefer to draw the pupillary margin either directly downwards, or outwards.*

The *after-progress of an Artificial Pupil* varies according to the structural condition of the iris. If this part be in a healthy state, its tissue strong and elastic, it does not give way under the hook, and, when cut with the scissors, it exudes a minute quantity of blood, which is absorbed in the course of a few days. If, on the contrary, there has been long-continued Iritis, the texture of the iris becomes soft and easily torn. The hook passes through it as it would pass through a piece of wetted blotting-paper; the edges of the rent do not retract; and the enlarged vessels pour out their blood into the anterior chamber, where it may remain unabsorbed for many weeks, or even months.

After-treatment.—If we have been startled at finding such wholesale depletion recommended after the operation of *Extraction*, what shall we say on reading that,—"as a general rule the patient should be *bled largely after any of the operations for the formation of an Artificial Pupil!*"—that this bleeding is to be to the extent of fourteen ounces; in some instances to twenty-four, or from that to thirty ounces; that if the diminution of pain be only temporary, and after a few hours begins to increase, recourse must again be had to bleeding; and that if *this* should not be sufficient to arrest the progress of the disease, it must be immediately treated

* See Appendix; Cases G and M. In the former the lens was found transparent; in the latter it was opaque, and required the subsequent use of the needle to procure absorption.

as a case of Iritis, and mercury administered in such a manner as to affect the system as rapidly as possible!*

Certainly my own description of the after-treatment both of Artificial Pupil and Extraction, must appear very tame, when I confess not only that I have never conceived the thought of bleeding in any cases of the former, but that even in the latter, more extensive, operation I have never found it necessary to do so.

All that is requisite, after making an Artificial Pupil in the way I have described, is that both eyes should be bandaged, so as to ensure perfect repose to the operated one, for a few days. On the second or third day the eye may be cautiously examined; and, should there be much sclerotic injection, or intolerance of light, the bandage must be replaced, and the eye allowed to remain undisturbed for another day or two. Usually, by the end of a week from the operation, a large eye-shade will be found a sufficient protection. Very great care must be taken to prevent the patient too soon exposing the eye to strong light, especially if the case be one in which there had been for several years no perception of objects. Patients restored to sight after many years of blindness derive such pleasure from trying their newly regained faculty, especially in observing light and colors, that too much caution cannot be impressed upon them on this head. With excitable subjects, it is sometimes desirable to give an opiate in the evening after the operation; but this may usually be dispensed with. As regards diet, there is no reason for

* Guthrie; *Lectures on the Operative Surgery of the Eye.* Second Edition, 1827, p. 516.

denying the patient a moderate quantity of plain, digestible, animal food, even on the day of the operation; and it is unwise wholly to forbid the use of such stimulants as he has been accustomed to.

Of course, a patient who is confined to bed, or to an easy-chair, is not to live as freely as if he were taking exercise out of doors; but it is a great mistake to suppose that he is to be wholly deprived of his accustomed stimulants because he has had a small puncture made in his cornea, and a minute portion of his iris removed. Old people, especially, can ill bear such reduction; and it will often happen, where a little bleeding into the anterior chamber has taken place from the wound of the iris, that a glass of beer, or a glass or two of wine, taken with the meals, will greatly hasten the absorption of the effused blood. Fomenting the closed lids with warm water is extremely soothing, and may be repeated night and morning.

CHAPTER XVII.

OPERATIONS FOR STAPHYLOMA, STRABISMUS, ETC.

The removal of a *Staphyloma* is resorted to either for the purpose of getting rid of a deformity, or on account of the pain which sometimes attends the protrusion. There are also other morbid enlargements of the eye, hardly to be classed under any one specific term, which all require, for their permanent cure, either the evacuation of the humors of the globe, or its complete removal. These enlargements may be caused by various kinds of spontaneous inflammation, or may be the slow result of wounds. In either case, it is not uncommon for the lens to become filled with a deposit of phosphate of lime; and this earthy mass, by pressing against the iris and ciliary processes, often causes extreme pain. In excising a Staphyloma, therefore, it is necessary to make an opening sufficiently large to allow of the lens being removed, should it be still existing within the globe.

Another reason for making a free opening, is to facilitate the escape of the blood, which is sometimes abundantly poured from the choroidal vessels into the vitreous chamber. When this hæmorrhage occurs, and suddenly fills the cavity of the unyielding sclerotic, intense pain is produced, and the operation therefore is one of those which should be performed under the influence of chloroform.

The lids being separated by the fingers of an assistant, the surgeon passes a cataract knife through the cornea, or the fibrous tissue which replaces the cornea in cases of true Staphyloma, so as to make a flap rather smaller than that for ordinary Extraction; this is instantly seized with a forceps, and removed with a stroke of the knife. The aqueous humor, or the serum which has replaced it, of course escapes as soon as the first wound is made; perhaps the lens slips out when the wound is enlarged; or should that body have been previously lost or absorbed, vitreous humor, more or less changed in consistence, is alone ejected; if the lens do not escape with the humors, it must always be removed.

I have said that the sudden removal of pressure from the enlarged choroidal vessels is very apt to cause them to give way. I have sometimes endeavored to obviate this, by making with a broad cutting-needle, a preliminary puncture through the staphylomatous projection, so as to allow its watery contents to escape, and in this way to prepare the blood-vessels for that total loss of support which follows the gush of vitreous humor. But I believe the most likely way to prevent excessive hæmorrhage is to apply pretty firm pressure to the eye through the closed lids, by means of a cold sponge, the instant after the operation has been completed.

As soon as hæmorrhage has ceased, or all risk of its taking place is gone by, water-dressing may be applied. When bleeding has occurred, copious discharge of sanies continues for several days; and the globe gradually shrinks, so as to allow of an artificial eye being worn. Sometimes great constitutional disturbance follows the

operation, and must be met by suitable treatment of a soothing kind; or, at a later period, pus may form within the clot, and require evacuation.*

OPERATIONS FOR STRABISMUS.

Tenotomy, as applied to Strabismus, has been much simplified since its first introduction in 1840. The variously-shaped knives, which at that time were invented, have been pretty generally superseded by the scissors, and little stress is now laid upon the exact amount of curve to be given to the director, or blunt hook.

On the other hand, there has been increased care in selecting suitable cases; and this has very much lessened the number of operations. A knowledge also of the gradual changes in respect of position, which an eye may undergo long after the most careful operation, has taught the conscientious members of our profession to be very guarded in their prognosis; while, at the same time, it has imposed a wholesome silence on such as were wont to publish long list of cases, *which had all been successful.*

The sitting position is the best for the patient during the operation of Strabismus, for it allows the blood to escape readily from the little wound, instead of lodging in it, and obscuring the parts to be divided. With unsteady patients, it is a useful precaution to secure the arms by means of a round towel passed around the back of the chair. If chloroform be given, which is often

* See two cases, illustrating these remarks, in the *Lancet* of May 25th, 1850, Cases 2 and 3, pp. 622, 623.

necessary, the recumbent position must of course be chosen. The internal rectus is divided so much more frequently than any other muscle, that I may select that operation to illustrate my remarks.

The assistant, standing behind the patient, receives his head, and holds it perfectly steady. The operator then separates the lids with a spring speculum, and the assistant, with a broad-bladed forceps, pinches up a fold of the ocular conjunctiva, to the *outer* side of the cornea, and so draws the eye away from the median plane.

Having raised a fold of conjunctiva about midway between the cornea and the plica semilunaris, the surgeon divides the membrane with scissors, a little below the level of the lower edge of the cornea. If this cut be prolonged vertically upwards, it should not be too extensive, otherwise the plica semilunaris shrinks away and disappears after the operation, which imparts an unnatural prominence to the globe. At the lower part of the incision, the scissors should next divide (if not severed at the first cut) the dense sub-conjunctival tissue, so as to expose the white, smooth sclerotic. A curved director, or blunt hook, is then slipped upwards along its surface, beneath the tendon of the internal rectus muscle, which is then divided with the least possible extension of the conjunctival wound. There is less risk of the plica semilunaris shrinking, if the tendon of the rectus is divided sub-conjunctivally; the first incision being made transverse, instead of vertical, and the curved hook or director being slipped under the tendon, which is then divided by successive snips of the scissors, without any further injury to the conjunctiva.

If the patient now attempts to turn the eye inwards towards any object, he is unable to do so, except to a slight degree. The limited power of adduction still remaining, is chiefly due to the attachment by areolar tissue between the belly of the muscle and the sclerotic, partly, perhaps, to the action of the innermost fibres of the superior and inferior recti. If the power of adduction be too strong, a search must be made with the hook for some undivided fibres of the internal rectus.

For a day or two the eye will require the protection of a bandage, but as soon as the immediate effects of the operation have passed off, the eye should be left uncovered, at least during part of the day, while the sound eye is completely closed, so as to force the patient to bring the defective organ into use. It must be remembered that in all cases of Tenotomy, the division of the preponderating or contracted muscle is but the first step towards a cure, which careful training must complete.

The areolar tissue, which has been disturbed during the operation, becomes infiltrated with blood, and sometimes forms a little prominence in the wound. The winking of the lids gradually moulds this mass into a small button-like excrescence, attached by a narrow pedicle, which may require to be snipped through some weeks after the operation.

Division of the *external rectus* is very rarely required, but it may be resorted to for the purpose of remedying the unsightly abduction which sometimes occurs when the section of the abductor muscle has been accompanied with too extensive separation of its connections.

ENTROPION AND ECTROPION.

In the Chapter where the appearances of these affections of the lids are described (pp. 290–292), I have very briefly alluded to the various operations employed for their cure. The main object of the present work being to direct attention to the *outward* phenomena of those diseases which affect *tissues peculiar to the eyeball*, I have devoted comparatively little space even to the important operations in which those tissues are concerned. The Operations of Entropion and Ectropion, involving as they do merely such tissues as are met with in other parts of the body, need not therefore here be specially described. The works of MACKENZIE and WALTON, already alluded to, may be consulted for fuller details concerning plastic operations on the lids, and other parts adjacent to the eye.

REMOVAL OF THE EYEBALL.

As Pathology advances, this operation becomes more rare, in cases of malignant disease—the very instances in which it formerly was chiefly employed. Meantime, its performance has been rendered much less formidable by the adoption of BONNET'S method, whereby, instead of scooping out all the contents of the orbit, the globe alone is removed by making a circular incision through the conjunctiva and ocular fascia, and then successively dividing each muscle of the eyeball close to its point of insertion, and the optic nerve just before it pierces the sclerotic. A much smaller wound is made by this method than by the older one, and there is also less bleeding.

Instead of raising with a hook all the tendons of the ocular muscles, one after the other, and dividing them before cutting through the optic nerve, I operate in the following way, which is simpler and more rapid. Having inserted the spring speculum between the lids, and made with curved scissors the usual circular division of the conjunctiva, I grasp the external rectus and its surrounding fibrous tissue with a forceps, and snip them across; an assistant seizes the cut tendon and draws the eye inwards. Sliding one blade of the scissors under the superior rectus and oblique muscles, they are divided; and then the inferior rectus. The optic nerve is next snipped through, and the globe starts forwards. Two or three strokes of the scissors divide the internal rectus, vessels, and bands of areolar tissue, and the operation is completed.

Removal of the eyeball should never be resorted to so long as any sight remains in the organ; unless, indeed, such an amount of irritation be present as may lead the surgeon to fear that, by allowing the diseased organ to remain, the sight of its fellow might be endangered.

I may, in conclusion, say a few words respecting the employment in Ophthalmic Surgery of Chloroform. We may regard it under two aspects; as saving the patient from pain, and as facilitating the manipulations of the surgeon. Now, it is notorious that operations performed on the globe itself cause very little pain, and last but a very short time. Those on the lids, involving, as they

do, the wounding of skin, are of course more painful; but, in respect of the suffering they cause, none even of these are comparable to the larger operations of General Surgery; and there are few adults who, if thoroughly informed as to the real nature of such operations as those for Cataract, Artificial Pupil, and Strabismus, or even Entropion and Ectropion in their slighter forms, will not readily undergo them without the aid of anæsthetics.

A perfectly passive condition of the eye is so desirable in the delicate operations of Cataract and Artificial Pupil, that one would naturally expect to find chloroform universally applicable in such cases; and specially indicated in the most delicate of all, namely,—Extraction. But this forms a peculiar and exceptional case, and for the following reason:—

We have seen that—provided the operation have been properly performed—the successful result of an Extraction chiefly depends upon the rapidity with which union of the corneal wound can be effected. Now, with every precaution, it will sometimes happen that chloroform induces vomiting; and the violent efforts which attend this might disturb the lips of the wound, and cause the vitreous body to escape between them, thus inducing a prolapse of the iris, with all its accompanying irritation and retarded union. But without taking such an extreme case as this, we shall find a very serious objection to the use of chloroform, in the fact, that the squeamishness and disrelish for food which it induces, may interfere with the reparative process, by impairing the

nutrition of the cornea during the critical twenty-four hours immediately following the operation.

In adults who are extremely fearful and unsteady, chloroform may be required in the operations for Artificial Pupil and Strabismus; it will always be indicated in cases of Extirpation of the Globe; and it may greatly facilitate the examination of eyes rendered irritable by disease or by the presence of foreign bodies.

In children, all these manipulations will be greatly facilitated by the use of chloroform, and some can hardly be performed at all without its aid. The recumbent position is, of course, necessary in every instance of its employment.

APPENDIX.

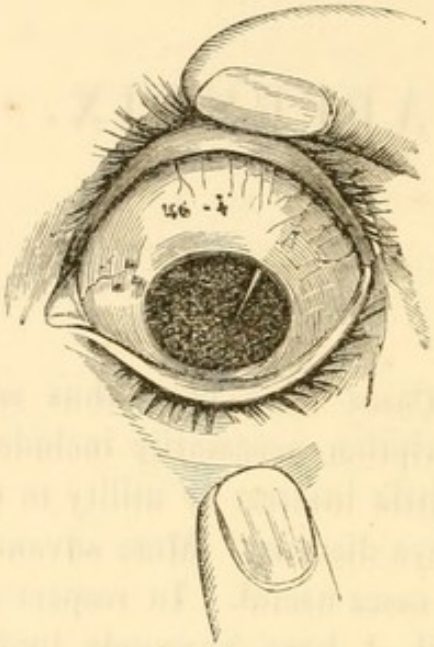
THE following Cases have been thus separately placed, because their description necessarily includes such technical details, as are of little interest or utility to those just beginning the study of eye diseases. More advanced readers, however, may find the cases useful. In respect of the operations for Artificial Pupil, I have purposely limited myself to a single example of each form mentioned in the text.

CASES A. and A. *a*.

Rupture of Eyeball; escape of Iris and Lens; function of Retina retained.

It was hardly to be expected that an eye, after undergoing such extensive injury as rupture of choroid and sclerotic, with loss of lens, should still retain much sight; and yet a case came under my own observation, in which the organ not only sustained this amount of injury, but *loss of the whole iris* also, without the function of the retina being destroyed. I did not see the patient until eight months after the accident, the precise nature of which could only be deduced from the existing state of the eye. A description of the case was read before the Medico-Chirurgical Society, but was too short to be offered for publication in their *Transactions*. I therefore

subjoin the account, and add a woodcut, showing the appearances presented when the patient came under my care.



(A.) Maria M'F——, aged 49, received a blow with a fist on the left eye. The lids became much swollen, and she suffered great pain for some weeks; but she had no medical advice until she applied to me, eight months after the accident. The cornea was then bright and clear, but all behind was dark, and no iris visible. On raising the upper lid, I noticed a very faint bluish mark, about three lines long, just above the upper edge of the cornea. It seemed as if the sclerotic had been divided there, and afterwards repaired by a substance rather less opaque than the original structure. Three or four little dots, like particles of black pigment, appeared beneath the conjunctiva, close to the mark in the sclerotic.

The patient kept her hand over the injured eye, finding that otherwise the light dazzled it, and so interfered with her making good use of the sound one. By means of a convex glass I threw light into the eye, to discover what had become of the iris. I could then see into the vitreous chamber, and

distinctly perceive the surface of the retina; but no vestige of the iris could be discovered. I held a lighted candle before the eye, to ascertain the condition of the lens. A single upright image, reflected from the cornea, showed that the lens also was wanting. Vision was limited to the perception of large objects: she could distinguish the form of a sheet of paper, but could not see letters printed on it. I made her look through a magnifying glass: to her surprise, she could then make out some of the larger capitals. I added to the glass a card, perforated by a small hole, and she saw every object distinctly, and read a "brevier" type. By these two expedients I had temporarily supplied the lost parts of the organ; the glass acting as a crystaline lens, while the perforated card screened the retina in the manner of an iris

It appears probable, therefore, that the blow had ruptured the coats of the eye—perhaps the conjunctiva also—and, at the same time, had completely torn the iris from its ciliary attachment; both lens and iris escaping through the wound, and the rent in the sclerotic afterwards healing up.

The most curious feature in the case is this—that after so extensive an injury, the function of the retina was preserved; while the vitreous humor had been so far retained that the figure of the globe was but slightly altered, and its bulk not appreciably diminished.

(A. *a*.) While this sheet was passing through the press, I met with a case resembling, in almost every particular, that just related.

John N——, aged 29, came to the hospital March 17th, 1859. A year and a half ago he was struck with a fist on the left eye, and at once lost all sight in it. There was much irritation for several weeks; this gradually passed off, and sight began to return. When I saw him, there was in the sclerotic, near the upper and inner edge of the cornea, a blackish mark,

about two lines broad. This was the spot where the coats of the eyeball had been ruptured. All behind the cornea was of an uniform blackness, and I at once recognized the nature of the injury. With this eye the man could see large objects, and even the streaks of type on a printed page. With a convex glass and perforated plate, he read off a "minion" type. I examined the eye with the ophthalmoscope, and found the optic nerve and retina apparently healthy. I could not detect the slightest filament or shred where the iris had once been attached, and the vitreous was perfectly clear. The lens and iris had been separated from all their connections, and ejected through the rupture in the sclerotic, without leaving a trace behind.

Case B.

Irideremia, observed in an Adult.

Caroline P——, aged 36, applied at the Royal London Ophthalmic Hospital in August, 1857. She had evidently suffered from chronic inflammation of the corneæ; both were slightly hazy, and traversed by a few tortuous veins. There was no general redness of the sclerotic, no intolerance of light, nor any signs of acute disease. Both upper lids drooped very slightly, giving the patient rather a sleepy and heavy appearance. She could not read ordinary type; but with the right eye, where the cornea was less hazy than in the left, she could make out large capitals. Opposite the centre of each cornea was a white speck, evidently situated in the lens, but neither the outline of the pupils nor the tissues of the irides could be distinguished. It seemed unlikely that such a degree of corneal haziness as permitted an opacity of the lens to be seen could, at the same time, prevent a view of the iris; and a more careful scrutiny convinced me that the irides were

wholly absent. A moment's glance with the ophthalmoscope proved this to be the case, the whole area of the cornea presenting the reddish glow of an illuminated retina. Across this field a few corneal veins were seen ramifying, while, in the centre, the black, nuclear opacity of the lens stood out in bold relief, surrounded by a few widely-separated striæ, radiating from the circumference of the lens. When speaking of the irides as absent, I should observe that, behind the upper and inner margin of the left cornea, a very narrow, scarcely traceable, brownish line indicated a rudiment of iris.

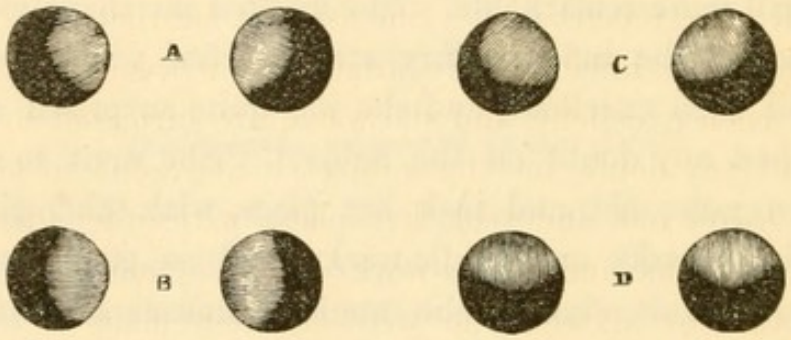
It seems singular, that with central and radiating opacities of the lenses, hazy corneæ, and absence of irides, the patient still enjoyed a useful amount of sight; and her previous history is still more remarkable. She assured me that until the occurrence of the inflammatory attack, a few years ago, her sight had been excellent, and she was quite surprised at my having had any doubt on the subject. She went to school when ten years old, and took her place, with other girls, at the ordinary tasks and needle-work; and so good was her progress, that at sixteen she went as housemaid into the household of a nobleman, remaining there and in another situation for eight or ten years. She stated that, as a girl, she never suffered any inconvenience from bright sunlight or candlelight, and saw distant and near objects equally well. Both her parents, and several brothers and sisters, had good sight.

In June, 1858, the case was still under treatment, and some improvement in the condition of the corneæ had taken place. The movements in the eyeballs had always been perfectly natural, no trace existing of that unsteadiness which, as far as I have seen, characterizes Irideremia in infants.—(*Ophthalmic Hospital Reports*, vol. i., p. 158.)

Case C.

Abnormal position of the Lens occurring in four members of the same family.

This malformation has lately come under my notice, in four members of the same family, a mother and three sons, who applied to me as suffering from "shortness of sight." The mother is dyspeptic, but, considering the fatigues and anxiety incident to the bringing up of a large family, she may be said to enjoy a fair state of health. The sons—aged 17, 15, and 13—are all well-grown, healthy, and intelligent. For the sake of more easy reference to the accompanying diagrams, I shall distinguish these four patients by the letters A, B, C, D.



The father and three younger children have perfectly healthy eyes. The irides of the father are of a mixed color, between grey and brown; those of the three children are bluish-grey; and in all of them vision is excellent, both for near and distant objects.

In the four patients, the appearance which first attracted my attention was a slight tremulousness of the iris, and some little deviation of the part from its normal position as a vertical plane. In A and C, for instance, the lower and outer portion of the iris slightly receded; in B, the outer, and in D, the lower portion presented the peculiarity. In each case it was this receding portion only which became

slightly tremulous when the eye was moved. The pupils all acted well under the stimulus of light. When slightly shaded with the hand, I noticed that their area was not uniformly black, but presented a slightly cloudy aspect through the greater part of its extent. This very slight cloudiness was evidently in the lens; and when the pupil was allowed to expand, the rest of its area presented a clear black appearance, which made the displaced lens more visible by contrast. Under concentrated light, the edge of the lens appeared as a bright line of a golden hue. The following peculiarities were observed:

A., aged 40. The irides are light brown; the very slight oscillations which take place during the act of moving the globes are limited to the lower half of the irides. When the pupils are in their contracted condition, the whole of their area is occupied by the lens, which accounts for the patient enjoying such comparatively good sight. She reads ordinary type, and sees objects across a room with tolerable distinctness, but has difficulty in reading small type, or in seeing any great distance.

Ophthalmoscopic examination with dilated pupils.—Each lens is slightly displaced upwards and inwards, so that between it and the lower and outer edge of the pupil a space exists which allows of the retina being seen through the vitreous body only. The lenses appear to be rather flattened, and their edges are not perfectly even, but present a slightly wavy or scalloped outline. The retina and optic nerve have a perfectly healthy appearance. In this case, as well as in the other cases, these parts could be best seen by looking at them through the crystaline lens: when viewed through the vitreous body alone, it was difficult to bring the parts into focus, and they consequently appeared misty.

B., aged 17. Light grey irides; their outer portion tremulous and receding. When the pupils are contracted, this patient looks wholly through his lenses. He is short-sighted, but reads small type fluently, at a distance of five inches. Concave glasses appear to be of no use.

Ophthalmoscopic examination with diluted pupils—Each optic nerve is slightly reddened at its inner half, and in the left eye there is a small patch of pigment just below the nerve. In other respects the fundus of the eye appears natural. The lenses, displaced directly inwards, are perfectly clear, and free from oscillation.

C., aged 15. Brown irides, receding and tremulous at their lower and outer portion. Both lenses are so much displaced upwards and inwards that, in the natural state of the pupils, only a portion of their area is occupied by the lens. This patient reads with difficulty, and at a short distance. Concave glasses, however, do not assist him, but he sees distant objects much better with convex glasses of twenty-four inches focus; and for reading, a deeply convex glass of four inches suit him best. Such a glass, in fact, supplies the place of the crystaline lens, which is wanting at the outer and lower part of the pupil.

Ophthalmoscopic examination with dilated pupils revealed nothing abnormal in the choroid or retina. The lenses appeared to be transparent and tremulous.

D., aged 13. Brown irides, receding and tremulous at their lower portion. Both lenses displaced directly upwards. Vision much the same as in the case just described. The ophthalmoscopic examination presented nothing abnormal in the fundus of the eyes, except an unusually reddish tinge of the optic nerves.

In the diagrams, I have represented all the pupils as being of the same size, and quite circular. I need hardly say that there were some deviations from this perfect uniformity of size and shape, but they were so slight as to be needless to particularize. The relative position of the lens to the pupil, being the only important point, has been carefully preserved.

Although I have spoken of the lenses as *transparent*,—and they allowed the vessels of the retina to be seen through them with the ophthalmoscope,—they presented, when examined with the naked eye, a very faint haziness, contrasting with that part of the pupil where the vitreous humor was immediately exposed to view. The oblique position of the lenses would, by reflecting light, in some measure account for this slight appearance of cloudiness; and perhaps there was actually some little deviation from perfect transparency, which disappeared under the strong glare of the ophthalmoscope.

A single case of malposition of the lens, similar in extent to that described in the patient B., is recorded by GRAEFE in the *Archiv. für Ophthalmologie* (vol. i. p. 345, 1854). I also met with it in a boy, about five years ago; but I am not aware of any instance in which this remarkable deformity has been observed in several members of the same family.

CASE D.

Post-mortem appearances referred to at p. 269.

"The body was extremely emaciated. A large cerebriform tumor occupied the right side of the head and neck, involving the whole of that side of the face in one uniform mass, without any trace of features. The skin had given way; and the tumor was softening and ulcerating on the surface. It presented all the appearances of true cerebriform cancer, and

in almost every stage of development, from a firm, brain-like consistence, to all the varieties of softening. The disease occupied the whole of the orbit, and not a trace of any of the normal structures of that cavity could be detected. The bony walls were laid bare and carious, but not destroyed to such an extent as to lay open the neighboring cavities. There was, however, very extensive caries at the optic foramen, the bone being so much eaten away as to allow the little finger to pass through the aperture. The right side of the commissure itself was softened, and the tractus opticus on the same side was not so firm as the opposite one. The dura mater appeared healthy. The arachnoid was partly opalescent, with some considerable serous effusion. The surface of the brain was pale; and over the optic foramen, and along the track of the diseased growth, there was some softening. The ventricles contained a considerable quantity of fluid. The liver, spleen, and kidneys were quite healthy, nor were there any cancerous deposits in any other parts of the body than those above-mentioned."

Case E.

Cancerous growth within the eyeball, involving the lower half of the retina; the upper half retaining its function.

I have cited the following case, not as presenting an instance of rare disease, but chiefly as illustrating some points connected with the use of the ophthalmoscope, as a means of correct diagnosis. Of course it is as yet too soon to form any opinion as to the final result of the operation, considered as a means of cure.

A young lady, aged 26, consulted me, May 31st, 1858, for defective sight in the left eye. Four months previously she had noticed that objects in certain positions were not seen

with this eye, while other objects were seen almost perfectly. The right eye was quite unaffected, and she attributed the defect in the other to some derangement of the stomach. I found no trace of inflammation. The only point in which the affected eye differed from the sound one was that, on careful inspection, the iris could be observed to bulge very slightly forward at its lower part, and this caused the pupil to deviate, in a very trifling degree, from the circular form. In all other respects the iris appeared perfectly healthy. Objects placed above the level of the eye were not seen, but those below that level were seen almost as well as with the sound eye, and even small type could be read when the page was held so low that the rays from it fell upon the upper part of the retina.

When the pupil had been dilated with atropine, I could see a rounded, greyish mass, of considerable size, rising up from the floor of the vitreous chamber. In consequence of the transparent state of the media, this mass was beautifully seen with the ophthalmoscope, and presented the ordinary appearance of an encephaloid growth. The upper part of the retina seemed healthy.

The manner in which images falling on the sound portion of the retina were conveyed to the brain, seemed to prove that the optic nerve itself was not the seat of encephaloid deposit; and, as a careful examination of the patient, by my friend Dr. Peacock, failed to detect any visceral disease, I proposed to the patient and her friends to have the eye removed; fairly placing before them the probability of malignant disease eventually developing itself in some other organ, if the mass in the eye were really encephaloid; but, at the same time, telling them it was just possible the tumor might be scrofulous; but that, in either case, the eye, if left to itself, must inevitably be lost.

I removed the globe under chloroform, June 10th, 1858.

Recovery went on satisfactorily; and when I last saw the patient (in October) she was in good health, and showed no signs of any return of the disease.

The eye was examined immediately after removal, and its tissues were found healthy, except those portions implicated in the tumor. From the lower part of the globe a rounded mass, about the size of a small hazel-nut, rose up nearly as high as the middle of the lens. The summit of the tumor was rather nearer to the lens than to the optic nerve. The base of the tumor was firmly adherent to the sclerotic; and the choroid, which had been raised up from its position, was expanded for some distance over the sides of the tumor, and was gradually thinned and finally lost some distance below the summit. The retina had been gradually raised up by the mass, but did not appear changed in structure. The lens and vitreous humor were healthy.

Under the microscope, the tumor presented all the characters of cancer tissue; being chiefly made up of transparent tubes with granular excrescences; tubes containing elongated nucleated cells; and free rounded cells of various sizes.

Case F.

Cyst-like expansion of the Iris.—Re-formation of the cyst, after repeated evacuation of its contents, and laceration of its walls.

The following case does not resemble any I have ever met with, either in my own practice or that of others. Its most curious features are,—the length of time during which the morbid process has gone on, and the constant re-formation of the cyst after the free division of its anterior wall. It is also remarkable that the transparency of the cornea has never been in the slightest degree impaired. The annexed woodcut gives

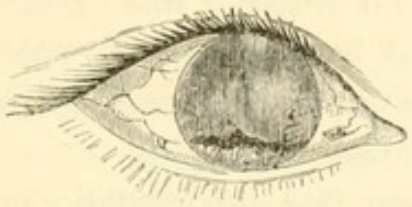
but a very imperfect notion of the appearances; for, although I made the original drawing with extreme care, it is impossible to represent on wood the peculiar translucency of the cyst, and the dimly seen streakiness of its posterior wall.

In 1834, when 17 years old, Eliza S—— wounded the right eye with a two-pronged fork. One prong entered the sclerotic about a line from the inner and lower margin of the cornea, the other seems to have struck the upper part of the cornea itself: whether it pierced the cornea, and wounded the iris, is uncertain. The eye remained weak and irritable for three or four months, and then appeared to have completely recovered, the sight being almost as good as before the accident, so that she could read fluently with that eye.

In the winter of 1846, the eye began to be occasionally irritable and intolerant of light. In May of the following year, she became a patient at Moorfields, under the care of Mr. Dalrymple. At that time there was a slight vascular zone in the sclerotic; the cornea was perfectly healthy; the upper third of the anterior chamber was filled up by a cyst, projecting from the iris, and covering the upper portion of the pupil: through the lower part of this aperture, which was clear and black, the patient enjoyed good vision, although not quite so perfect as that of the other eye. The walls of the cyst were very thin, and seemed to be formed of the fibrous tissues of the iris itself. On May 20th, Mr. Dalrymple passed a cataract-needle through the cornea into the cyst, and thus allowed its fluid to mix with that of the anterior chamber. The cyst at once collapsed, the pupil regained its circular form, and the upper part of the iris was restored almost to its natural aspect; it looked, however, as if its fibres had been slightly bruised. At the end of a month the cyst had re-filled, and resumed its former size: the eye was again irritable, and vision slightly obscured. On the death of Mr. Dalrymple, the patient came

under my care. I punctured the cyst, and with the same results as had followed the former operation. The eye remained perfectly quiet, and the patient followed her occupation of cook, until April, 1848. The cyst then reformed, and was again punctured. Another long period of repose ensued, no irritation occurring in the eye till February, 1855. At that time the patient again applied to me, with the old train of symptoms, but the cyst was now larger, and concealed the upper two-thirds of the pupil. Vision was also more dim than it had previously been, probably on account of the pressure which the larger bulk of the cyst exerted on the retina, through the medium of the lens and vitreous humor. Hoping effectually to prevent the re-formation of the cyst, by more thoroughly breaking up its walls, I used two needles at once, entering them through opposite margins of the cornea, and thus lacerated the anterior wall of the cyst in various directions, so as to leave it hanging in loose, filmy shreds. I then opened the cornea with a broad cutting-needle, and allowed all the fluid contents of the anterior chamber to escape. It was curious to see, even after this free division of the cyst, how nearly the natural aspect of the iris was restored. It seemed evident that the cyst was formed by the expanded fibres of the iris itself, and, on the evacuation of the fluid, their elasticity obliterated the traces of the cyst almost as completely as on the occasion of the first puncture, eight years previously. In a few days, when the aqueous fluid had been re-secreted, the eye looked almost healthy. The pupil was nearly circular, and vision was restored so that the patient could read with this eye almost as well as with the sound one. Early in October the cyst had developed itself precisely to its former extent, the eye was irritable and vision obscured. On the 12th of October I punctured the outer edge of the cornea with a broad needle, introduced a blunt hook (TYRRELL'S),

and endeavored to draw out a portion of the cyst. In doing this, however, the capsule of the lens, which had hitherto been avoided in all the various operations, was slightly wounded, and, of course, opacity of the lens gradually ensued. Some degree of chronic iritis followed, and the pupillary margin became adherent to the anterior capsule. On the 3d of January, 1856, the patient once more visited the hospital, with the cyst re-formed. On this occasion I contented myself with simply puncturing the cyst with a cataract-needle. Within



four days the cyst was restored to its former bulk, but no irritation occurred for many months. The drawing was made in July, 1856. Opposite to the lower part of the cornea a small portion of healthy iris, which remained uncovered by the cyst, formed a plane facing obliquely upwards and forwards. The rest of the anterior chamber was filled by the cyst, which had a dark tint, owing to the extreme thinness of its walls and the depth of its cavity. The anterior surface was slightly constricted in a vertical direction, so as to present a faintly lobulated appearance. Near the inner and outer margins of the cornea a few light-colored fibres were thinly spread out over the sides of the cyst, apparently the remains of the normal tissue of the iris. Under concentrated light the posterior wall of the cyst became distinctly visible, and presented a patchy and striated appearance. Examined with the ophthalmoscope, no light was transmissible through this posterior wall, or beneath its lower border, so that the pupil might be supposed to have been wholly obliterated. Some narrow chink must, however, have existed, so as to transmit

light to the retina; for the patient had sufficient vision to count fingers, and recognize well-lighted objects, such as a piece of paper, a pen, &c.

April 13th, 1857; the patient came again. Within a few days the eye had become rather injected and intolerant of light. Its appearance was precisely the same as when the drawing was made. I now tried the effect of freely lacerating the cyst *from behind;* and, passing a broad, double-edged needle through the sclerotic, just behind the ciliary processes, I extensively tore the posterior wall of the cyst. This operation appears to have been permanently successful. I kept the patient in view for many months afterwards, and there was no attempt at re-formation of the cyst.

I need hardly say that this posterior operation would not have been proper during the earlier progress of the case, when the lens were still uninjured and transparent; but, after the lens had been wounded, and consequently become absorbed, there was immediately behind the cyst no structure which it was of importance to avoid.

(Communicated to the translators of MACKENZIE'S work, and printed in the second volume of the *Traité Pratique des Maladies de l' Œil*, p. 262, 1857.)

CASE G.

Iritis.—Closure of the pupil by lymph.—Operation for Artificial Pupil seven years afterwards.

Mary Ann T——, aged 29, presented herself at the hospital, in July, 1853, with her eyes in the following condition: — The left globe enlarged, the cornea prominent, and hazy throughout; its circumference indistinct, the adjacent sclerotic being thinned, and of a leaden hue. She had very little vision in this eye, merely distinguishing large objects. Of

the right eye she was quite blind; it had been attacked with Iritis about seven years ago, for which she stated she had taken mercury, and applied belladonna, and was long under treatment. The textures of the globe now appeared healthy, excepting that the pupil was contracted, puckered, and filled with a whitish membrane. When atropine was applied, two minute dark dots showed themselves, one at the upper, and the other at the outer angle of the pupil. They seemed to be clear spaces where the pupillary margin was not adherent to the capsule of the lens; and appeared to indicate, that, although the capsule was covered with opaque deposit to an extent corresponding to the contracted area of the pupil, it might, perhaps, at other parts be transparent, and, together with the lens, unaffected by the old disease which the eye had undergone. The little black dot at the outer angle of the pupil, if it really were an aperture, seemed barely sufficient to admit the point of a TYRRELL'S hook.

July 8th: Having punctured with the broad cutting-needle the outer margin of the cornea, just on the equator of the eyeball, I passed in a blunt hook with a shortened bend, inserted its point very carefully at the small spot where the pupillary margin appeared to be free, and succeeded in drawing out a considerable portion of iris, which was cut off. A large transverse opening resulted, and the lens and capsule which were thus exposed were found to be perfectly transparent. No irritation followed, and the next day the little corneal wound was closed, and the anterior chamber refilled with aqueous humor. Two days later, the patient could read common newspaper type quite well. She has continued to improve, and enjoys very good vision.

Case H.

Extraction of Cataract.—Subsequent closure of the pupil with lymph.—Double needle-operation.

Thomas P——, aged 72, had the operation of Extraction performed on both eyes by the late Mr. Tyrrell; the right eye in 1841, the left in the year following. In 1850, "inflammation" attacked the left eye, which is now a mere button in the orbit. I found the right eye in the following state:—The cornea clear; the cicatrix of the wound barely traceable; the pupil contracted to a mere pin-hole, and filled with a membrane of old inflammatory deposit; the iris bulging forward in pouches, so as almost to touch the cornea throughout the greater part of its extent. The patient had good perception, not only of direct light, but of that reflected from light-colored surfaces, such as a sheet of paper or a hand.

September 23d, 1853: Using a spring speculum to expose the eyeball, I introduced two needles through the opposite margins of the cornea, and stretched open the pupil. A very small clear space resulted, through which the patient could at once discern large objects. The next day, as there was no irritability about the eye, I repeated the use of the needles, and succeeded in enlarging the opening to the extent I desired. It was still small; but, being quite central, and perfectly clear of opaque membrane, gave the patient excellent vision. With a convex glass he read "minion" type, having been unable even to guide himself about during the last three years.

Case I.

Total opacity of the right cornea; opacity of four-fifths of the left cornea.—Artificial Pupil formed by dividing fibres of the iris.

While Robert H——, aged 38, a gunner in the East India Company's service, was in the act of ramming a gun, the cartridge exploded. His right hand and arm were so severely shattered, as eventually to require amputation through the upper third of the humerus, and both his eyes were injured to such an extent as entirely to deprive him of sight. The accident occurred at Bombay in November, 1849

When he applied to me in May, 1852, the right cornea was uniformly white and opaque; the left was in the same condition throughout four-fifths of its extent, but along its upper margin was a narrow strip, almost perfectly transparent. The iris immediately behind this portion of the cornea looked healthy. With the left eye the patient could discern light, which seemed to be transmitted chiefly through a round spot near the centre of the cornea, where the cicatrix appeared to consist merely of a thin membrane.

May 7th: Having explained to the patient how uncertain the benefit of any operation must necessarily be, I proceeded to attempt the formation of an Artificial Pupil. For that purpose I determined to employ a single instrument, that there might be less risk of diminishing, by a needlessly large cicatrix, the very limited extent of transparent cornea. A needle, cutting on both sides as far as is indicated by the dotted line in Fig. D, was passed through the cornea at the very edge of the opacity, and pushed a short distance upwards and inwards. This was done slowly and with difficulty, for the opposed surfaces of the iris and cornea were in contact with, though not adherent to, each other. Then the needle

was rotated, and one of its cutting edges directed against the iris, and a few of its fibres having been divided, they retracted, so as to leave a small, well-defined aperture (Fig E). The patient could at once recognize large objects, such as a hand or a towel.

28th: The patient's sight has steadily improved. He not only recognizes the features of those about him, but can distinguish small coins, and tell the hour by a watch. No form of convex glass seems of use, although there can be little doubt that the crystaline lens is absent. He commonly sees best when the eye is a good deal overhung with a shade; and in a bright glare of sunshine he requires a wire-gauze "railway guard," fitted with a plane neutral-tint glass.

Dec. 30th: The patient's sight continues as good as at the date of the last report.

Case J.

Complete destruction of one eye, and obliteration of pupil in the other, by Purulent Ophthalmia.—Operation of Artificial Pupil twenty-seven years afterwards.

The operation in this case was attended with much disadvantage in its performance, on account of the rolling motions of the eyeball, and from the circumstance that no part of the

cornea was quite clear. Its result is encouraging to the adoption of a similar procedure in many like cases, which have probably been given up as beyond hope of benefit.

Mary Ann H——, aged 27, came to me in the following state:—The left eyeball collapsed and lost; the right smaller than natural, and constantly rolling about. The cornea of the right, small, and densely opaque throughout two-thirds of its extent; the upper and outer part hazy, but allowing the iris to be seen through it. No vestige of pupil; that portion of the iris having become identified with the dense and slightly prominent cicatrix at the centre of the cornea. The lens was presumed to be absent, and to have escaped through the large ulcer which had given origin to the cicatrix. The patient had been reduced to her present condition by an attack of severe Purulent Ophthalmia just after birth. She had retained, however, the perception of light, and could even recognize the colors of bright red or yellow surfaces, if held close to the eye; but beyond this she had not, from the earliest infancy, enjoyed the faculty of sight. On the 14th of October, I made an Artificial Pupil opposite the upper and outer part of the cornea, puncturing the latter with a broad cutting-needle, the point of which was made to penetrate the iris close to its union with the corneal cicatrix. A TYRRELL'S hook, with a shortened bend, was then passed in at the little aperture made in the iris, and a small portion of the latter drawn out and cut off. A good pupil resulted, and this was farther improved a week later, by the removal of a fine band of iris which ran across the aperture. Hardly any irritation followed these operations, and within a few days of their completion the patient could test her newly-acquired powers of vision. She is very intelligent, and learned the forms of most common objects with great quickness, distinguishing certain objects, as square or round, the first time they were presented

to her. She was afterwards furnished with a convex glass, to compensate for the want of a crystaline lens.

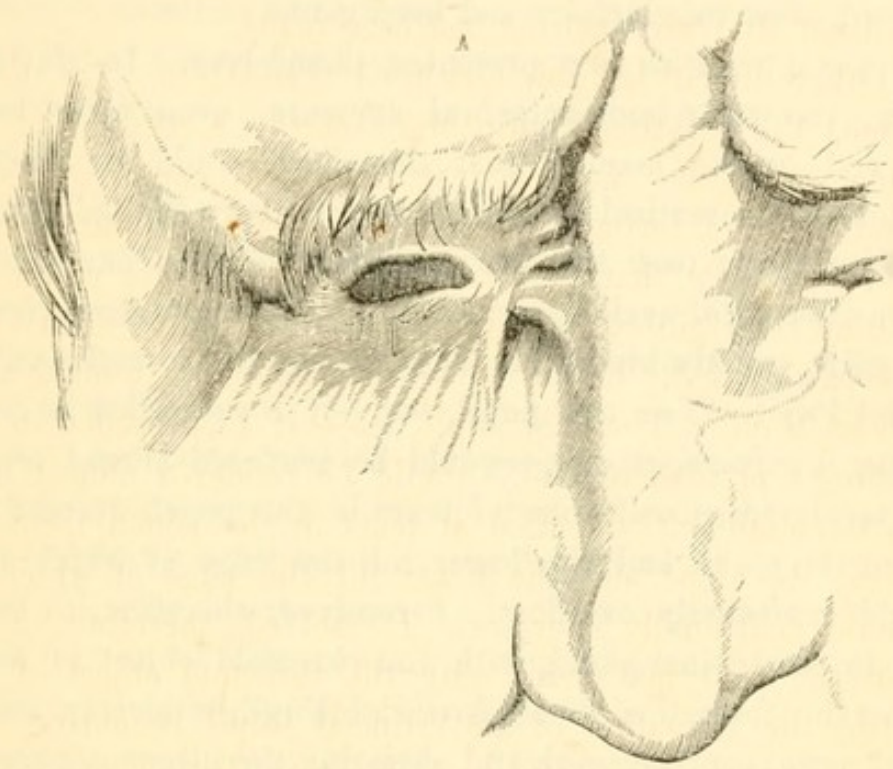
Case K.

Total loss of left eye; very large opacity of right cornea, and closure of pupil; obliteration of puncta lachrymalia, and extreme narrowing of palpebral aperture.—Enlargement of the latter; Extirpation of lachrymal gland; and subsequent formation of an Artificial Pupil by Excision.

J. R——, a Cornish miner, aged 29, was severely wounded in the head, chest, and arms, by an explosion of gunpowder at a copper-mine in Cuba, on the 19th October, 1847. When he came under my care, in May of the following year, his forehead and cheeks were seamed with scars, some of which extended to the scalp. Small fragments of stone might be felt here and there, beneath the skin of the face, which was dotted with grains of unexploded powder On the left side the eyeball had been totally destroyed, and the lids torn in various directions. The right palpebral aperture presented a very singular appearance, both lids being confounded together in one uniform cicatrix, so firm and rigid that the aperture, diminished to about a third of its natural size, never underwent the slightest change of form. It looked like a hole cut in a mask. The margin of this opening was smooth and rounded, and fringed with a few straggling eyelashes. The lachrymal puncta and canals having become entirely obliterated, tears were continually trickling over the cheek. (Fig. A.)

It was by no means easy to ascertain the condition of the eyeball, the palpebral aperture being so narrowed that only a small portion of the cornea was visible at one time; but a probe could be freely moved over the surface of the globe—a proof that no adhesions existed between it and the conjunctiva

of the lids. The cornea was white and opaque, except at its upper and outer part, where a transparent portion, two lines broad, allowed me to see the iris, which adhered by its pupillary margin to the large cicatrix of the cornea.



As the patient had decided perception of light, it seemed desirable to try whether, after first enlarging the palpebral aperture, an Artificial Pupil might not be made, sufficient to enable him to guide himself. Accordingly, on May 11th, I commenced by passing a grooved probe into the palpebral aperture, and dividing, in an outward direction, the cicatrix which united the tarsi to each other. To prevent as much as possible the contraction of the wound thus made, the conjunctiva and skin on each edge were brought together with fine sutures. By this operation the palpebral aperture was enlarged to nearly twice its former width, and a considerable portion of the eyeball came into view. The marks of three

small wounds in the sclerotic could now be seen—two near the outer, and one near the inner edge of the cornea. Several eyelashes which had been turned inwards against the globe by the growing together of the lids, came into their proper position after this incision had been made.

Other difficulties now presented themselves. In the first place, the cicatrized palpebral aperture, even after being widened in the manner just described, could be forcibly stretched in a vertical direction to only a very limited extent; and I foresaw that the accumulation of tears dammed up behind the rigid eyelids, would, by preventing a clear view of the parts, greatly hinder me when attempting to make an Artificial Pupil. The new pupil, too,—if I succeeded in establishing a permanent one,—would be rendered almost useless by the abundant collection of tears in the pouch formed between the globe and the lower lid, the edge of which they would continually overflow. I resolved, therefore, to extirpate the lachrymal gland, with the threefold object of facilitating the formation of an Artificial Pupil, rendering such a pupil permanently useful, and obviating the inconvenience the patient would otherwise suffer by the continual trickling of tears over the cheek.

May 21st: An incision carried along the outer half of the upper edge of the orbit passed *above* the hairy eyebrow, as the latter had been drawn downwards by the contraction of the cicatrix. The edge of the orbit having been exposed, and the fascia detached from it, the gland bulged forwards, was seized with a forceps, and dissected out. The only difficulty I experienced was in ascertaining when this fascia had been reached, as it was confounded with the scar in one brawny mass. The wound was closed with four stitches, and strips of plaster and a compress of lint applied. During the following day the patient was quite easy, but on the 23d complained of

having had a disturbed night from pain in the wound. The stitches were removed, and a strip or two of plaster substituted. The conjunctiva lining the upper lid had become swollen and infiltrated, and being bound down in front by the unyielding cicatrix, had bulged through the palpebral opening, which it had almost filled up, turning over its upper margin so as to resemble, at first sight, an excoriation of the upper lid itself.

June 3d: The patient complains of pain in the wound. A moisture overspreads the eyeball, which, if the lachrymal gland had not been removed, one would term *tears*, thickened with a little mucus. The quantity is inconsiderable, not sufficient to run over the cheek.

8th: The wound made in extirpating the lachrymal gland has cicatrized as a mere line; the everted conjunctiva has almost withdrawn itself again within the palpebral aperture.

21st: To-day I made an Artificial Pupil opposite the transparent portion of the cornea. Using a broad cutting-needle and TYRRELL'S blunt hook, I succeeded in drawing out and removing a small piece of iris. During the operation, tears collected to an extent sufficient to require removal with a bit of sponge; but of course the quantity of fluid was quite inconsiderable as compared with what used to collect before the operation on the lachrymal gland. Although, on examining the gland after its removal, it appeared to have been taken out entire, it is probable that a few granules of its palpebral portion—that part of the gland, namely, which in the healthy state is prolonged upon the upper lid—had been left behind, in consequence of the way in which it had become matted together, and lost in the cicatrix.

22nd: The pupil is very small—a mere slit in the iris: nevertheless, there is not only increased perception of light, but various objects reflecting it, such as a white card, or a

bright coin, are perceived when held towards the patient's right hand.

July 5th: I enlarged the Artificial Pupil, by catching its upper edge with the blunt hook, drawing out and excising a portion of iris; an assistant steadying the globe with a fine sharp hook fixed into the dense corneal opacity. The flow of tears, was rather greater than on the 21st of June, but still very inconsiderable. The enlargement of the pupil improved the patient's sight so much, that within a few days he could recognize coins, and see the lines of type on a printed page.

Although, by extending the palpebral aperture outwards, I had brought so large a portion of the cornea into view, I found that the cicatrized inner edge of the aperture formed a kind of dam, which retained a quantity of tears still secreted, and prevented their running off at once. I, therefore, on the 25th of July, divided the inner edge of the palpebral aperture, in the same manner as I had formerly divided the outer edge. This incision exposed the caruncula lachrymalis, which had escaped injury. To prevent the wound contracting again, I took advantage of a small portion of tolerably sound skin about its margins, and having dissected up two little flaps, in the way exhibited in the sketch (Fig. B), attached their edges to the conjunctiva with four fine stitches.

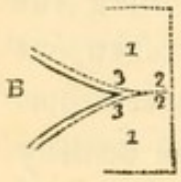
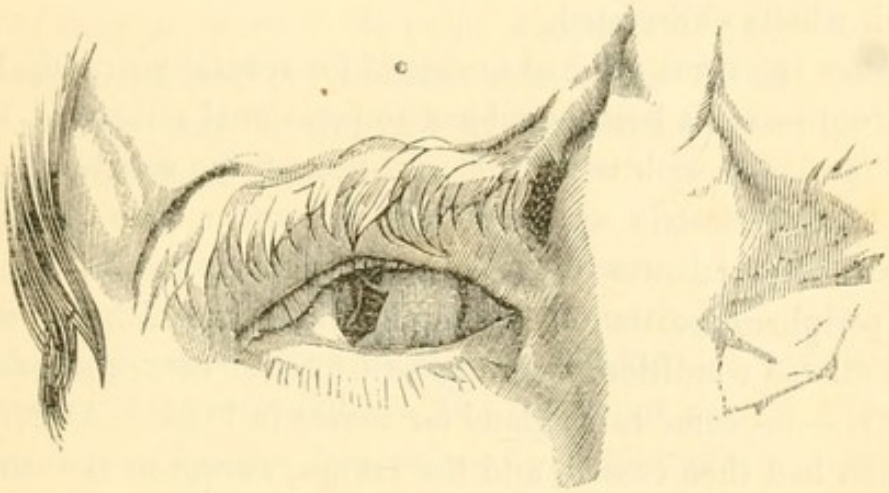


Fig. B.--The two flaps (1, 1,) are marked out by dotted lines. The broad part of each flap, having been dissected up, was shifted a little, so as to make its corner (2) correspond to the inner angle of the enlarged palpebral aperture at 3.

The patient's sight gradually improved. I tried convex glasses, of various forms, in the belief that the lens must have escaped from the eye shortly after the injury, or must have been wounded at the time, and subsequently absorbed; but I did not find them of any assistance.

When the patient left London, he could guide himself, and recognize all the objects of furniture in a room; but I did not expect to hear such an account of him as was brought to me, in November, 1852, by one of his friends, who informed me that "that J. R—— is able to gain his living by driving a coal-cart down to the coast, a distance of ten miles from his residence, unattended by any companion."



Figs A and C are from drawings which I made with extreme care. A represents the appearance the patient exhibited seven months after the injury; C is from a drawing made a few days after he left the hospital. The cicatrix resulting from the extirpation of the lachrymal gland, is near the outer extremity of the eyebrow.

Case L.

Left eye useless.—Dense central opacity of right cornea, hiding the pupil; iris and lens healthy.—Lateral displacement of the pupil, by Excision of a small portion of its margin.

A gentleman, holding the appointment of government surveyor in one of our colonies, was attacked, in 1841, with ulceration of the right cornea, which terminated by forming a dense white cicatrix exactly opposite the centre of the pupil.

As the cornea surrounding the cicatrix completely recovered its transparency, he was eventually enabled to resume his occupations; for, by shading the eye, and thus causing the pupil to dilate, he enjoyed vision sufficiently distinct to allow of his executing drawings, and other fine work connected with his profession. His left eye had been useless from early childhood, in consequence of corneal ulceration and prolapsus iridis; the lower half of the cornea being opaque, and the pupil wholly obliterated.

After the right eye had remained for several years free from active disease, it became subject to occasional attacks of keratitis, attended with much inflammation of the sclerotic. The old corneal cicatrix appeared irritable, and a halo of opacity began to spread outwards from its margin, so as at last to cover the peripheral portion of the pupil, which had hitherto, when in a dilated condition, been opposed to clear corneal tissue.

Mr. —— came to England for advice in 1853. All inflammation had then ceased, and the cornea, except at the centre, was perfectly clear. By looking obliquely through this clear portion, I could see the pupil, which appeared quite natural in respect of form, size, and contractility. The patient could not read even a large type. Atropine dilated the pupil sufficiently to bring its margin beyond the edge of the opacity, and then, by looking through a small hole in a card, he could distinguish the smallest letters.

It therefore appeared to me probable that an operation, which should ensure the *permanent* displacement of the pupil towards the clear portion of the cornea, would be of the utmost service to him. Accordingly, having separated the lids with a spring speculum, I punctured the cornea at its outer edge with a broad cutting-needle, and passed in a blunt hook with a short bend (*Plate*, fig. 9). Then, carefully catching the outer margin of the pupil, I drew it directly outwards through

the wound; snipped off a small portion with scissors, cutting quite close to the hook, and with the *spatula* returned the rest of the iris into the anterior chamber.

The eye was kept closed for two or three days, and then very gradually accustomed to the light. There had been no bleeding from the iris, and at the end of a week not a trace of redness remained about the globe. The pupil, clear and black, now extended beyond the edge of the corneal opacity, but was not so large as to reach the outer margin of the cornea. The patient could read the smallest type of the *Times*. After a few months' stay in England he returned to the colony, to resume his official duties.

Case M.

Both pupils much contracted, and blocked up with opaque deposit, after old Iritis.—The left pupil enlarged by Excision; an opaque lens exposed.—Keratonyxis, to procure absorption of the Cataract.

John R——, aged 67, presented himself, in June, 1852, in the following condition:—Both pupils were very small and irregular, and closed by a whitish membrane, evidently the product of old Iritis, although the patient could give no account of any inflammatory attack in the eyes. The left one, he said, had been useless for twelve or fourteen years; the right for about six or seven. With the latter he could still dimly make out the form of large, well-lighted objects, but not sufficiently to enable him to go about alone. With the left eye, the pupil of which was no larger than a pin-hole, he could merely distinguish between light and darkness.

As the obstruction to vision was so evidently a result of inflammation of the iris, I thought it possible that the periphery of the lens might be still transparent in both eyes, and

that good sight might therefore be restored by artificially extending the pupil, so as to bring it opposite to such clear portion.

On the 18th of June, 1852, I made an Artificial Pupil with TYRRELL'S hook, drawing the lower edge of the left pupil directly downwards, and then cutting off a portion with scissors. The result was a long, narrow slit, reaching to the margin of the cornea. I was sorry to find the lens opaque, and presenting the ordinary aspect of a firm senile Cataract. To extract or to depress this seemed equally out of the question, on account of its firm adhesion to the iris,—to say nothing of the objections which, to my mind, always exist against "Depression," as an unscientific and destructive operation. I had therefore no alternative but to get rid of the lens by "Solution," which, however tedious a process, seemed all but certain of eventual success. By attacking the lens, too, near its exposed thin *edge*, the good effects of absorption would be sooner manifested than happens in the ordinary form of Keratonyxis, where the thick *centre* of the lens is the part first broken up.

The needle was used for the first time about the beginning of August, again towards the end of September, and a third time on the 3d of December. On each occasion I carefully avoided disturbing the more central part of the lens, and fretted away merely that portion of its margin which corresponded to the area of the Artificial Pupil. When this last operation was performed, so much of the lower edge of the lens had become absorbed, that the patient could discern large objects held a little above the level of the eye. He did not return to town till the beginning of March, by which time the Artificial Pupil was perfectly clear of lens and capsule, except towards its upper angle, where the thick central portion of the lens was situated. With a convex glass the patient could read large type.

Case N.

Extraction of a Foreign Body from the Vitreous Chamber.

James Perkins, a cooper, aged 24, came to the hospital, December 2d, 1858, half an hour after receiving an injury to the left eye. As he was knocking an iron hoop off a cask, the edge of the chisel broke, and a chip of metal flew off and struck his lid. A small vertical wound, a little above the margin of the upper tarsus, marked the spot where the chip had penetrated the skin. On everting the lid, I found a corresponding wound in the conjunctiva covering the tarsal cartilage. In the sclerotic, nearly on a level with the upper border of the cornea, and about a line from its inner edge, was a small gaping wound, a line long, surrounded by a patch of blood effused beneath the conjunctiva. A minute vesicle of vitreous humor showed itself in the opening. The pupil was active, and the patient could read large type, but saw all objects through a slight mist.

I at once dilated the pupil with atropine, and examined the eye with the ophthalmoscope. At the upper and inner portion of the pupil was a clot of blood, behind the lens, hanging down from the wound, and slightly waving to and fro in the vitreous humor. The rest of the humor was perfectly clear, and as the cornea and lens were also quite transparent, I obtained a good view of the retina. Just below the optic nerve I noticed a small rounded body, looking almost like a minute air-bubble, and it appeared as if this globule were a portion of clear lymph, effused around a foreign body which was assumed to have entered the eye. There was, however, no redness surrounding this little globule; and this absence of vascularity made me doubt that what I saw could really be lymph.

A light pad of cotton-wool and a bandage were applied over

the closed lids; rest and temperance enjoined; and a draught ordered to be taken every night, containing tinct. hyoscyami ʒi in camphor mixture.

On December 6th, the little wound in the sclerotic was closing; there was no pain, and not much redness of the conjunctiva. Sight was less dim than on the patient's first visit, and he could read a good-sized type pretty easily. At the end of ten days the hyoscyamus was left off, and pot. iodidi. gr. iv. ordered twice a day, in decoction of bark.

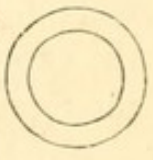
Sight continued to improve, and by the 30th all redness of the conjunctiva had disappeared; the little wound in the sclerotic (*a*) presented a hardly traceable grey line; there was no intolerance of light. I dilated the pupil, and made my second examination with the ophthalmoscope.

I could no longer detect the little globular body which, on the patient's first visit, I had noticed near the optic nerve, and I am still at a loss to explain its nature. At a sudden turn of the globe, there started from behind the inner portion of the iris an oblong, black body, which was instantly recognized as a chip of metal. It was entangled in a few thread-like remains of clot, which kept it suspended in the vitreous humor, and allowed it to move freely backwards and forwards, while its movements outwards were checked by the body of the lens.

It is well known to ophthalmoscopic observers that opaque bodies in the lens or vitreous humor assume very deceptive appearances as to their real position; and this foreign body, which was really behind the lens, seemed, when viewed upon the illuminated field, to be in front of the lens and on the plane of the iris. When examined by daylight, concentrated by means of a convex glass, the true position of the body was at once recognized, as it swung to and fro on a level with the equator of the eyeball.

Could the foreign body be removed? If left to itself, it would not long remain harmless; for, when the shreds of clot which were keeping it suspended should become absorbed, it must inevitably fall down on the retina or ciliary processes, and then no doubt would set up an inflammation, which would eventually destroy the eye. In penetrating into the vitreous humor by the route the body had taken in entering the globe, one would be almost certain to break through the suspending threads, and then the body must fall down out of reach. I determined, therefore, to penetrate into the vitreous humor from below. Every variety of illumination was tried, both by natural and artificial light, and in various positions of the patient; and, as the foreign body sank backwards and disappeared when the patient lay down, I gave up the intention of using chloroform, which would have rendered a recumbent position necessary.

As the suspending filament allowed the foreign body a certain degree of motion, it was suggested that magnetic attraction might be employed to draw it nearer to the surface. A powerful magnet was tried, but its action on the foreign body, although very decided, was not available; for, if drawn inwards, the body became hidden behind the iris, and if drawn outwards, it came into contact with the lens, the very structure it was important to avoid.



The patient being seated in a chair close to a window, I stood behind him; the lids were separated with a spring speculum, and I fixed the globe by nipping up a fold of conjunctiva just above the cornea. Then I thrust a JÆGER'S lance-knife through the coats of the eye at *b*, directing the point of the instrument backwards, to avoid wounding the lens. Having withdrawn th knife, I passed in a forceps, invented by ASSALINI, for catching the iris in his operation

for Artificial Pupil, which opens when one of the branches is pressed, and closes again, by means of a spring, when the pressure is relaxed. I could obtain but a very dim view of the foreign body, for it was by no means brilliant, and only now and then glanced indistinctly as the light fell upon it. After two ineffectual grasps, I was so fortunate as to catch it by one end, and draw it out. The lids were immediately closed with plaster, and cold rags applied for a short time.

The foreign body proved to be a part of the edge of a chisel. It was about a tenth of an inch long, and weighed a quarter of a grain.

On examining the eye, on January 6th, I found the pupil circular and its area clear. The patient could read the large type on his bed-ticket. The wound (*b*) made at the operation had drawn together. There was, of course, a small quantity of blood extravasated beneath the conjunctiva, but very little increased vascularity of the membrane.

January 13th: The pupil to-day had recovered from the effects of the atropine, and was round and contractile. There was no intolerance of light, and the patient could read a pica type. For the first time after the operation, I made an examination with the ophthalmoscope. A few threads of clot, quite unattached, were floating in the vitreous humor. The lens was perfectly clear. The only appearance I could call morbid, was a slight reddening of the retina and optic nerve, the effect, probably, of a slight traumatic inflammation from the recent wound.

March 3rd: Under treatment, the irritation of the retina subsided; but, to prevent any risk of its recurrence, I abstained from using the ophthalmoscope until to-day. The perfect transparency of the lens allowed of my thoroughly examining the retina. It seemed quite healthy, and the only morbid appearance I could detect in the eye, was a single

opaque filament, floating in the vitreous humor. The patient's sight was steadily improving.

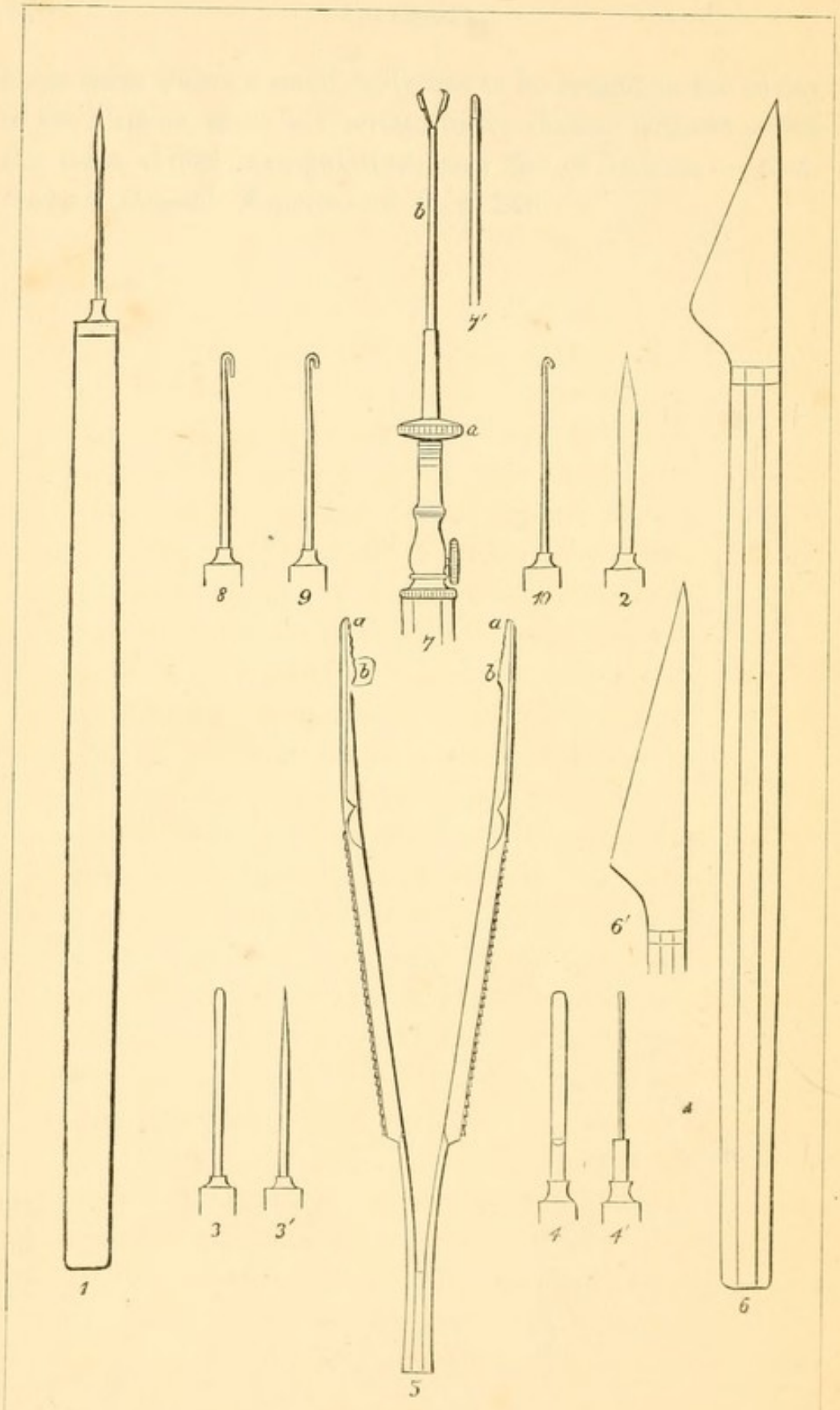
The points in this case to which I would draw attention, are the following. When the patient was first seen, it appeared unlikely that the fragment of metal had entered the cavity of the eyeball, inasmuch as the wound in the skin of the lid was so much larger than that in the sclerotic. Wounds of such different length might have been produced by a wedge-shaped body which had fallen off again after its point had just pierced the sclerotic. It seems, however, that the skin was first struck by the long edge of the fragment, which then, in passing through the tarsal cartilage, turned, and presented its narrow end to the sclerotic.

The deceptive appearances of the foreign body, when first seen with the ophthalmoscope, I have already alluded to; and although the fragment itself could be far more distinctly seen with the ophthalmoscope, I felt myself compelled to operate by natural daylight (dull as that was on the day in question), as by that light only could I at all judge of the true position of the fragment. The impossibility of obtaining a distinct and continuous view of it, was the chief cause of difficulty in the operation, although the narrowness of the space within which an instrument could be moved with safety—the *transparent* lens being on one side, and the retina on the other—was an additional difficulty. Of course, the wounding of the lens would have been a trifling evil in comparison with the benefit which the extraction of the foreign body ensured to the patient.

The forceps I employed was not the best instrument I could imagine for the purpose, but the best I had at hand, and the delay of a day might have caused the fragment to break its slender attachment, and fall down upon the retina.

I need hardly say, that in a case like the present, as in

those cases where a small body has to be caught in the cavity of the bladder, there is a certain lucky chance, without which the most skilful manipulations may fail of success.—(*Ophthalmic Hospital Reports*, vol. i., p. 280.)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EXPLANATION OF THE PLATE.

Fig. 1. *Cataract needle.*—Instruments larger or smaller than the present one will be required according to circumstances; but the general rule for their construction seems to be, that the lance head and the shaft should bear such a proportion to each other that the latter may play easily in the aperture made by the former; neither allowing a too rapid escape of the aqueous humor, nor fitting into the wound so tightly as to cramp and confine the movements of the point. Needles of a size intermediate between that of fig. 1 and fig. 2, are large enough to allow of their edges being ground sufficiently sharp to divide the fibres of the iris in making an Artificial Pupil by *Incision*.

Fig. 2. *Broad cutting-needle,* used in opening the cornea for the introduction of the blunt hook in Artificial Pupil. It may also be employed to remove the substance of a softened or fluid Cataract from the anterior chamber.

Fig. 3. Instrument for tilting out little foreign bodies imbedded in the cornea. For want of a better name, I have termed it the "spud," from its resembling the action of the common gardening tool.

Fig. 3′ represents a side view of the instrument.

FIG. 4. A front, and fig. 4′ a side, view of a little *spatula*, which may be used, after the operation of Extraction, for adjusting the iris,—for returning it into the anterior chamber, in making an Artificial Pupil by Excision,—or for preventing a sharp fragment of metal, which has transfixed the cornea, from falling backwards into the anterior chamber, while attempts are being made to dislodge and extract it. The instrument resembles the *spatula* of BEER, but is of much smaller size.

FIG. 5. *Cilia forceps.*—The spring of the blades should be so adjusted, and their extremities so formed, that, when firm pressure is made, the slightly roughened surfaces *a b* may be brought into complete contact, without any gaping of their points.

FIG. 6. *Cataract knife.*—This instrument, the principle of which is explained at page 339, is commonly known as "BEER'S knife," although it has, since his time, undergone several modifications as to form and size. FIG. 6′ shows the exact shape of the blade, as given in BEER'S own work, *Lehre von den Augenkrankheiten;* 1817.

FIG. 7. *Cannula forceps.*—The instrument is here represented open, and at fig. 7′ closed. In the latter state it is passed through an opening made in the cornea. By drawing back the disk *a*, attached to the cannula *b*, the points of the forceps are allowed to separate, and are then brought close together again by thrusting the cannula forwards. This to-and-fro movement is in most instruments effected by means of a trigger in the handle; but I prefer the simple contrivance here represented, as being much less liable to accidental derangement.

FIG. 8. TYRRELL'S *blunt hook*.

FIG. 9. A similar instrument, but with a shorter bend, and a rather wider space between that part and the shaft. This modification enables the surgeon to draw out a smaller portion of iris than is possible with the original hook of TYRRELL

FIG. 10. A still further modification of fig. 9; the part where the bend is given to the instrument being made rather pointed, but by no means sharp; only just conical enough to allow of its being thrust through the substance of the iris, so as to obtain a firm hold, when the pupil has become wholly obliterated.

THE END