

In cases of dislocation of the lens, if symptoms of glaucoma arise, von Graefe advises that an iridectomy should be made, especially if the dislocation is moderate, and the iris pushed forward to a limited extent. The incision should be as near the periphery as possible, on account of the danger of the vitreous humor entering the anterior chamber and pushing back the iris in such a way that its excision becomes difficult. The operation should not be undertaken in these cases until the patient is completely under the influence of an anæsthetic and the muscles are completely relaxed, otherwise there is great danger of escape of vitreous, and consequent intra-ocular hemorrhage.

Secondary glaucoma supervenes on serous choroiditis, and if repeated paracentesis fails permanently to reduce the increased tension, and the disease resists other treatment, an iridectomy should be made.

In posterior staphyloma, or sclerectasia posterior, secondary glaucoma may, and often does, supervene.¹¹ Von Graefe states that the disease here always attacks both eyes sooner or later, and that it assumes the character of glaucoma simplex, or that of the inflammatory form. The secondary affection, if its character is not early recognized and an iridectomy made, leads to grave impairment, or even to total loss, of sight.

Richard H. Derby.

¹ Graefe-Saemisch, iii., pp. 359, 360.
² Ophth. Beobacht., Berlin, 1867.
³ Archiv f. Ophth., Bd. xii., 1, p. 214.
⁴ Graefe-Saemisch, Bd. iii., S. 340.
⁵ Archiv f. Oph., l., Band ii., p. 243.
⁶ Ibid., ii., p. 245.
⁷ Ibid., iii., p. 456.
⁸ Ibid., iii., p. 202.
⁹ Ibid., iv., p. 153, and *ibid.*, xv., p. 173.
¹⁰ Ibid., xv., p. 121.

IRIDOTOMY.—Iridotomy and iritomy are the names which have been given to the operation of cutting the iris, thus making a distinction between that operation in which the iris is simply cut, and the *iridectomy* in which a portion of it is removed.

In a normal eye it is not difficult to make a cut in the iris, either radial or tangential, with a Graefe knife, and that too without wounding the lens or its capsule; but iridotomies are usually done on eyes in which the conditions are far from normal, in which the lens has been removed, and in which the pupil is so blocked by iris, or thickened capsule, or both, that neither iridotomy nor capsulotomy can be considered exclusively descriptive of the necessary operation. In such cases the method of de Wecker is usually followed. A small cut is made with a lance knife or a Graefe knife as for a cataract operation, the points of de Wecker's scissors (Fig. 2960) are introduced closed and nearly on the flat, and are then allowed to open so that the sharp point shall pierce the iris and pass below it until the limit of the proposed incision has been reached. Now the cut is made by closing the scissors, after which the instrument is withdrawn and the operation is complete. A single slash in the iris is not always sufficient to secure an open pupil, so the operation is sometimes varied by making a second cut before the scissors are removed, this being made in such a manner as to leave a slender tongue of iris the point of which will roll up on itself leaving a triangular pupil. The after-treatment is the same as that following iridectomy.

Fig. 2960.—De Wecker's Scissors.

IRIS, CONGENITAL ANOMALIES OF.—Congenital anomalies of the iris are usually associated with malformations of other ocular structures and frequently with congenital defects elsewhere, such as harelip, cleft pal-

ate, etc. They are dependent in great part upon hereditary influences, although it seems highly probable that in certain cases they may be due to inflammatory processes occurring in the eye during fetal life. Poor vision is the rule, but it is usually to be attributed to the insufficient development of the eye as a whole rather than to the defects in the iris. Not infrequently there is microphthalmos of one or of both eyes. Errors of refraction of high degree are common and add to the general impairment of vision. In addition to this, such congenitally defective eyes are especially subject to diseases, particularly choroiditis and cataract.

Membrana Pupillaris Perseverans (persistent pupillary membrane, Fig. 2961). In the fetus the entire lens is surrounded by a vascular membrane, the *tunica vasculosa lentis*, the blood supply of which is derived chiefly from branches of the *arteria centralis* that pass around the edge of the lens and anastomose on its anterior surface. The network of vessels is particularly free at the equator of the lens and least marked at its anterior pole. The portion of the membrane occupying what is to be the pupillary area is known as the pupillary membrane, and as the iris is developed an anastomosis takes place between its vessels and those of the membrane. Usually at birth all of these vessels and the membrane itself have disappeared, but exceptionally portions of them persist throughout life. When this is the case there is rarely found anything that resembles a true membrane, but simply a number of strands of tissue, often highly pigmented, which arise from the anterior surface of the iris and project into the pupil. The strands may hang freely in the pupil, they may be adherent to the capsule of the lens, or they may extend entirely across the pupil forming a network in front of the latter. Not uncommonly there remains only a single fine thread passing across the pupil. In rare instances the strands have been seen united with the cornea. That these strands really represent vessels has been proven by microscopic examination. Blood corpuscles have been seen in them and they have been artificially injected shortly after birth. They usually take origin from the small circle of the iris, but they may be given off farther toward the periphery. Rarely a portion of the pupillary membrane itself remains on the lens capsule and may be mistaken for an anterior polar cataract.

This is one of the commonest anomalies of the eyes. Fuchs says it is frequent in new-born infants, but usually disappears. It is more common in the right eye than in the left, and in one eye than in both. It occurs more frequently in females than in males. As a rule the strands do not interfere with vision, but in a few cases the sight has been so much impaired as to necessitate their removal by operation. They are sometimes mistaken for synechie, although they can readily be distinguished from the latter by their distensibility and by their arising from the anterior surface of the iris.

Corectopia (displacement of the pupil). A slight degree of corectopia must be regarded as normal, since the pupil is usually not exactly central but situated a little to the nasal side. In marked cases of the anomaly the pupillary margin may lie within 1 to 2 mm. of the corneal limbus. The displacement is usually upward and outward and the pupil is apt to be small and to present irregularities in its contour. The iris may be perfectly normal and react normally to light, and in such cases the condition is commonly unilateral and not associated with other ocular defects. Often, however, corectopia occurs in conjunction with other congenital anomalies such as buphthalmos, albinism, coloboma of the lid or iris, and microphthalmos. Not infrequently it is accompanied by ectopia of the lens, both eyes as a rule being affected. In

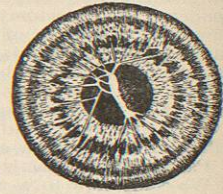


Fig. 2961.—Persistent Pupillary Membrane. (After von Hippel.)

such cases the lens and pupil are most often displaced in opposite directions and there is apt to be iridodonesis. The lens is usually clear but noticeably small and may present a greater or less degree of coloboma. It is noteworthy that in cases of corectopia coloboma of the choroid or retina has never been observed. Remains of the pupillary membrane are sometimes seen. In some cases the iris may be discolored and atrophied, and the radial striae run in such directions as to produce the appearance left by an iridectomy when the root of the iris has been incarcerated in the wound. For this reason it has been suggested that the condition here is due to an adhesion of the growing iris to the periphery of the cornea as the result of an intra-uterine iritis.

The vision may be normal or greatly impaired, the impairment in these cases being dependent upon the optical defects rather than upon changes in the fundus. When the edge of the lens is opposite the pupil, monocular diplopia may occur.

Dyscoria (irregularity in the shape of the pupil). It is very common to find a number of pigmented tags extending from the pupillary margin into the pupil. These are due to a proliferation of the pigmented epithelium lining the posterior surface of the iris. In some cases they are quite large and they have been known to break away and lie free in the anterior chamber. They are to be distinguished from posterior synechie due to iritis by the fact that they are never adherent to the capsule of the lens. Sometimes they are regarded as remains of the pupillary membrane, but differ from the latter in arising from the margin of the pupil. Very similar projections are normally present and highly developed in the eyes of horses. Dyscoria may also be the result of posterior synechie following fetal iritis.

Polycoria.—Strictly, this condition does not exist, since no authenticated case has been described in which an iris contained more than one pupil surrounded by a sphincter muscle. Cases have occurred, however, in which there were a number of openings in the iris in addition to the single normal pupil. They usually appear as radial clefts in the iris tissue surrounding the pupil and may be as high as sixteen in number. Less often the defects occur at the root of the iris and are sometimes regarded as instances of iridodialysis. The appearance of polycoria may also be produced by a bridge coloboma of the iris or by a persistent pupillary membrane.

Irideremia, Aniridia (congenital absence of the iris). From a clinical standpoint this may be either complete or, less often, incomplete. If a microscopical examination could be made in every case, however, it is probable that some remains of the iris would always be found. When the irideremia is complete, both eyes usually show the defect. The incomplete form may closely simulate a coloboma, in fact it is impossible to draw a sharp distinction between the two conditions. The influence of heredity is more apparent in irideremia than in any other congenital anomaly of the eye.

The pupil ordinarily appears a little less dark than normal, and by artificial light under suitable conditions it may appear luminous to the observer. The ciliary processes usually are not visible, probably because they are not well developed. The accommodation, however, is perfectly normal. In most cases a strong light is not borne well by the patient, but this is not always true. The vision is as a rule very defective, due in most instances to other complications rather than to the mere absence of the iris, and there is frequently nystagmus and sometimes strabismus. Other congenital anomalies, such as persistent hyaloid artery, ptosis, and microphthalmos, may be present. Corneal and vitreous opacities, choroidal atrophy, and detachment of the retina occur, but the most frequent complication is cataract, most often of the anterior or posterior polar variety. Luxation of the lens, usually upward, may be present at birth or take place later in life.

A not infrequent and particularly interesting complication is glaucoma. This fact has been brought forward as an objection to the theory that glaucoma is due to a

blocking of the filtration angle by the iris, but is really in favor of such a view because anatomical investigations have shown that in irideremia there is always a small stump of iris either free or firmly adherent to the periphery of the cornea.

A number of theories have been advanced to explain the occurrence of the anomaly, none of them very satisfactory. The best explanation seems to be that of Manz. According to this observer, the proper development of the iris is mechanically prevented by a delayed separation of the lens and cornea. The frequent occurrence of corneal opacities and of anterior polar cataract certainly supports this explanation. A highly theoretical view is that an intra-uterine glaucoma causes the iris to be pressed against the cornea, thus preventing its further development.

Coloboma of the Iris.—In typical cases this consists of a cleft in the iris which extends into the pupil and with the latter forms a pear-shaped opening (Fig. 2962).

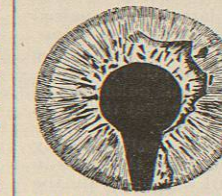


Fig. 2962.—Coloboma of the Iris. (After Seggel.)

Less often the edges of the gap are nearly parallel so that the appearance of a keyhole is produced, and in rare instances the edges of the coloboma may converge toward the pupil. The coloboma may be complete, the opening extending to the ciliary margin, or incomplete, a bridge of iris tissue remaining at the apex of the gap. Usually it involves from one-sixth to one-fourth the circumference of the iris and is placed downward or downward and inward.

In the lowest grade of the anomaly there is simply a slight notching of the pupillary margin. The pigmented posterior layer of the iris is usually visible along the edges of the opening and may send irregular projections into the latter, or, in the form of a black membrane, it may more or less completely close in the gap. Sometimes a band of tissue unites the edges, forming the *bridge coloboma* (Fig. 2963). The bridge usually arises mainly from the anterior surface of the iris and possibly represents the remains of the pupillary membrane, but it may arise directly from the edges of the opening. In some instances a strand of tissue has been found connecting the apex of the coloboma with the optic disc.

The sphincter muscle passes along the edges of the coloboma and in the incomplete type may encircle the apex. The pupil reacts in the usual way both to light and to myotics and mydriatics. A mydriatic may cause a small coloboma to become evident which was previously invisible. The pupil is usually displaced downward, less often upward. The appearance of a coloboma may be simulated by a highly pigmented streak that has the shape and position of a typical coloboma, by a localized thinning of the iris, or by a streak in which the pigment is scantily present—*pseudo-colobomata*.

Coloboma of the iris is among the most common congenital anomalies of the eye. It usually occurs in one eye only, most commonly the left, and in most cases it is associated with a coloboma of the choroid or ciliary body. Two colobomata have been met with in the same iris. While in typical cases the defect is directed downward, cases have been observed in which it was directed inward, outward, or even directly upward. Sometimes the defect is so great that it becomes a question whether it should not be regarded as an example of incomplete irideremia. In more than half the cases of atypically directed coloboma the shape of the coloboma is typical. Bridge coloboma has been observed in these cases. In most of them there is no coloboma of the

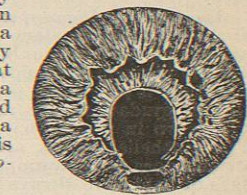


Fig. 2963.—Bridge Coloboma. (After Saemisch.)

deeper structures, and when the latter occurs it usually corresponds in direction to the defect in the iris. Cases have been reported, however, in which an upward coloboma of the iris was associated with a downward coloboma of the choroid.

The explanation of typical coloboma of the iris seems simple enough. Its downward direction and its frequent association with coloboma of the choroid point clearly to some relationship with the fetal cleft. Normally there is at no stage in the development of the eye a cleft in either the choroid or the iris, so that the defect cannot be due, as often supposed, to imperfect closure of clefts in these structures. On the other hand it is perfectly possible that a delayed closure of the cleft in the secondary optic vesicle would lead to an imperfect development of the choroid in this region, and since the iris grows as a prolongation of the choroid, this in turn would lead to a localized defect in the iris also. According to this theory, the coloboma of the iris must always be preceded by a defect in the choroid. In those cases in which no such defect is found, it is assumed that the latter was repaired after the iris had been sufficiently hindered in its development to produce a coloboma, or that the defect in the choroid was small and occurred only in the ciliary region. Cases of coloboma of the choroid without coloboma of the iris are readily explained by assuming that the fetal cleft was delayed in closing only posteriorly.

This theory, however, fails to explain satisfactorily the atypical cases of coloboma, for instance the cases in which the coloboma is directed upward. To explain the latter, Pflüger assumes that a torsional rotation of the eye occurs during fetal life, but if this is the case it is difficult to understand why the macula develops in its normal position. It is still more difficult to explain the cases in which a coloboma of the iris differs greatly in direction from a coloboma of the choroid in the same eye, or the cases in which one iris shows two colobomata. It seems likely that these atypical cases and possibly certain cases of corectopia as well, are all examples of incomplete iridemia and are dependent upon the same factors which give rise to the latter anomaly. For it is readily conceivable that the factors which would lead, if acting strongly, to complete iridemia, if acting less strongly would give rise to incomplete iridemia, coloboma of the iris, or simply corectopia. The cases in which there is an atypically directed coloboma in one eye and complete iridemia in the other support this view. And Theobald's case of a mother with double-sided upward coloboma of the iris, whose child had complete iridemia in each eye, suggests not only this as the explanation, but also that the predisposing factors are hereditary and hence probably not, as sometimes supposed, of an inflammatory nature.

Anomalies of Pigmentation.—The variations in the color of the iris are dependent upon the amount of pigment in its stroma, the posterior layers of epithelium being always densely pigmented except in cases of albinism. In a blue iris there is very little pigment in the stroma, and from this all gradations are met with up to the black eye of the negro in which the stroma is intensely pigmented. The epithelial layers are pigmented at birth, but the stroma does not contain pigment until later so that the eyes of babies are always blue or gray. The irides of the two eyes may differ entirely in color, one being a decided blue and the other a dark brown—*heterochromia*. Or a blue iris may show a brown sector or be studded over with brown patches. In *melanosis oculi* the iris together with other structures of the eye, conjunctiva, sclera, optic nerve, and choroid, may show circumscribed areas of deep pigmentation comparable to the pigmented moles of the skin. Like the latter they may form the starting-points for malignant tumors.

In *albinism* there is a marked absence of pigment in the iris as well as in other parts of the body which normally contain pigment. The color of the iris in this condition depends to some extent upon the illumination and it may appear of a lilac, rose, or yellowish-white hue. In structure the iris is perfectly normal, but the pupil is always

very narrow and dilates but little in a feeble light. Photophobia is a marked symptom and as a rule the eyes are almost amblyopic. Nystagmus is a frequent complication. The fact that in the fetus pigment is so sparingly present suggests that albinism represents a lack of development. Heredity is undoubtedly an important factor in its occurrence. It is interesting that this anomaly is relatively common among negroes.

For the literature on congenital anomalies of the iris, reference should be made to von Hippel, "Die Missbildungen und angeborenen Fehler des Auges," Graefes-Saemisch "Handbuch der gesammten Augenheilkunde," 2. Auf., ii. Bd., ix. Kap. Frederick Herman Verhoeff.

IRITIS.—Iritis, or inflammation of the iris, is one of the common affections of the eye. It arises from a variety of causes, may attack one or both eyes, and, while almost always amenable to treatment if recognized in its inception and judiciously managed, it usually impairs the sight more or less seriously and permanently damages the integrity of the eye if allowed to run its course unchecked, or if improperly or only tardily treated. It is of the first importance, therefore, that its true character should be recognized at the outset, and that the requisite therapeutic measures should be resorted to without delay. The diagnosis of inflammation of the iris is commonly not a difficult matter, and the indications for its treatment are usually plain. It is nevertheless true that it is frequently confounded with other forms of inflammation of the eye, and improperly treated; and in consequence of this, or because of the ignorance or indifference of those whom it attacks, it is by no means an uncommon cause of blindness.

Speaking generally, the presence of iritis is to be suspected whenever, without increase of intra-ocular tension or other evident cause, pain in and around the eye, usually worse at night, is complained of, and is accompanied by pericorneal subconjunctival injection and a contracted pupil. This concurrence of symptoms does not necessarily indicate the presence of iritis, but it is distinctly suggestive, and should lead to a careful search for other evidences of its existence. A dull, lack-lustre appearance of the iris, with appreciable change of color and more or less swelling of its tissue; immobility of the pupil, and perhaps loss of its circular form; loss of transparency of the aqueous humor, and frequently of the cornea as well, with consequent indistinctness of vision; adhesions between the margin of the pupil and the anterior capsule of the lens, which, however, are frequently not evident until a mydriatic has been used; and in severe cases a grayish opacity of the pupil from the deposition of an organized exudate upon the lens capsule, are the other changes which should be sought for, and which, if found, establish the diagnosis beyond question.

Among the causes of iritis, syphilis doubtless deserves the most prominent place. Traumatism is another frequent cause, and not only when the iris itself is involved in the injury, but also when the cornea, lens, or ciliary body is wounded. Rheumatism and gout, diabetes, and the acute infectious diseases, also deserve prominent mention in this connection, and gonorrhœa, though an infrequent cause, occasionally gives rise to it, the ocular inflammation having the same relation to the urethral disease that gonorrhœal arthritis has. Iritis may also be a consequence of inflammation of other structures of the eye, as, for instance, abscess or perforating ulcer of the cornea.

There is also another cause of iritis to which the writer is disposed to attach great importance, and which he believes to be an essential factor in the production of several apparently distinct varieties of the disease. He refers to an influence transmitted through vaso-motor or "trophic" nerves, which is frequently reflex in its character, and is probably always dependent upon structural changes in gray nerve matter, either in the cerebral ganglia themselves, or in the ganglia connected with the fifth nerve, or in both. It is such an influence as this, he believes, that determines the development of sympathetic iritis,

the iritis which is frequently found associated with herpes zoster ophthalmicus, that which occasionally follows malarial attacks, and probably also certain cases of serous iritis. In this category belong also those cases of iritis which he thinks have been rightfully ascribed to reflex dental and uterine irritation, as well as certain intractable forms of irido-keratitis, which are not infrequently accompanied by anæsthesia of the cornea. Obstinate and intractability are the common characteristics of these several varieties of iritis, and in the pathological changes which they exhibit, there are also striking resemblances.*

The consequences of a severe attack of iritis which has not been properly treated are disastrous to the integrity of the eye in several ways. In the first place, especially in syphilitic iritis, the other structures of the eye are liable to become involved in the inflammatory process, the ciliary body, choroid, retina, lens, and cornea not infrequently suffering irreparable damage. Again, the pupil may be closed or obstructed by an organized membrane (occlusion), so that vision is reduced to mere perception of light; or the iris may become adherent to the anterior surface of the lens, at its pupillary margin only (exclusion), or throughout its whole extent (complete posterior synechia). In the two former conditions operative interference may accomplish great good; in the latter, the prognosis is less favorable, as the nutrition of the eye is apt to be seriously impaired, and in time the deeper tunics suffer and the lens loses its transparency. Sympathetic inflammation of the fellow-eye is another result which, though not of frequent occurrence, happens often enough to deserve mention.

Although there are so many causes of iritis, there are not, strictly speaking, so many different kinds of iritis.

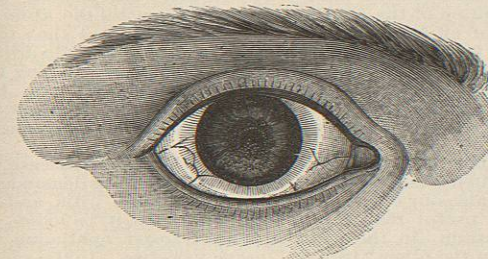


Fig. 2964.—Serous Iritis. (Noyes.)

Indeed, it seems scarcely necessary to describe more than three varieties—plastic iritis (*iritis plastica*), suppurative iritis (*iritis suppurativa*), and serous iritis (*iritis serosa*, Descemetitis) (see Fig. 2964). The first-named variety is by far the most comprehensive. It includes most cases of syphilitic, of rheumatic and gouty, and of sympathetic iritis. Many cases of traumatic iritis are also of this character, and so are most of those which have been spoken of as due to "trophic" nerve influence. Suppurative iritis is less common. It is usually the result of penetrating wounds of the eyeball, or of operations in which the globe is opened, and is almost always due to the presence of pyogenic micro-organisms. It may also follow extensive suppurative inflammation of the cornea. Iritis serosa is a disease of by no means rare occurrence, but it is one about the pathology of which we have yet much to learn. There is no doubt but that the iritic inflammation is often only a part of an inflammatory process which involves the entire uveal coat. In some instances it seems to be dependent upon a rheumatic diathesis, and in others, as has already been intimated, upon a reflex or "trophic" nerve influence. It occasionally exhibits a

*The writer realizes that, from the standpoint of the prevalent school of pathology, it is heterodox to express such an opinion as this regarding the genesis of inflammation. He is not without hope, however, that some day he may see a change of opinion upon this point.

mixed type, the characteristic dots upon the membrane of Descemet and a tendency to glaucomatous tension, which belong to the usual form of the disease, being associated with a disposition to the formation of posterior synechia. When, as is very commonly the case, the deeper portions of the uveal tract are involved in the inflammatory process, cloudiness of the vitreous humor and the development of floating opacities in it are of frequent occurrence. It usually runs a protracted course, and does not always respond satisfactorily to treatment. When the tension is above normal the pupil is apt to be dilated rather than contracted, and under such circumstances the supervention of a distinctly glaucomatous condition is to be feared.

All of the varieties of plastic iritis are characterized by a tendency to the formation of an organized exudate, but this tendency is much more marked in some than in others. It is especially so in sympathetic iritis, in the iritis of herpes zoster ophthalmicus, and, in fact, in all those forms of iritis which appear to be due to "trophic" nerve influence. In syphilitic and in rheumatic iritis this tendency usually manifests itself by the formation of adhesions between the pupillary margin of the iris and the capsule of the lens, but in sympathetic and the other allied forms of iritis a felt-like exudation develops upon the posterior surface of the iris, causing it to adhere throughout its whole extent to the lens, and the pupil is commonly occluded by similar material. Under such circumstances, also, projecting portions of the anterior surface of the iris may become adherent (without ulceration) to the inner surface of the cornea (anterior synechia).

A characteristic, but by no means constant, feature of syphilitic iritis is the development upon the anterior surface of the iris, and occasionally upon its posterior surface in the pupillary zone (Bull), of yellowish or reddish-brown nodules, which project forward into the anterior chamber, and sometimes even press against the cornea. Usually there are not more than one or two present; but they may be so numerous, and of such size, as to fill the anterior chamber. They occur more frequently in the iritis which develops during the secondary stage of the disease, and are then of the nature of condylomata; those met with in the iritis of tertiary syphilis are gummata. Hence the former variety of iritis is sometimes designated as *iritis condylomatosa* and the latter variety as *iritis gummosa*. They may undergo absorption, or may disappear through fatty or purulent degeneration. The inflammation of the iris tissue being more intense over the area which corresponds to their base, we find here a special tendency to the formation of adhesions to the lens capsule. All of the varieties of iritis may be complicated by hypopyon, though it is more common in the purulent and syphilitic types. It is due to the deposition from the aqueous humor of leucocytes and fibrin, and, as a rule, undergoes absorption slowly.

Some authors describe a fourth variety of iritis, which they call "spongy iritis." It is, however, only a type of the plastic variety, in which there occurs a low form of plastic exudation in the anterior chamber, which presents a cyst-like appearance, and might be mistaken for a dislocated lens. Such cases are commonly of rheumatic origin.

A chronic form of plastic iritis is occasionally met with, in which the inflammatory symptoms are but slightly marked. It is often associated with a rheumatic or gouty diathesis, and shows a disposition to recurrence. Points of adhesion between the iris and lens are apt to take place before the true nature of the attack is discovered, as it develops insidiously, and is unattended by pain or other symptoms calculated to alarm the patient and induce him to seek medical advice.

In examining a case of suspected iritis the use of "oblique illumination" is of great assistance, since it enables one to detect slight changes in the cornea and in the tissue of the iris, and in many cases to discover adhesions between the iris and lens, which cannot be seen by simple inspection. If, however, any doubt remains as to the