Original Articles.**EXTENSIVE CALCIFICATION OF PLEURITIC EXUDATION CAUSING CURVATURE OF THE SPINE.**

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ISOLATED calcifications of this kind are often seen, but specimens like the present one are very rare; therefore this observation on the body of a man, aged forty-five, who had died of uremia, seems worth recording. There is no clinical history, but there had been very extensive pleuritic adhesions throughout the back and more or less of the side of the right chest, forming a very thick layer between the walls and the lung. A flattened piece of what seemed to be bone, some

8 or 10 cm. long, probably not over 1 cm. broad, was found free in the back of the right chest, pressing into the lung. It apparently was not far distant from the chief piece to be described presently. Moreover, a thin circular bony disk about 2 cm. in diameter was found far forward in the right side of the parietal pericardium, where it was in contact with the right pleura.

The chief bar, which is shown in the figure, consists of the union of a large number of what would seem to have been originally distinct spicules, which must have appeared in the degenerate fibrous tissue and later have been fused.

The greatest length of practically continuous bone is nearly 11 cm. It is flattened, with the greatest breadth of more than 2 cm. at the upper part. This bony bar does not lie against the wall of the thorax, but projects inward so that where it crosses the eighth rib it is nearly 1 cm. in front of it. The bar is also convex laterally. When the specimen was fresh, fibers could be seen radiating from the bone in many directions, comparatively few of which appear in the photograph, which, however, gives a very fair idea of the nature of the tissue. The particular band of fibrous tissue in which the change has occurred may be seen extending from the first rib to the diaphragm, of which a small piece is preserved, with lateral expansions to several of the ribs.

I am indebted to the kindness of Dr. E. H. Nichols for an analysis of a piece from the upper part of the bar. He finds that calcification has taken place in dense fibrous tissue and that there is no true bone. It would be impossible with the naked eye to determine the point. Unfortunately the two pieces found free were both lost. The long one was of the same general character as the bar shown in the figure. The round thin disk found in the pericardial layer looked quite like true bone.

Perhaps the most practical deduction from this observation is the effect that this bony bar must have had in causing the twisted curvature of the spine, which the photograph shows, but to which it does not do full justice. Looked at from behind, the right ribs from the third to the ninth are brought near together at their angles and project strongly backward, while the left ones from their tubercles to their angles extend nearly straight outward, so that the two sides of the chest are extremely uneven. The bodies of the fourth and fifth thoracic vertebræ are much lower on the right than on the left and are fused together. I shall not presume to discuss the clinical aspects of the case beyond observing that this bar would oppose, after the fashion of a bow-string, any effort to correct the deformity. After the bar had been discovered I had the body x-rayed, but though the structure was shown, there was nothing sufficiently striking to warrant the reproduction of the plate. The bar was much less opaque than the ribs. Presumably its faintness is due to the fact that it is not true bone.

The specimen will be found in the Warren Museum of the Harvard Medical School.

THE ETIOLOGY AND DIAGNOSIS OF IRITIS.*

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THE iris, situated as it is in intimate relation with other parts of the eye which frequently become inflamed; being made up chiefly of blood vessels and a stroma composed of a framework of connective tissue containing bundles of radiating and interlacing fibers with pigment cells more or less numerous, nerves and unstriated muscle tissue; covered anteriorly by a layer of

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endothelium which is continuous with the inner lining of the cornea, and posteriorly by the uveal layer, consisting of two layers of deeply pigmented cells, altogether furnishing a rather complex curtain which is nearly always more or less active in regulating the size of the pupil, is, therefore, quite a common seat of primary or secondary inflammation.

The arterial supply of the iris is derived from the anterior and long ciliary, and from vessels of the ciliary processes. The two long ciliary arteries, just before they arrive at the root of the iris, one on the nasal and the other on the temporal side, both divide into two branches, sending one downward and the other upward. They meet in the vertical plane above and below and anastomose slightly. This forms a large arterial circle around the circumference of the iris, from which numerous branches radiate through the iris tissue toward the pupillary border, where they unite to form a smaller circle.

In the anatomical arrangement and the physiological action of the iris we get all the conditions necessary to favor the development of an inflammation when attacked by injurious agents. These may be mechanical, thermal, electrical or chemical. The latter can be divided into inorganic and organic substances. Of the organic, bacteria and their products are by far the most important.

These are exciting causes, and, though they may be necessary to produce inflammation, anything that lowers the power of resistance — as heredity, age, temperament, mental condition, food, habits, occupation, temperature, climate and previous inflammation — may act as a predisposing cause.

Having the proper soil and the necessary amount of injurious agent present in the iris tissue, certain changes take place, especially in the blood vessels and circulation. The vessels become temporarily constricted, then follows dilatation with more rapid flow of blood. This dilatation of the capillaries and the excessive volume of blood passing through increases the bulk of the iris tissue, which causes it to encroach on the pupil and thus diminish its size and to become sluggish in reaction. Should the injurious agent now cease to act, or be eliminated, this hyperemia of the iris would terminate in resolution; if not, the dilatation of the vessels continues, but the flow of blood becomes much slower and, in some of the capillaries, the flow may cease entirely. The leucocytes accumulate, attach themselves to the vessel walls which have undergone degenerative changes, and, later, migration takes place. Finally there is a diapedesis of the red blood globules escaping passively through breaks between the endothelial cells, resulting in small hemorrhages. In addition to the leucocytes and the red blood globules a certain amount of the plasma of the blood passes through the walls of the capillaries, reaching the tissue spaces in the form of lymph. In this lymph fibrin is formed in varying amount by the action of a

ferment which is produced by disintegration of the escaped leucocytes.

The exudate thus formed varies greatly in character and amount, depending upon the general physical condition of the patient, general condition of the eye, the state of the iris itself, nature, amount and duration of the presence of the injurious agent affecting the iris, and upon the relative proportion of the various elements that go to make up the exudate. When the fluid element is present in large quantities, and the cells and fibrin in small amount, there is less tendency for adhesions to form between the iris and lens, but it may partially fill the anterior chamber and cause a haziness of the aqueous; later, spots, fibrinous in nature, become deposited on the posterior surface of the lower part of the cornea, usually arranged in the form of a pyramid with its base downward. It is this form of exudate and deposits that has given rise to the term Serous Iritis, Descemetitis, etc. When the exudate is rather scant in amount and rich in cells and fibrin, partially occupying the pupil, and covering the anterior and posterior surfaces of the iris, the pupil being small and the iris in close apposition with the anterior capsule of the lens over considerable area at the pupillary border, adhesions always form at this point. Owing to the great tendency for adhesions to form in this type of exudate it is called Plastic Iritis. Occasionally, when there is considerable exudate from the iris, consisting largely of plasma of the blood, into the anterior chamber, on mixing with the aqueous it may coagulate, nearly filling this space with a spongy mass; hence the name Spongy Iritis sometimes given to this condition. Owing to the presence of pus-forming agents which have reached the iris through wounds from accident or operation or by way of the circulation, the leucocytes are called out in large numbers and the exudate may then consist chiefly of pus cells, and in settling in the aqueous makes it cloudy, forming, at the bottom of the anterior chamber, more or less hypopyon. Inflammation with this type of exudate has been described as Suppurative Iritis. When the inflammation of the iris becomes intense, and there is great engorgement of the capillaries with blood, the red blood globules may pass out in large numbers in proportion to the other ingredients, changing the color of the exudate and sometimes causing marked hyphema.

These facts illustrate the great variation, even in the course of the disease, we find in the appearance, character and amount of the exudate, and how much depends upon its presence. It is also responsible, together with the dilatation and engorgement of the capillaries with blood, for the swelling, thickening or puckering, and for the striking changes which take place in the color of the iris when it becomes inflamed.

These changes in color depend, in the first place, on the increased volume of red blood passing through the distended vessels furnishing more red material and, later, on the appearance

of the exudate, furnishing a yellow material. These combine successively with the normal pigment present and may produce an entirely different shade or color from any one of the originals, this being modified by the natural tint of the iris and whether the exudate is located chiefly in the interstices, or on the anterior or posterior surface, and, to some extent, by the particular shade of the exudate and the increased volume of blood. It is very much like mixing two or more colors of paint to get another shade or a different color, as combining red with light blue to get purple, red with black to get brown, yellow with brown to produce chocolate, etc.

As early as 1841, Dr. James Hunter, then surgeon to the Edinburgh Eye Dispensary, called attention, in a paper on "The Changes in the Color of the Iris Produced by Inflammation,"¹ to the importance of these changes as a great aid in the diagnosis of iritis, in determining the particular type under observation, and the stage of the disease, and also in indicating the particular kind of treatment, both local and general, to employ throughout the course of the disease.

In describing the changes in color which take place in the course of iritis in a full blue iris, involving its whole thickness, and allowed to produce permanent organic injury, he says: "At first the iris acquires a more or less deep purple tinge, from the combination of red blood with the natural blue of the part. In the next stage, when yellowish lymph begins to be exuded, and there is still much red blood in the vessels, the iris becomes almost quite black in some cases, but more frequently of a hornblende or basalt black, with a tinge of green. In the third stage, when a much greater quantity of lymph is exuded, the color gradually acquires a greenish cast, very dingy and neutral at first, but brighter afterwards and approaching to grass-green in the sequelæ of the disease when the increased vascularity has quite subsided." "This green color," he continues, "is caused by the combination of yellow lymph with the natural blue of the iris."

He divided these changes into three stages, and the following is a brief outline of the average which he observed in each, occurring in the more common natural colored irides in the course of iritis.

A blue iris first becomes purple or plum shade; second, black or greenish black; third, dingy green, sap green or grass green. Bluish-gray iris with yellow markings: first, grayish-black; second, apple-bark green; third, yellowish green. Grayish-black iris: first, brownish black; second, chestnut; third, hazel, wood-brown, light olive or wax yellow, according to the depth of the original color. Clove-brown iris: first, reddish black; second, light chestnut or hazel; third, hazel, wood-brown, light olive or wax yellow, according to the depth of the original color. Hazel iris: first, brownish-red or tile-red; second, wood-brown or very light hazel; third, tawny

orange or amber yellow. Citron, or more or less yellow-hued iris: first, deep orange; second, lighter orange; third, light yellow.

After all inflammatory symptoms have subsided, and if organization has taken place, the shade of the iris often remains permanently changed. Therefore, the finding of a difference in color of the irides always suggests previous trouble and, if associated with pigment spots on the anterior capsule of the lens, or posterior synechiæ, furnishes conclusive evidence of previous iritis.

All the foregoing pathological processes may terminate in resolution, organization or supuration, or organization after suppuration, depending upon the exciting and predisposing causes, and whether appropriate local and general treatment have been employed.

Syphilis is by far the most frequent cause of iritis. Nearly all authors say it is responsible for 50% of the cases, and one put it up to nearly 75%. This must vary greatly in different parts of the world and in the various clinics. Even here in our own city I should say a larger percentage of the cases attending the eye department of the Boston City Hospital are syphilitic in origin than at the Massachusetts Charitable Eye and Ear Infirmary, because the patients often attend the other departments of a large general hospital like the City Hospital for other manifestations of the disease, and naturally come or are referred to the eye department when the eyes become involved. This disease acts both as an exciting and predisposing cause. By its systemic effect the general resistance of the body is lowered, and by the local action of the specific organisms, the spirochete pallida of Schaudinn or its products, or both, the iris is injured.

Rheumatism is said to be the cause of iritis in 25% of the cases by most writers, while a few hold it accountable for 30%. This will vary somewhat according to just what affections are included under this term. Dr. A. C. Crofton, in his article on "Certain Systemic Diseases that Involve the Ocular Apparatus," in Wood's "Ophthalmic Therapeutics,"² says, "The term 'rheumatism' is a remnant of an ancient nomenclature and is loosely employed to designate a great number of morbid conditions, many of them related in no way to one another. Used originally by the 'humoral' pathologists to indicate the circulation of disordered 'humors,' it was later applied to a variety of fleeting pains in many parts of the body, i. e., to a symptom. As such pains were commonly produced by exposure to cold and dampness, many disorders that followed such exposure were called rheumatic, so that the term was now used in an etiologic sense. As the joints were commonly affected in these disorders, the term 'rheumatism' was then rather loosely employed to designate joint affections in general. Finally a 'rheumatic diathesis' was constructed, in which there was said to be a special predisposition to articular involvement."

¹ Edinburgh Monthly Journal of Medical Science, February, 1841.

² Page 264.

It will be sufficient for this paper simply to state that the injurious agents or their products, or both, that are capable of producing the condition known as rheumatism in other parts of the body, may reach the iris through the circulation, injure its tissues, and there set up an inflammation.

Gout, in like manner, is apparently the cause of some cases of acute and insidious chronic iritis.

Gonococci, from a local infection, may enter the circulation and sometimes they are deposited in the joints, giving rise to the condition known as gonorrheal rheumatism, or, occasionally, they attack the iris and produce gonorrheal iritis. The latter is more apt to occur in conjunction with, or immediately following, involvement of the joints, but either may take place independently.

Traumatism alone may cause iritis, as blows, penetrating wounds, operative procedure, lodgment of foreign bodies, etc. If infection also takes place, the severity of the inflammation will be increased in proportion to the amount and nature of the same.

Auto-intoxication is now thought to be the etiological factor of many of the formerly so-called "idiopathic" cases of iritis. This refers to changes that take place in the blood, brought about by the absorption of poisonous substances which are formed by decomposition taking place in the gastro-intestinal tract, especially in the intestines, indicated clinically by an increased amount of indican in the urine.

Tuberculosis may be a more common cause of iritis than it was thought to be formerly. It is usually secondary to tuberculosis in other parts of the body, and it is said to occur more often in those under the age of twenty years. The tubercle bacilli may reach the iris by means of the circulation or through a wound, but usually the former, and there develop and so injure this structure.

Diabetes occasionally causes iritis. Galewski found it in 7 cases out of 144 diabetics, and Leber observed it in 9 out of 39 diabetic patients having eye diseases.

Malaria was supposed to be the cause of iritis in a few cases reported by Jacobson and Pechni.

Renal disease, the various *anemias* and nearly all of the *infectious diseases* may rarely cause primary iritis.

It may be stated that there seems to be no end of possible causes of this disease. Even nasal and oral affections, administration of certain drugs, etc., have been reported in this connection. No case of iritis should be termed idiopathic until every known means has been exhausted in order to ascertain the real cause, as this is one of the most important legs of the tripod, which goes to form the basis of all rational treatment, viz., remove or treat the cause, dilate the pupil and relieve the pain.

Inflammation frequently extends from adjacent parts involving the iris secondarily; in fact, it is doubtful if any part of the globe can be seriously affected without the iris becoming more or less involved in the process sooner or

later, and it may even travel from the fellow eye, as in sympathetic ophthalmitis. In a similar manner primary iritis may involve other parts in intimate relation, secondarily. Iritis is associated with uveitis, usually with cyclitis, often with the various forms of keratitis and scleritis, occasionally with choroiditis, and even with conjunctivitis, etc.

Classification of iritis is rather difficult to make scientifically. Some authors prefer to name it in accordance with the nature of the exudate and general appearance, as plastic, serous, spongy, suppurative, etc., while others choose to term it according to the constitutional vice or local condition causing the iritis, as syphilitic, rheumatic, autotoxic, diabetic, gonorrheal, traumatic, etc. There are advantages and disadvantages in each scheme. While the former conveys more clearly the true nature of the local condition, it does not indicate the real cause of the affection, whereas with the latter it is the reverse. The classification according to the etiology is most desirable, as it in itself furnishes a valuable clue to treatment. However, the name indicating the cause, and the term representing the local condition or appearance, may be combined, if desirable, to picture more clearly the true state of affairs as, syphilitic-plastic, syphilitic-serous, syphilitic-spongy, traumatic-plastic, traumatic-suppurative, rheumatic-plastic, etc. Iritis may be further classified as acute or chronic, congenital or acquired, primary or secondary.

Symptoms quite common to all varieties of the acute form may be mentioned first and the characteristic features of each type pointed out later. In the very beginning, in the stage of active hyperemia, they are often so mild that, unless we use close, careful inspection, aided by focal and reflected illumination, at the same time directing the patient to look in various directions, the early signs will pass unnoticed and be mistaken for slight conjunctival irritation; but, if observation is carried out in the manner suggested, a slight discoloration of the iris, most noticeable at the pupillary border, gradually shading off into the natural tint as the root of the iris is approached, a pupil smaller and less active than its fellow, and later, when looked at obliquely by means of focal and reflected light in the dark room, one or more small points of exudate just beginning to form, situated on the posterior surface of the iris near or at the pupillary border may be seen, associated with very little redness. Momentary blurring of distant and near vision and discomfort in and about the eye are often the only subjective indications of trouble. These forerunning signs are soon followed by well-marked symptoms.

ACUTE IRITIS is an inflammation of the iris, characterized by circumcorneal injection, variable amount of exudate, discoloration of the iris, small, irregular and sluggishly reacting pupil, associated with impairment of vision in proportion to the turbidity of the media, and more or less pain, photophobia, and lachrymation.

Injection furnishes a good index to the severity of the attack. It is produced by the reaction of nature, sending more blood to the part to destroy and eliminate the injurious agents and to repair the damage done. This engorgement of the vessels supplying the iris limits the redness for the most part to a narrow zone about two or three millimeters wide surrounding the cornea. At first this congested ring assumes a pinkish hue, soon becoming dusky red in color, gradually fading to normal when the battle has been won by the defense.

Exudate is always present. It is responsible for nearly all the symptoms, which vary greatly according to its nature, amount and location. Coming from the interstices of the iris, or the anterior or posterior surface, or all at the same time, it accumulates in the pupil, in the anterior chamber, in the so-called "posterior chamber," and some may even reach the vitreous when the inflammation extends to the ciliary body. The causes of the exudate, the way in which it is formed, the marked variation in its character and amount, have been referred to already. When the cause of the exudate ceases to act there is no further formation, and that already present is carried off by the circulation as fast as it is liquefied. If any remains it may become organized and the results remain permanently.

Discoloration of the iris. This is an important sign from start to finish. If only one eye is involved at a time the diseased iris should be carefully compared with the normal. The various changes in color, the ultimate results, and the cause of same have been given. The condition of the cornea and aqueous may still further modify the color, as it must be viewed through them. The iris also appears swollen or thickened, puckered and muddy, and its normal luster and striations are blurred.

Pupil contracts and becomes sluggish in reaction early in the disease. As it gets smaller, the iris tissue which forms its border hugs the anterior capsule of the lens all the more, owing to the greater prominence of the lens at the center. From the sticky exudate adhesions begin to form, one after the other, at various points around the pupillary margin, to this capsule. Owing to variation in size of the pupil, when the different points stick, it assumes an irregular shape. The synechiæ thus formed interfere still further with the pupillary reaction. If the eyes are alternately exposed to the dark and the light, or if a mydriatic is instilled in the affected eye, the irregularity and posterior synechiæ show more plainly; and, if the latter is powerful enough, the iris may break away from some or even all of the points of adhesion; but in doing so it often loses pigment from the uveal layer at these points, which stays on the anterior lens capsule and may forever afterward partially remain, to tell the tale of previous iritis. This is also true of the adhesions that do not break away, but later become organized and remain permanently. We may get in this way complete annular adhesions by a ring of iris tissue sur-

rounding the pupil, sticking to the lens capsule; and, rarely, all the posterior surface is covered with an exudate of about the consistency of glue, forming a complete posterior synechia. Unless the pupil is speedily dilated in these cases, passage of aqueous into the anterior chamber will be prevented; and if organization takes place in this situation, exclusion of the pupil will then become permanent. The pupil in some cases contains more or less exudate from the time the inflammation becomes well established until it subsides, which often partially or entirely disappears and reappears during the course of the disease. Occasionally, when the pupil has remained well filled with a sticky exudate, especially if no treatment, or improper treatment, has been employed, this sometimes undergoes organization, resulting in the formation of a more or less dense whitish membrane or delicate film which may remain, producing occlusion of the pupil.

Vision is always more or less impaired, depending chiefly upon the location, nature and amount of the exudate. The greatest disturbance is experienced when the pupillary space is occupied with opaque material, when a sufficient quantity of exudate mixes with the aqueous to make it lose its transparency or extends high enough in the anterior chamber to cover the pupil, and when opaque deposits form on Descemet's membrane in the line of vision. The various changes which take place in iritis may alter the refraction of the eye somewhat, usually only temporarily, and further interfere with the vision. Much will depend also upon whether appropriate general and local treatment are employed or omitted, as to the amount of impairment of vision during and after the attack. Under favorable conditions and suitable treatment, however, the exudate and the changes produced by its presence interfering with vision become absorbed or disappear from the line of vision and the visual acuity returns to its former standard. Where occlusion of the pupil has taken place, the impairment will be in proportion to the density of the membrane or film covering it, but occasionally breaks form in this covering and the vision may become quite good again. In exclusion of the pupil, unless relieved by operation, blindness in the affected eye is usually the final outcome, resulting from secondary glaucoma.

Pain is usually a very troublesome symptom, as the iris is richly supplied with sensory nerves derived from the ciliary branches of the lenticular ganglion and the long ciliary from the nasal branch of the ophthalmic division of the trigeminal. This accounts for the pain being frequently referred to parts supplied by one or more branches of the fifth nerve, especially the ophthalmic division. The pain is caused primarily by irritation of the sensory nerve endings in the iris tissue. This is produced by the injurious agents, engorgement of the capillaries and the presence of the exudate, resulting in swelling and pressure, and by the pull made on the adhesions when

the iris attempts to regulate the size of the pupil. The pain, which is often mild at first, may become severe, shooting, throbbing, boring or aching in character, but varies much according to the type of iritis and in the different stages of the disease. It is frequently worse at night, preventing sleep, and is greatly aggravated, and may even be readily produced, when not present, by sudden exposure to light and by using one or both eyes for near vision. It extends from the eye to the brow, temple or forehead, or to all at the same time, and may even be felt along the side of the nose, in the cheek, or in the upper jaw. Occasionally there is hemicrania. Later, if there is pronounced ciliary tenderness, the inflammation has very likely extended to the ciliary body.

Photophobia is often an annoying symptom. The degree depends much on the intensity of the inflammation and the amount of pain, especially the latter. Bright light increases the pain, and when the eyes are in darkness and then suddenly exposed to much light the pain is intense and often causes blepharospasm. This is why some of these patients have such great fear or dread of light.

Lachrymation is also caused chiefly by the pain, and is, therefore, in proportion to the severity of this symptom. When the pain is great, the tears well up and overflow the lids every few moments.

Acute Iritis usually runs its course in from two to six weeks, but it often lasts much longer, especially when not treated, or incorrectly treated, and when bad complications arise.

PLASTIC IRITIS is much more commonly seen than any of the other varieties. This name was given to this type of inflammation because of the great tendency it always possesses to form adhesions, particularly between the iris and the anterior capsule of the lens. This is made possible by the nature of the exudate, which is usually of about the consistency of thick glue. It sticks firmly to all parts with which it comes in contact and is very pliable. This form of iritis is the most frequent cause of exclusion and occlusion of the pupil. The plastic variety may be the result of any one of the various causes of iritis already mentioned, but it is naturally more often seen in connection with syphilis and rheumatism. It is frequently caused by traumatism and it is this form that usually follows cataract extraction. Plastic iritis may be acute, subacute or chronic. The acute is very much more common than the others. It presents all the classic symptoms given above.

SEROUS IRITIS, so called by many writers, is rarely, if ever, confined to the iris alone. The ciliary body is involved sooner or later, if not primarily. The choroid may share in the process. One writer³ said he had never seen a case in which the ciliary body and choroid were not affected. Opacities in the vitreous are frequently seen, especially in the anterior portion. It is said that the entire uveal tract may become involved, and the sheath of the optic nerve, etc., as well. This type of inflammation of the iris received the

name on account of the serous nature of the exudate which is always present in considerable quantity. It has very little tendency to form adhesions in the early stage, but they usually occur later. It contains solid elements in suspension which makes the aqueous foggy or cloudy and gradually forms deposits on the posterior surface of the cornea in the manner described under exudates. These deposits are best seen by focal illumination and may be viewed to advantage, especially when they are very fine, through a strong convex lens, but they may be seen by ordinary inspection or by reflected light. They are whitish or yellowish-white in color. In some instances the tension becomes increased at first, in which case the ciliary body is probably involved as well; but it is often diminished later. The pupil may be normal in size or slightly dilated. The anterior chamber is usually normal, or slightly increased in depth. This condition is said to be due to pathological changes in the glands of the ciliary body. The increase in tension is thought to result from hypersecretion of aqueous by these glands and, possibly, partially to some obstruction in the exit for the aqueous by the solid elements of the exudate. The symptoms are usually subacute, but may be either acute or chronic.

PARENCHYMATOUS IRITIS, as the name implies, is that variety in which the essential structure of the iris is involved. The exudate is chiefly in the substance of the iris. This, together with the proliferation of cells and dilatation of the capillaries, causes marked thickening or swelling and considerable wrinkling of its surface.

SUPPURATIVE IRITIS occurs more often following penetrating wounds of the eye associated with, or followed by, infection with pus-forming organisms. There is always a possibility of the iris becoming so infected during or after an operation when the globe is entered, but in these days of aseptic and antiseptic surgery it is rarely seen. The iris is swollen and there are pus cells in its substance and upon its surface. The pus accumulates at the bottom of the anterior chamber and hypopyon is formed.

SPONGY IRITIS is the name which has been applied to that variety of inflammation characterized by the formation of a spongy mass partially filling the anterior chamber. This results, as stated before, when the exudate contains considerable plasma of the blood, which, on mixing with aqueous, causes coagulation. Deposits on the posterior surface of the cornea occasionally occur. The mass in the anterior chamber remains apparently unchanged for a few days, when it gradually begins to shrink and continues till it disappears.

SYPHILITIC IRITIS is a common manifestation of the general disease. It may appear any time after the beginning of the second stage. Some writers state that it usually occurs early in this stage, while the majority say it more often comes in the latter part. The nature and amount of the original infection, the general resistance of the individual, the local condition of the eyes, the time after the primary lesion at which general

specific treatment is started, and the thoroughness with which it is followed, etc., all make some difference as to whether it will be an early or a late manifestation of the second stage. The iris may be involved any time during the tertiary stage also, and what has just been said relative to treatment, etc., applies here as well. This tendency to develop iritis may even be passed on to children born of syphilitic parents. Iritis occurring in infants and children is practically always due to inherited syphilis when not caused by traumatism. Cases of congenital iritis due to syphilis have been reported. Bull has found posterior synechiae in infants within two hours after birth. These cases, and those coming on in infancy and early childhood, are rare. Iritis is frequently seen occurring secondarily to interstitial keratitis. Acquired syphilitic iritis usually manifests itself as a plastic inflammation or one associated with the formation of nodules, or gummata, but it is more often seen without the latter, macroscopically, at least. The so-called serous and the spongy variety are much more rarely seen. Both eyes are usually affected in syphilitic iritis. The so-called gummatus form occurs more frequently in the latter part of the second stage of the general disease, and occasionally in the tertiary stage. When nodules appear on the iris while secondaries are still present, strictly speaking, as a few writers have suggested, it should not be called gummatus but iritis papulosa, reserving the former name for late manifestations only. They grow quite rapidly and are more apt to form over one of the arterial circles of the iris, usually over the small one at the pupillary border, and, for this reason, the blood vessels are thought to play an important part in their development. They vary in size from the head of a pin to quite a large pea, or the iris may only appear slightly thickened at one point. They may be multiple or single, and when the former condition is present they may rarely almost fill the anterior chamber. Sometimes several small nodules coalesce, producing a large one. When large, extensive adhesions form in their vicinity between the iris and the anterior capsule of the lens. They vary in color, may be yellowish-gray, yellowish-brown, reddish-brown, or, if large, may appear as a yellowish mass surrounded by a brownish-red or red border, the latter color especially being due to the development of numerous new blood vessels. When an inflammation of the iris is associated with one or more of these gummata, it is in itself sufficient evidence to consider it due to specific disease. There is another condition, however, that might be mistaken for it and that is when nodules form in the iris, due to the presence of tubercle bacilli. In any case the history, the presence of other signs of the general disease, the Wasserman serum test, the results of specific treatment, etc., will give further proof of its syphilitic origin.

TUBERCULOUS IRITIS associated with the development of nodules, on the other hand, is rare. They nearly always form at or near the ciliary margin of the iris instead of the pupillary border; they grow more slowly; and they are inclined to

be more on the gray and less on the red color. Large deposits may form on the posterior surface of the cornea. The symptoms are usually subacute and are likely to continue till the eye is finally entirely destroyed, when not enucleated before. After enucleation, if these nodules are examined microscopically the tubercle bacilli may be seen when suitably stained, etc. They were found in the case reported by Dr. Myles Standish⁴ as far back as 1885. The age of the patient, the history, the evidence of tuberculosis in other parts of the body, the tuberculin tests and the fact that specific treatment has no effect on the growth, will further assist in determining the cause of the local condition clinically.

RHEUMATIC IRITIS usually only affects one eye at a time. Recurring attacks in either eye are common and they are often involved in turn. The disease is naturally rare in infancy and childhood. This variety frequently manifests itself during or following an attack of acute, subacute or chronic rheumatism, or the iritis may be the only indication of the rheumatic diathesis. The pain is usually severe but, occasionally, insidious cases are seen in this form. This type of inflammation presents no characteristic symptoms, so the diagnosis must be made upon evidences of the general disease in other parts of the body, by the previous history, and, possibly, by the effect of treatment.

GNORRHEAL IRITIS is not commonly seen when compared with the total number having gonorrhea, but, when compared with all who present themselves for treatment on account of iritis, it is not so rare. It often has the so-called punctate keratitis associated with it and in most of the cases which I have seen the spots were not numerous and appeared to vary in size from about 0.2 to 1.5 mm. It is often associated with involvement of the joints, or develops afterward, but an iritis may occur without other signs except the original local disease. This variety may come on in the late stages of gonorrhea, especially, whenever there is an exacerbation of a thin gleet discharge from the urethra. There is nothing particularly characteristic about this variety of inflammation of the iris, so the diagnosis must be made by the presence of the local disease, the history and the absence of other causes.

TRAUMATIC IRITIS is usually plastic or suppurative in variety. The diagnosis is made on the evidence of injury to the eye found on examination and the history of the case.

AUTOTOXIC IRITIS is now demanding a more prominent place. It is usually insidious in its onset and is apt to affect both eyes sooner or later. In every suspected case the condition of the gastro-intestinal tract should be ascertained and, if abnormal, corrected. Examination of the urine for an excess of indican will assist in the diagnosis, in addition to the absence of all other causes.

DIABETIC IRITIS is rarely seen. It is usually plastic, but may be purulent or, rarely, serous in

⁴A Case of Tuberculosis of the Iris. Transactions of the American Ophthalmological Society, 1885.

variety. It often runs a persistent course. The cause of the iritis in these cases is easily revealed by an examination of the urine and by the presence of other manifestations of the general disease.

MALARIAL and SCROFULOUS IRITIS, as well as iritis caused by RENAL DISEASE, INFECTIOUS DISEASES, etc., are sufficiently explained by their name. In each of the above forms the diagnosis is made upon the presence of characteristic signs common to the systemic affection producing the iritis, and the absence of all other reasonable causes.

QUIET IRITIS, so-called on account of its insidious onset, coming, as it does, without appreciable pain, redness or discoloration of the iris, is often well advanced before noticed by the patient so afflicted, who seeks treatment finally only on account of blurring of the vision, often thinking they simply require glasses or a change made in same if already wearing them. It might be further stated that the objective signs of this type of inflammation of the iris are so slight at times that they may not be noticed even by an experienced observer on ordinary inspection, but on close observation, aided by artificial means, together with instilling a mydriatic in the suspected eye and waiting till it has time to take effect, the true condition will then be readily revealed by finding that the pupil does not dilate as it should and, if it does, it will very likely be irregular owing to posterior synechiæ which have formed, or if, as rarely happens, the pupil should dilate well and regularly there may be spots left on the anterior capsule of the lens. The fact that the exudate forms slowly and is only present in small amount and is almost entirely confined to the posterior surface of the iris accounts for the latter not being noticeably discolored and the absence of some of the other symptoms common in iritis.

The iris always sooner or later shares in the inflammation of sympathetic disease of the eye and, for this reason, the latter may be simply mentioned in connection with iritis. This affection is entirely due to primary inflammation of the fellow eye. The diagnosis can be made on the history, on the location, nature and extent of the injury to the exciting eye, etc., and on the conditions found on examination of the sympathizing eye.

The iris, as suggested before, also shares in the inflammation with uveitis, usually with cyclitis, often with the various forms of keratitis and scleritis, occasionally with choroiditis and conjunctivitis. In each of these combinations the diagnosis is made on the presence of all or some of the symptoms of iritis plus the characteristic signs common to the affections with which it is associated.

DIFFERENTIAL DIAGNOSIS between iritis and other affections of the eye that in any way resemble or might be mistaken for it is very important, since the treatment appropriate to one may be of no avail in the other, and, in some cases, glaucoma in particular, great damage to the eye and its usefulness for vision will result from using the wrong treatment by reason of a mistaken diagnosis.

Acute glaucoma, acute conjunctivitis and keratitis

are the diseases most commonly mistaken for acute iritis, and vice versa.

Injection is red in color in all four diseases, but in conjunctivitis it is less marked near the cornea, while in iritis it is more noticeable surrounding the cornea, forming a bright zone of ciliary redness; in keratitis it is also most conspicuous near the cornea, but is more on the rose-pink shade, and in glaucoma the injection is apt to be a dark shade of red.

Conjunctiva is more or less thickened in conjunctivitis, it can be readily thrown into folds, and on everting the lid the vessels are seen to be partially or entirely obscured by the general redness; whereas in the other affections, as a rule, these conditions are not particularly noticeable.

Vessels run straight toward the ciliary region in iritis and are deeply situated, therefore they are not movable with the conjunctiva; while in conjunctivitis they are irregularly distributed and run superficially and are tortuous in their course and are freely movable; in keratitis, however, the vessels run straight, but as they approach the cornea they divide and form a fine network at its periphery; in glaucoma they are much dilated and widely distributed.

Secretion of mucus is marked in conjunctivitis, appearing as flakes which mix with the tears and accumulates on the cilia and margin of the lids, often causing the latter to stick together after closure during sleep; in iritis the secretions consist chiefly of tears; in keratitis and glaucoma there is no hypersecretion of mucus, but there is often profuse lachrymation, especially in the former.

Cornea is clear in uncomplicated conjunctivitis; in iritis it is usually clear, except in a few varieties, in which cases the opaque spots are nearly always on the posterior surface of the cornea; in keratitis there is more or less cloudiness or opacity which may involve its superficial layers or nearly all of its substance, obscuring the view of the iris and pupil; in glaucoma the cornea becomes slightly hazy generally and as the disease grows more severe it acquires a steamy look and it may even approach the appearance of ground glass.

Anesthesia of the cornea is more or less pronounced in glaucoma, while in keratitis it may be hypersensitive, except the neuropathic type, in which anesthesia is a characteristic feature, but in iritis and conjunctivitis sensation is normal.

Tension is increased in glaucoma, which is an important indication of this disease; in iritis it is normal except when the ciliary body becomes involved and then it may be slightly increased, or when the passage of aqueous through the pupil is prevented by adhesions between the iris and lens capsule producing exclusion; in conjunctivitis and keratitis it is normal.

Anterior chamber is shallow in glaucoma but it is normal in all the other diseases except that rarely in iritis it may become shallow or deep.

Iris is discolored, thickened, puckered and dull looking in iritis, but in the other affections it is normal except in glaucoma, when it may be slightly discolored.

Pupil is small, sluggish in reaction or fixed, and

irregular in shape in iritis; in glaucoma it is dilated, sluggish and may be greenish in color; whereas in the other two diseases it is not affected.

Vision is slowly impaired in iritis; but in glaucoma there is rapid and marked loss early in the attack; in keratitis it is more or less blurred, depending on the amount of haziness or opacity of the cornea; in conjunctivitis it is very slightly interfered with on account of mucus and tears flowing over the cornea.

Field of vision is contracted in glaucoma, but in the other affections it is not.

Cupping of disk is present in glaucoma, and it may be seen by the aid of the ophthalmoscope provided the media are not too turbid; it is absent in the other three affections.

Pain is severe and similar in character in both glaucoma and iritis, but in the former it is not apt to be worse at night; in keratitis it is not so marked, but is more constant; in conjunctivitis it is more of a smarting or burning sensation, as if there were sand in the eye, than actual pain.

Photophobia is intense and very conspicuous in keratitis; it is less troublesome in iritis and glaucoma, and in conjunctivitis it is hardly noticeable.

A CASE OF CHRONIC GLOMERULO-NEPHRITIS IN WHICH DOUBLE DECAPSULATION WAS PERFORMED.

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A. B., a girl aged fifteen years, was first seen in July, 1905. The patient had had an attack of scarlet fever at one year of age. No details could be gotten in regard to the severity of the attack, and it was probably an ordinary case of the disease. She had whooping cough at four years of age, but beyond this there was nothing of note.

She had exhibited marked symptoms of nephritis for a year, the disease having been ushered in by swelling of the eyelids. This led to an examination of the urine and a diagnosis of chronic nephritis was easily made.

When first seen the patient had edema of the eyelids, feet and legs. Pitting of the skin was deep and the face was puffy and swollen. She suffered somewhat from headaches, but there was no other pain. She slept well, the appetite was good and there was no vertigo. Beyond a general feeling of lassitude and disinclination to exert herself she did not suffer very much.

Her catamenial periods came on at the usual time, at about the age of ten years, and they were regular in time until about a year ago when they ceased entirely.

On examination she presents the appearance of an undersized girl, rather poorly developed mentally, but there is no serious defect. She has a pasty look and appears sick. Lungs are negative, but the heart is enlarged and the apex beat is nearly in the nipple line. There are no murmurs.

The operation was performed at St. Elizabeth's Hospital on July 18, 1905, with the assistance of Dr. C. H. Hare. The patient was placed on an Edebohl's roll pad, lying flat on her face, and the two kidneys were readily exposed. Dr. Hare did one side, and the writer the other. The kidneys were enlarged to about twice the normal size. They were perfectly regular in outline and they were yellow and mottled on the surface. They were soft and the capsule over them was very

thin and was easily stripped off and cut away near the hilus. There was no compression of the kidney substance by the capsule, for the latter was spread over the surface of the organ very loosely. A small piece of kidney tissue was excised for examination.

The greatly enlarged kidneys were in marked contrast to the very small atrophied cirrhotic kidneys which were removed at the autopsy nearly three years later.

Immediately after the operation, there was a good deal of vomiting and general prostration and it was thought that she must succumb. At the end of a few days, however, she rallied, and from that time until her discharge from the hospital the convalescence was uneventful. During the first twenty-four hours she passed only 180 ccm. of urine, which contained only a trace of albumen. This was in marked contrast with the amount of albumen just preceding the operation. Two days before it was performed there was $\frac{1}{2}\%$ and three days before there was $\frac{1}{4}\%$. Two days after the operation she passed 555 ccm. of urine with a large trace of albumen. Four days after the operation the amount of urine was 720 ccm. with $\frac{1}{2}\%$ of albumen. The amount of albumen stayed fairly high, as will be seen by referring to the chart, until July 31, 1905, when it dropped to $\frac{1}{8}\%$ again. In November she was passing 2,000 ccm. of urine with $\frac{1}{4}\%$ of albumen and the amount remained large until a short time before her death, when it rapidly decreased.

The following notes are taken from my note-book:

Aug. 28, 1905. For seven days has had severe headache over the eyes. Last week vomited twice. Much less edema of the feet and legs and she has had edema under the eyes only once since the operation. She feels very much better in every way. Pathological report, Dr. W. H. Prescott and Dr. F. B. Mallory: Subacute glomerulo-nephritis.

Nov. 18, 1905. Is feeling very well. No edema, no nausea, no headache, no subjective symptoms of any kind. Sleeps well and looks better than she has for a long while. Runs around and plays with other children and there is nothing to suggest any serious disease. Is taking Blaud's pills. Patient has been very much improved by the operation and she says herself that she is much better.

Jan. 15, 1906. No headaches, no dizziness, good appetite, regular bowels, some edema of the feet and hands. Urination three or four times a day and once at night.

May 6, 1906. Good appetite, some edema of the feet and face, some dyspnea, otherwise comfortable.

Oct. 18, 1906. The patient has until now been very comfortable indeed. She has done nearly as much as girls of her age usually do and she has not been distressed in any way by her affection, but lately she has begun to fail. There is a yellow, pasty color, a considerable degree of emaciation and some edema of the face and legs. Her appetite continues good, her bowels are regular, she sleeps well and she is able to be about.

Feb. 27, 1907. About the same as she was when last seen. Dr. F. I. Proctor examined both eyes and reported the fundi to be normal.

March 13, 1907. Has improved a little. Looks better, has less edema.

April 2, 1907. Has been vomiting a good deal lately.

July 15, 1907. There is more edema and some nausea. She is failing. She is pale, anemic, has lost more flesh and her appetite is not very good.

March 11, 1908. Died to-day. For the past few months has failed rapidly, emaciation increased, nausea and vomiting came on, the urine began to diminish in amount and towards the end there were numerous convulsions, in one of which she died.