

**Observations on the analogy between ophthalmic and other diseases :
being the substance of a paper read at King's College, London / by Charles
Vines.**

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OBSERVATIONS

ON

The Analogy

BETWEEN

OPHTHALMIC AND OTHER DISEASES:

BEING

THE SUBSTANCE OF A PAPER

READ AT KING'S COLLEGE, LONDON.

BY

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TO

G. J. GUTHRIE, ESQ., F.R.S.

PRESIDENT OF THE ROYAL COLLEGE OF SURGEONS,
SURGEON TO THE WESTMINSTER HOSPITAL, AND TO THE ROYAL WESTMINSTER
OPHTHALMIC HOSPITAL, ETC. ETC.

THESE OBSERVATIONS,

IN A BRANCH OF SCIENCE SO GREATLY ENRICHED BY HIS
TALENT AND RESEARCH,

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RESPECTFULLY INSCRIBED

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CHARLES VINES.



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P R E F A C E.

THE following observations were originally read before the Medical Society of King's College, in January, 1836, at which period their publication was suggested to me. Having since, however, in the course of my profession, frequently found their application of great service, I have been induced to arrange them in a more systematic and practical form.

The analogies mentioned may perhaps be deemed, in some instances, theoretical; but I think that anything tending to remind us of the link subsisting between the anatomy and physiology of different parts, to point out the similarity of the diseases of corresponding structures, and

thus guide the practitioner in the diagnosis and treatment of disease generally, should not be neglected.

Trusting that this object may in some measure be attained through the following pages, the Author ventures on their publication.

5, *Castle Street, Reading,*
October, 1841.

ON THE ANALOGY
BETWEEN
OPHTHALMIC AND OTHER DISEASES.

PERHAPS no organ of the body possesses a higher share of interest, both in a moral and physical point of view, than the eye. We find it actuated by, and participating in, all the various mental emotions, and under disease it is observed to sympathize with organs the most remote and opposite in function, thus not unfrequently aiding the practitioner in arriving at a safe and accurate diagnosis.

The important offices for which the eye is designed have rendered it necessary that numerous and various textures should enter into its construction, and consequently we find it liable to a multiplicity of diseases,—some authors have described no less than one hundred and twenty-six. In comparing ophthalmic with other diseases, it

is clear, however, that only the more obvious can be selected, many of the affections described being but the results or modifications of some primary one ; the same is true of diseases of other parts.

A circumstance which adds materially to the interest of eye diseases is, that we have an opportunity of examining the conditions of each texture under treatment, and ascertaining, without any fallacy, the influence of the remedies employed. Taking the eye *generally* under inflammation, we find all those signs manifested common to other inflamed parts—viz , redness, heat, pain, and swelling. Similar terminations likewise result,—as, effusion, adhesion, suppuration, ulceration, and mortification. But since, as before mentioned, the textures are diversified, so have the diseases of each texture very marked and distinct characters. For instance, the *mucous* conjunctiva throws out its peculiar secretion ; the *fibrous* sclerotic, in the obstinacy with which it is attached, and the peculiar pain manifested, exhibits signs of *rheumatic* inflammation ; the *fibro-cartilaginous* cornea suffers from *ulceration* ; the erectile *iris* loses its capability of acting ; the aqueous membrane sometimes secretes its fluid in morbid

excess ; the *vascular choroid* becomes disordered in its function ; the crystalline capsule exudes lymph upon its serous surface ; and the *delicate nervous retina* loses its exquisite sensibility. Taking the membranes in the above order, I propose first to consider the affections of the *conjunctiva*, and those parts more immediately connected with it.

The *conjunctiva* may be attacked by the inflammation common to all mucous membranes—viz., the catarrhal or puro-mucous, or by diseases evidently, as regards their pathology, of a cutaneous nature. A similar course is observed in disease of the lining membrane of the fauces, the inflammation at one time being marked by excess of the normal secretion, at another by *aphthæ*. The same applies to the prolongation of the genito-urinary lining membrane over the glans penis, which we see in some instances affected with blennorrhœa, in others with a pustular eruption.

The general symptoms of *conjunctivitis*, from whatever cause arising—whether from the irritation of a foreign body, exposure to cold, contagion, or the application of gonorrhœal or leucorrhœal matter—observe something like the follow-

ing order :—There is, *first*, a feeling of dryness and itching in the eye, owing to a suppression of its natural secretion ; *then* a thin, irritating discharge ; *next*, a copious puriform discharge, which, after a longer or shorter continuance, becomes thin, and at last entirely ceases.

Similar symptoms accompany inflammation of the Schneiderian membrane. Every one is familiar with the disagreeable tingling and sensation of dryness arising from a common catarrh ; also with the copious secretion which is produced by an inflammatory condition of this membrane. So the mucous membrane of the throat also manifests, under inflammation, an unpleasant sense of dryness. The tonsils afterwards pour out a secretion, observing the several stages already described. And—to continue the analogy to the lining membrane of the *urethra*—the peculiar irritation and itching about the orifice of this canal at the commencement of a gonorrhœa is certainly referrible to a suppressed natural secretion, the complaint afterwards proceeding through its peculiar stages.

The *marked symptoms* of catarrhal conjunctivitis are easily determined. The patient first com-

plaints of a feeling of sand in the eye; on the white of the eye, the vessels are arranged in a network of a scarlet colour; by pressing the eyelid against the eye-ball with the finger, they can be moved in every direction, and the headache is but very slight, or altogether absent.

By adopting the antiphlogistic plan, this disease generally terminates in the course of two or three weeks. The application of leeches, or the scarification of the lids in the first instance, and in some rare cases general blood-letting, may be necessary. Acting on the bowels, as in inflammation of mucous membranes generally, is very important, as may readily be conceived from the continuity of the conjunctiva with the mucous membrane of the alimentary canal, by means of the nasal duct, Schneiderian membrane of the nose, and the lining membrane of the œsophagus.

The conjunctiva occasionally becomes the subject of gonorrhœal inflammation, owing to a direct application of the gonorrhœal matter, or arising, it has been said in some cases, from metastasis. Unless very prompt and effectual measures be taken in this disease, the most fatal effects will soon be evidenced. There may be sloughing of

the cornea, escape of the humours, and, in fact, total loss of the eye. These violent effects on the eye would seem to shew the peculiar virulence of gonorrhœal matter.

In the *urethra* we have a lax membrane, thrown into folds by numerous lacunæ, and the contiguous parts endowed with far less delicacy of organization than in the eye. But in the conjunctiva we have a thin, delicate membrane spread over the globe of the eye in a plane continuous surface. The action excited in it by the gonorrhœal matter is too powerful for it to withstand; thus the inflammation quickly extends to the adjacent delicate tissues, until the entire organ perhaps is destroyed.

Very similar in its nature and effects to the last described is the purulent ophthalmia of newborn infants; and very prompt measures must likewise be used in its treatment. It is said to arise from the contact of leucorrhœal matter from the mother with the child during parturition. It makes its appearance a few days after birth, and similar remedies are available for its cure as for the leucorrhœal discharge of females—viz., the zinc and alum wash, injecting the part with warm

water, and, most useful of all perhaps, the nitrate of silver, either in solution, from 5 grs. to 10 grs. to the oz., or, as recommended by Mr. Guthrie, in the form of ointment, 10 grs. to the drachm. The nitrate of silver injection is useful also in some chronic cases of leucorrhœa, and occasionally in gonorrhœa, varying the strength of the solution. Since leucorrhœal matter produces inflammation in the conjunctiva of infants, it is certainly probable that it might produce the same effects in the adult.

It would be well to intimate this to females labouring under leucorrhœa, at any rate those of the lower classes, who may not be aware of this dangerous peculiarity of their complaint.

From the conjunctiva we next trace a continuation of the mucous membrane through the lachrymal canals, lachrymal sac, and ducts; and hence we have a mucous canal analogous in some respects to the other mucous canals of the body. When inflammation occurs in these lachrymal passages, a thickening of the mucous membrane is the consequence; hence is produced stricture. Stricture may *thus* occur in the Eustachian tube,

in the mucous canals of the salivary ducts, the œsophagus, the biliary duct, the intestines, or the urethra.

The exciting causes of stricture in each of these parts must certainly vary; the effect, however, is the same—viz., an obstruction to the passage of those matters they are intended to convey. Since the urethra, like the lachrymal passage, is destined to transmit a saline fluid, perhaps they may be said to bear certain analogies.

In stricture of the lachrymal passages, which may happen either from inflammation of the canals, sac, or duct, the patient experiences considerable inconvenience; for the tears being no longer carried away, flow over the cheek, which they greatly irritate, and sometimes inflame. The eye also becomes considerably irritated, owing to the constant suffusion of the conjunctiva. After this state has continued some time, effusion of lymph into the cellular tissue takes place; suppuration of the sac is very likely to ensue, and, if proper measures be not adopted, a fistulous opening may result. But at the very commencement of these symptoms, leeches

should be applied in the neighbourhood of the part, cold lotions used, and the bowels freely acted on.

The introduction of a small silver probe is often highly useful in removing any obstruction, or in the dilatation of a stricture; and, in some instances, by leaving a fine style in the canal, afterwards increasing its size, the stricture will be effectually removed. Similar to these, we know, are the means adopted in cases of stricture of the urethra, by the introduction of different sized bougies. Stricture of the rectum also, is treated on the same principle.

The *lachrymal glands*, like other secreting organs, as the breast or testicle, may become the subject of malignant disease.

The *Meibomian glands*, like the *salivary glands*, or the kidney, may be the seat of calcareous deposit; this deposit taking place from the tears.

Mr. Mayo relates the case of a gentleman who applied to him, suffering great pain in the eye, as though some irritating substance had lodged there. On examination there was detected a small portion of calcareous matter embedded in

one of the Meibomian follicles; on the removal of this, the eye recovered. This foreign matter might possibly have arisen from a piece of mortar, or similar substance, falling into the eye, and then, from subsequent inflammation, becoming embedded in the mucous membrane. But Mackenzie describes a most decided case of spontaneous calcareous concretion in the mucous follicles of the eye, in which, after the removal of the concretion, it recurred several times in each eye, and was cured by adopting the same treatment as for calcareous concretions of the kidneys—viz., blood-letting and the alkaline remedies.

Some young persons are unfortunately affected with a peculiar ulceration of the eyelid, termed "*ophthalmia tarsi*." It has also received the names of Blear-eye, Psorophthalmia, Tinea of the Lids, and Lippitudo. We often observe this affection among the children of the lower orders, presenting a most uninviting appearance. It has been said to arise from want of cleanliness; for when dirt, or the mucous secretion of the lids, is allowed to concrete among the eye-lashes, irrita-

tion is set up, and the lids are found constantly sticking together when the patient awakes from sleep. This disease appears to be connected with the bulbs of the eye-lashes; hence closely resembling that troublesome complaint, *tinea capitis*—the latter being said to arise from an affection of the glands secreting the hair. Both these diseases most frequently occur in children of a strumous habit, and the same remedies are applicable in their treatment. For instance, the unguentum hydr. nitrat. may be applied night and morning. The oxide of zinc ointment, the white precipitate ointment, and, in some cases, a mixture of the white precipitate and sulphur ointments, are exceedingly beneficial. Frequent ablu-tion with warm water should be resorted to; and since in *tinea capitis* the disease is mitigated whenever there is a copious discharge from behind the ears, so in *ophthalmia tarsi* we may adopt artificial means of counter-irritation on the temple or behind the ears.

There are some individuals in whom the scrotum becomes affected with a superficial ulceration of a most obstinate nature. It is most likely connected with the glands secreting the

hair of this part ; and thus may be considered analogous with the other two affections.

Syphilitic ulcers may occur on the lids ; they require the same treatment as in other parts.

Inflammation of the sclerotic membrane (scleritis) is characterized by various distinct symptoms. On examining the eye, we find a number of fine pink vessels, radiating from the cornea ; they cannot be shifted, like the conjunctival vessels, which latter membrane may be easily made to slide over them. The patient experiences very great pain within the orbit, on the side of the nose, the corresponding side of the face, and eyebrow. The pain becomes aggravated at night, when the patient gets warm in bed ; the pulse is hard, full, and quick ; the tongue white and furred. Thus we have the direct symptoms indicative of rheumatic inflammation in other parts. When rheumatism occurs in other situations, it is remarkable that it flies to those parts in which the fibrous structure mostly predominates. Hence it attacks the knee, elbow, and shoulder, where we have the ligamentous insertion of so many muscles. Now, in the sclerotic, too, we have the ligamentous insertion

of several muscles expanding to form the *tunica albuginea*. Perhaps the rheumatic affection of these muscles is carried back to their tendinous origins around the optic foramen, and thus accounts for the deep-seated orbital pain. But the branches of the fifth pair of nerves distributed about the orbit, pass out also on the adjacent parts of the face, and are doubtless implicated in this extreme circumorbital pain of which the patient complains. This acute rheumatic inflammation of the sclerotic is very prone, like other rheumatism, to pass into the chronic form.

With regard to the remedies, we must adopt general and local bleeding, purgatives, and calomel combined with opium, so as to affect the gums. Diaphoretics should be administered to excite the secretion by the skin; and in the chronic form we must employ tonics and alteratives with sedatives. Similar remedies, in short, with some slight modifications, are applicable in each of these rheumatic affections.

My supposed analogies between the affections of the cornea and other parts may, perhaps, be deemed somewhat vague. It may seem to require some stretch of imagination to consider the eye

as analogous to a ball and socket joint ; yet in some respects it is so. We find it freely acted on by various muscles, thus enjoying very extensive motions within its socket. We also find the fibro-cartilaginous cornea rolling against the fibro-cartilages of the lids ; both of which are lined by a membrane in some respects analogous to the synovial membrane of joints, from the circumstance of being lubricated by a smooth, unctuous fluid. We might say further, that as we have in the joints disease beginning in the synovial membrane, articular cartilages, or cancellous structure of the bones, so in the eye articulation, we may have inflammation commencing in the secreting lining membrane, in the fibro-cartilaginous cornea, or in the bones of the orbit. The cornea is liable to a scrofulous inflammation, which, in some of its characteristics, may be said to resemble the inflammation of articular cartilages. This peculiar affection of the cornea is very slow and insidious in its origin. The cornea becomes reddened from the injection of its vessels, or opaque from a deposit of lymph between its layers ; or it may become roughened, from its surface being studded with little ulcers. It often

becomes more convex or conical than natural. This disease occurs most frequently about the age of puberty, and in females has been observed in connexion with amenorrhœa. It is very often accompanied with hoarseness of voice and swelling of the cervical lymphatic glands. It may continue from a twelvemonth to five or six years.

The remedial means are—counter-irritation, alteratives, tonics, and sedatives. The vin. opii may be dropped into the eye night and morning, or a little belladonna smeared on the lids. Iodine is probably of service ; calomel also, so as slightly to affect the genus. The patient's general health must be especially attended to. Disease of the articular cartilages of joints is also apt to occur in strumous constitutions. It is insidious and lingering in its progress, and very often cannot be referred to any exciting cause.

It may be objected that these cartilages do not coincide in structure with the cornea ; but in many joints there are fibro-cartilages of considerable extent ; and Sir Benjamin Brodie has observed that, previous to ulceration, the articular cartilages become softened, and assume a fibrous

structure, which must certainly render them very analogous to fibro-cartilage.

The remedies adopted in either case also bear a marked resemblance. In this affection of the joints, it is proper to use counter-irritation, with the unguentum antim. tart. ; to employ setons or blisters ; to give alteratives, tonics, and sedatives ; to keep the part at rest ; and apply belladonna in the form of plaister. The secreting lining membrane of the eye appears to be somewhat analogous to synovial membrane, although it certainly does not form a shut sac. Disease originating in the conjunctiva may, as in the joints, communicate with the adjacent structures, and so inflict extensive injury. With regard to the bones of the orbit, since they are fixed in their situation, we cannot say that they enter into this articulation ; still they surround it, are in near contact, and consequently may become implicated in some of its diseases.

The bones of the orbit may be affected with *syphilitic inflammation*, or more frequently with "*caries*." The latter disease is apt to occur in strumous habits ; the bones become absorbed by ulceration ; fistulous openings make their way

through the lids, discharging an ichorous fluid ; and eversion of the lids may occur, to the patient's great disfigurement.

Whilst at Guy's Hospital, I recollect a patient with exactly these symptoms, where the iodide of potassium, combined with the tincture of gentian, was used with great benefit.

Now, in the carious ulceration of other bones (and it seems to affect chiefly the joints in which the spongy texture most predominates) exactly similar effects result. The skin about the part becomes discoloured and puffy ; fistulous openings, discharging an ichorous or curdy secretion, are formed ; and the patient exhibits all those manifest signs termed *scrofulous*. When this disease occurs in joints, we are aware that it may go on to destroy them ; so in caries of the orbit, the eye may suffer very considerably, or even be destroyed. Correspondent remedies are employed in each case—viz., the use of tonics and alteratives. Iodine is also serviceable. Counter-irritation in either case is useless.

Thus it appears that the anatomical analogy between the *eye* and a ball and socket joint is

fully borne out by the pathological conditions of each.

We shall now consider the *iris*. The iris from its remarkable situation and important function, claims particular attention; and the more so that the peculiar organization of this membrane gives that colour and expression to the eye which often denotes the disposition, and frequently the constitution, of the individual. This membrane is liable to various affections, which may be either *primary* or *secondary*.

The general symptoms of "*iritis*" are, a dull or hazy appearance of the iris; the pupil becomes contracted and irregular. We find a vascular zone or circle around the sclerotic, near its junction with the cornea; the person feels great pain in the globe of the eye, and also severe circumorbital pain. Next there is a deposit of lymph, with adhesions of the iris, *posteriorly* to the capsule of the lens, or *anteriorly* to the lining membrane of the *cornea*. The inflammation may extend to the sclerotic, choroid, or retina, and thus amaurosis be induced; or vision may be lost from closure of the pupil by a deposit of lymph.

The treatment consists in bloodletting, purging, and the free exhibition of mercury; also in the application of *belladonna* over the brow and to the lids, in order to prevent permanent contraction of the pupil.

But several distinct species of iritis are observed to occur.

Thus the “rheumatic,” analogous in many of its symptoms with inflammation of the sclerotic,—viz., in the intense circumorbital pain, aggravated on the patient getting warm in bed, the full and quick pulse, and the white, furred tongue. It requires a similar treatment to “acute rheumatism” generally—viz., active depletion, and the free use of mercury. Fomentations to the eye of decoct. *papaveris* are also very useful. Like other rheumatic affections, it is liable to assume a chronic form, and to occur a second time.

There is a syphilitic form of iritis, connected with a venereal taint existing in the constitution, in which, in addition to the other symptoms of iritis, the nocturnal pains are very severe. It does not bear such active depletion as the rheumatic form. There are generally found in con-

junction certain other venereal symptoms, as a copper-coloured cutaneous eruption, pains in the limbs, or ulcerated throat.

Mr. Morgan has very recently observed that in these cases a brown or copper-coloured zone may be detected on the sclerotic, thus establishing an analogy with the eruption on the skin.

Another characteristic which gives it much similitude to venereal affections in other parts of the body is, that if not speedily attended to, it will go on to destroy the textures of the eye, even to complete disorganization.

With respect to treatment, the general remedy for syphilitic affections must be resorted to—viz., mercury; a combination of which with opium, and the external application of belladonna comprise the principal part of the treatment.

But adhesion of the *iris* to the adjacent membranes is very apt to occur; hence the analogy to the adhesions taking place in serous membranes in other parts of the body; for example—the pleura, in the chest; or the peritonæum, in the abdomen. And on this principle, since turpentine proves of considerable efficacy in counteracting adhesions of the abdominal lining

membrane, by contributing to the absorption of coagulable lymph, so, in syphilitic iritis, where mercury disagrees, it has been given with great success. The dose is one drachm three times a-day, in the form of an emulsion.

There are a scrofulous and an arthritic or gouty form of "*iritis*," each possessing distinct characteristics, and occurring in the peculiar diatheses these terms denote.

Inflammation of the internal lining membrane of the cornea sometimes takes place ; and, owing to a disturbance of the equilibrium between exhalation and absorption, we have a redundant secretion of the aqueous fluid, and thus an analogous disease (*hydrophthalmia*) to dropsy of other parts is produced. This affection causes great pain in the eye-ball, owing to the distension of its tissues, and if not relieved, may be attended with very serious consequences.

Now, since in "*ascites*," the operation of paracentesis is performed, and in "*hydrocele*" means are taken to evacuate the fluid, so in "*aqua-capsulitis*" the utmost relief is afforded by letting out the aqueous fluid, for which purpose a small opening is made through the "*cornea*."

Of the crystalline lens and its capsule, I would merely remark that, like all other structures of the body, they are obnoxious to disease. Various causes are said to produce disease of these parts of the eye—for instance, those assigned to “*amaurosis*.” But whatever may have been the “*exciting*,” inflammation must evidently be the “*proximate*,” cause, which inflammation may produce, as in other parts, *deposit* and *change of structure*; hence results opacity. This opacity constitutes “*cataract*”—impaired vision, arising from the luminous rays being intercepted in their passage to the “*retina*.”

Inflammation of the choroid membrane (choroiditis) sometimes occurs. The patient complains of severe pain in the orbit; the pupil becomes contracted, and perhaps drawn to one side. The sclerotic becomes vascular, and, owing to its attenuation by the swollen choroid, appears darkened by the pigmentum nigrum. Staphyloma is likely to occur, from the *choroid* protruding through the *sclerotic*, and thus irregular tumours are formed around the “*cornea*.”

From the great vascularity of the choroid, and its intimate connexion with the other ocular tis-

sues, it is natural to infer that any inflammation occurring in it should very quickly be communicated to the adjoining textures, and consequently to the sclerotic, iris, and retina, which, if depletion, with antiphlogistic treatment, be not employed, will speedily become implicated.

It need scarcely be remarked that the "*pia mater*" of the brain, (with which some consider the choroid continuous) is attended, under inflammation, with very serious consequences, and is likely to involve the neighbouring tissues. So, also, we find inflammation of the vascular tissue of the kidney and testicle accompanied with acute symptoms, and, if not attended to, likely to produce disintegration of these organs.

There is another disease connected with the general disorganizing process—viz., "*glaucoma*."

Glaucoma is a disease of the middle and advanced periods of life, in which the vitreous humour has been found fluid. On examining a glaucomatous patient, you observe a fixed and dilated pupil, insensible to light, a greenish or yellowish-green appearance towards the back of the eye, the vision of which is lost, and several dark-red tortuous vessels coming through the sclerotic

coat from within, about an eighth of an inch or less from the cornea, which are very characteristic of this disease.

Since the *pigmentum nigrum*, which is said to resemble the colouring matter of the skin of negroes, is supposed to be a mucous secretion, we may consider that whilst, in advanced life, some other secretions either utterly disappear or become very much deteriorated in quality—viz., the seminal fluid in males and the menstrual secretion in females,—that this black pigment of the choroid may become deficient, especially in constitutions debilitated by excess or disease. It seems equally probable, too, perhaps more so, that its diminution may be the result of some low inflammation of the eye itself.

The last and most important membrane of the eye—the retina, merits considerable attention. This delicate membrane may also be the seat of primary inflammation. The symptoms of retinitis are, acute pain at the back of the eye, contracted pupil, and extreme intolerance of light. The causes may be, any intense or sudden light, as a flash of lightning, sudden exposure to light after confinement in a dark room. It may occur

to those who work in foundries, from exposure to intense heat and light ; and it seems probable in some of the animals confined in our Zoological Gardens, especially the lions and tigers, this disease may be occasioned by constant exposure to the broad daylight. Several of these animals appear to have cataract also.

Amaurosis sometimes succeeds severe fevers, where the head has been much affected. Deafness we know, too, to be a frequent result of fever. We must suppose that, in the one instance, the optic nerve, in the other the nerve of hearing, has become affected.

The retina being composed of nervous matter, we find, under inflammation, analogous effects to those of inflammation of the cerebral substance, or spinal cord—viz., softening, with a purulent secretion. In some instances, this purulent secretion becomes apparent, making its way even through the pupil. It is manifest that any considerable affection of the retina must produce amaurosis. The causes of this disease are, however, so numerous, that it would be impossible now to speak of them. Pressure is one of the principal causes, whether from an exostosis of

the orbit, the growth of a tumour, or distension of vessels. Since all nerves lose their function and become paralyzed from pressure, so the optic nerve is similarly affected, and amaurosis is the effect.

Thus we find a great portion of the diseases of the system concentrated, as it were, in this small focus—the eye; and an attentive consideration of its affections must, I think, lead to minuteness of observation, and accuracy of diagnosis in disease generally. Independently, too, of these considerations, the eye often affords much assistance in general diagnosis—for instance, in compression, hydrocephalus, phrenitis, &c. And even after death the eye greatly aids the medical jurist in deciding whether the event arose from the action of narcotic poisons, the inhalation of certain noxious gases, starvation, or the effect of certain diseases.