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By JAMIESON B. HURRY, M.A., M.D.,

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VICIOUS CIRCLES ASSOCIATED WITH DISEASES OF THE EYES.

By JAMIESON B. HURRY, M.A., M.D.,
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By "vicious circle" is meant a morbid condition in which such a relation exists between cause and effect that these act reciprocally and continuously on each other. The condition is therefore a self-aggravating and self-perpetuating one, until the circle can be broken.

Diseases of the eyes are frequently complicated by vicious circles. In some cases different portions of the visual apparatus are involved in the morbid correlation; in others it is the visual apparatus and the general health.

The following classification will be found convenient, although it cannot always be strictly adhered to:—

- i. Circles associated with the eyes.
- ii. Circles associated with the eyelids.
- iii. Circles associated with disorders of refraction.

I.—CIRCLES ASSOCIATED WITH THE EYES.

A striking example is presented by glaucoma, of which Priestley Smith says: "A characteristic of the condition is that it perpetuates and intensifies itself in a vicious circle."¹

In the healthy eye the intra-ocular fluid, after being secreted by the ciliary glands, passes into the posterior, and then into the anterior, chamber, filters through the ligamentum pectinatum and spaces of Fontana, and escapes into the canal of Schlemm and thence into the anterior ciliary veins, a state of equilibrium being maintained by the processes of secretion and excretion.

In glaucoma this equilibrium is disturbed, with the result that the intra-ocular pressure rises. The exact mechanism is, however, not fully understood, although senile changes and the small dimensions of some eyes act as predisposing conditions.

According to the popular "retention theory," the root of the iris in the glaucomatous eye is approximated to the root

of the cornea, thus diminishing the angle of the anterior chamber and hindering the escape of the intra-ocular fluid, an excess of which is consequently retained. If under such conditions congestion of the ciliary processes takes place, the circumlental space becomes choked, with the result that the intra-ocular fluid is no longer free to escape, as it should do, into the posterior chamber, but accumulates in the vitreous and pushes forward the lens and iris, thus further blocking the angle of the anterior chamber and increasing the retention.

Lawson thus describes the circle:—"The sudden raising of the intra-ocular pressure increases the congestion, to be followed in its turn by a serous exudation from the venous channels, with a consequent further increase of pressure; and thus a vicious circle is quickly established, with symptoms of ever-increasing violence."²

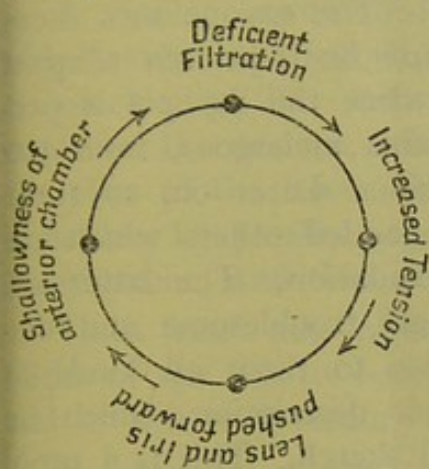
Reciprocal conditions may also occur in connection with secondary glaucoma, as, for example, in staphyloma of the cornea resulting from its perforation and from cicatrisation of the prolapsed iris. In these cases there is more or less complete obliteration of the angle of the anterior chamber, leading to increased tension. This increased tension in turn aggravates the staphyloma *et ainsi de suite*.

Phlyctenular ophthalmia, so largely dependent on malnutrition and struma, is an illustration of the way in which local disease may react on the general health and *vice versâ*. Owing to the extreme photophobia the affected person, usually a child, shrinks from light for weeks or months, burying the face in cushions or wherever light can best be excluded. The associated deprivation of fresh air and exercise lowers the already depressed nutrition and aggravates the primary cause of the disease.

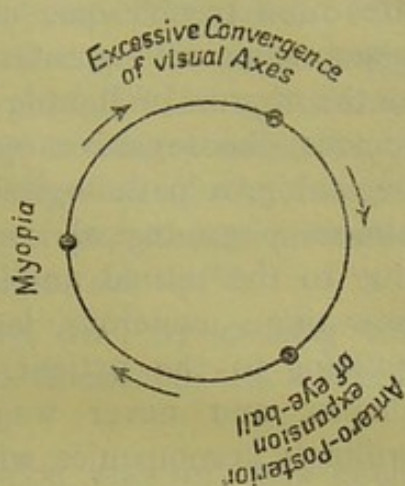
The development of "choked disk" or papilloedema is often due to a vicious circle. If, for example, the intracranial pressure is raised by hydrocephalus or by a new growth, an increased quantity of subarachnoid fluid is forced into the sheaths of the optic nerve causing engorgement of the central vein of the retina and œdema of the nerve and papilla. The papilloedema in its turn causes further pressure on the central vein, being thus both cause and effect of the venous stasis.

In neurasthenics suffering from hyperæmia of the disk

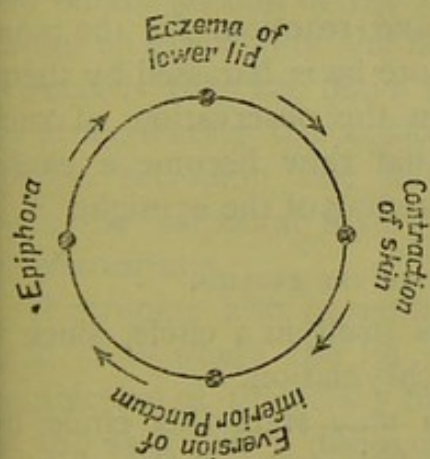
exaggerated fears of serious eye lesion may be conjured up by a process of auto-suggestion, or by injudicious professional



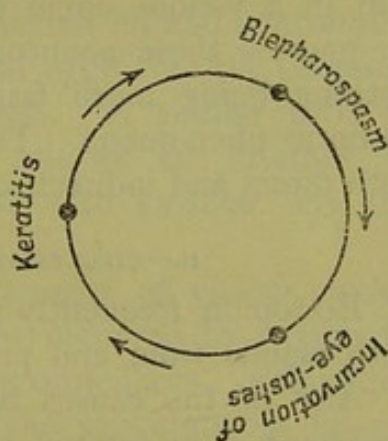
GLAUCOMA.



PROGRESSIVE MYOPIA.



ECZEMA AND EPIPHORA.



TRICHIASIS.

opinion leading to increased neuroses:—"These cases," says Schöbl, "are very frequently met with in practice, and the patient's statements are so misleading that inexperience may lead to a wrong diagnosis or to a hasty expression of opinion, with the result that the existing manifestations are merely aggravated." ³

Frequently in these and other forms of retinal hyperæsthesia the victim is tempted to resort to tinted spectacles and darkened rooms, which merely increase the trouble. As Michel well puts it:—"Since photophobia is kept up or even aggravated by darkened rooms, or by the use of smoked glasses, well-lit rooms must be ordered and the use of dark glasses prohibited." ⁴

6 VICIOUS CIRCLES IN DISEASES OF THE EYES.

Closely allied to retinal hyperæsthesia is the circle described by Landolt as associated with *muscæ volitantes*, which are often troublesome in myopia:—"The myope sees these phenomena with greater ease, because he is seldom adapted to the source of light. Moreover, when the myopia is pernicious, the sensitiveness of the retina undergoes, from the beginning, a pathological exaggeration. Later on, to these almost physiological corpuscles are added others which are due to the retinal and choroidal exudation. The latter are now more numerous, larger and more troublesome and disquieting to the patient. He ascribes to them all kinds of shapes, and never wearies of their description, which he willingly accompanies with a faithful sketch. This is a proof of the torments to which they subject him and of the anxiety with which he observes them. This observation itself places him in a vicious circle of action and reaction, for the more he pursues these phantoms, the more he is harassed by them, nothing being more fatiguing than the observation of such entoptic phenomena. Thus it is that they become a cause, both direct and indirect, of the weakening of the eyesight."⁵

II.—CIRCLES ASSOCIATED WITH THE EYELIDS.

Ectropion frequently perpetuates itself in a circle, since it both results from and provokes lachrymation.

Any of the causes of epiphora may start this circle by producing a macerated and contracted state of the skin of the lower lid and thus leading to eversion of the punctum, followed by increased epiphora. "The skin which is irritated by the tears contracts more and more, thus establishing a vicious circle which leads to a condition of ectropion."⁶

Chronic catarrhal conjunctivitis as seen in elderly people supplies an illustration. The conjunctivitis and the irritation extending along the tear canaliculus lead to eversion of the punctum lacrymale, to epiphora, and to relaxation of the palpebral portion of the orbicularis:—"When the position of the lid has thus been altered, the tears flow over the cheek, causing eczema, with thickening and excoriation of the skin, so that a vicious circle is set up, which tends always further and further to increase the deformity."⁷

The patient often aggravates his trouble by stroking movements from above downwards in order to wipe away the

overflowing tears; the ectropion and consequent epiphora are thus perpetuated.

A similar condition is readily set up in children with phlyctenular ophthalmia, especially if there is a tendency to eczema:—"The lachrimation in phlyctenular ophthalmia increases the eczema, which then, by causing contraction of the skin of the lower lid, produces eversion of the inferior punctum lacrymale, and this, in its turn, causes increased lachrimation, and thus a vicious circle is set up."⁸

Tinea tarsi acts rather differently, viz., by causing the edges of the lids to become rounded, thickened, and everted, and in this way leading to epiphora.

In chemosis of the eyelids ectropion may set up a circle in the following manner:—The bulging conjunctiva stretches the ciliary portion of the orbicularis, the contraction of which causes an eversion of the lid. The everted lid and contracting orbicularis then act like a ligature, and aggravate the chemosis by strangulating the conjunctival veins. A similar form of spastic ectropion not infrequently follows an attempt to open the palpebral fissure in a child with swollen lids and blepharospasm.

Ectropion also presents some examples of vicious circles, as in cases where the lid margins are incurved by spasmodic contraction of the ciliary fibres of the orbicularis. Relaxation of the skin and a disappearance of the subcutaneous fat act as predisposing factors, the exciting cause being some conjunctival or corneal irritation and photophobia which cause reflex contraction of the orbicularis. When once induced, the ectropion is maintained and intensified by the irritation that it produces. A still more serious condition is sometimes met with in which trichiasis, keratitis, and blepharospasm cooperate:—"The corneal inflammation causes great pain with photophobia and lachrymation, owing to which the patient keeps the eyes convulsively closed (blepharospasm), and by so doing causes a still greater approximation of the incurved lashes to the cornea, and establishes a vicious circle."⁹

Conjunctivitis eczematosa often gives rise to violent blepharospasm, which in turn exercises a prolonging influence on the conjunctivitis, by keeping the lids in close contact and leading to the retention of unhealthy discharges. Cause and

effect thus act and react on each other.

Where cicatricial entropion is associated with contraction of the conjunctiva and cartilage the commissure is frequently narrowed, producing what is known as blepharophimosis and further increasing the tendency to inversion. Muscular spasm and trichiasis are frequently present as aggravating factors.

Even apart from entropion or ectropion, the blinking of the upper eyelid may in cases of corneal ulcer give rise to a circle, as Lawson points out:—"The movement of the upper lid, by rubbing against and irritating the ulcerated surface, increases the pain and photophobia, and in this way keeps up a vicious circle, which is arrested by a light bandage."¹⁰

Dr. Burnett draws attention to a reciprocal condition present in trachoma:—"As we seldom see these cases until the inflammatory symptoms send the patient to the surgeon, there has always been a question as to whether the deposit is the cause or the result of the inflammation. From the fact, however, that they have been found in eyes which have not been inflamed, it would appear more likely that the inflammation is not the first step in the process, though undoubtedly the inflammation, when it is once set up, facilitates its progress and encourages new deposits, and thus a vicious circle is completed."¹¹

In cases of fissure of the canthus cause and effect sometimes act reciprocally on each other. Where corneal and conjunctival irritation are accompanied by photophobia and spasm a superficial ulceration is frequently caused by the continuous folding of the skin at the outer canthus and by the conjunctival discharges. This ulceration by reflex irritation increases the orbicular spasm and acts as an important factor in maintaining the irritable condition of the eye.

The severe itching that accompanies eczema of the eyelids may also establish a circle by provoking constant scratching. The scratching spreads the irritating discharges over the face and aggravates the itching.

III.—CIRCLES ASSOCIATED WITH ERRORS OF REFRACTION.

In progressive myopia reciprocal relations may be established between the accommodation and convergence (acting

on an eye with diminished resisting power) and the posterior staphyloma associated with sclero-choroiditis. Prolonged discussion has taken place as to the exact part played by various factors, and doubtless the *modus operandi* varies. But it may be stated in general terms that at any rate in some cases a reciprocal relation exists between posterior staphyloma and myopia, each factor aggravating the other.

Landolt thus describes the factors which give rise to this circle:—"The influence of near work may manifest itself in different ways. It will be noticed even that the three principal modes of production of myopia that we have mentioned, are so intimately related to each other that one of them necessarily suggests the others. Exaggeration of convergence leads to that of accommodation. The latter, of itself alone, and also by the excessive nearness of the object, which it necessitates, and the position which gives rise to cephalic hyperæmia, favours the production of choroiditis. The affection of the membranes of the *fundus oculi* entails a diminution of the acuteness of vision, which, in its turn, makes the gradual approach of the object and exaggeration of convergence obligatory.

"Sometimes this vicious circle will be opened, on the contrary, by diminution of the acuteness of vision, and, at other times, by a spasm of accommodation. But at whatever point this wheel of misfortune takes up the victim, he must go round with it, and will have to inexorably pass through the series of injurious influences, which reinforce each other to aggravate the evil.

"When we take into consideration this linking together of harmful causes, we are no longer surprised at the rapid and constant progress made by myopia in an eye which it has once attacked, especially when the latter has been, from birth, disposed to it, or is deprived of the ability to resist it."¹²

Noyes lays stress on the weakness of the muscular apparatus as leading to the establishment of the circle:—"Want of proper balance among the muscles, as they combine in their action, provokes unnatural strain and leads . . . to undue pressure on the globe. The difficulty of steady fixation induces close approximation of the work to the eye, and thus cause and effect are set going in a vicious circle."¹³

The injurious influence of myopia on general health may establish a second circle. Thus Lawson, speaking of progressive myopia, writes:—"The general health in young children often suffers greatly from the aching and general discomfort they experience, and in this way a vicious circle may be established which favours the rapid advance of the disease."¹⁴

R. W. Doyne¹⁵ has recently drawn attention to a vicious circle frequently present in anisometropia, when the demands of the fusion centre throw a strain both on the ciliary muscle and on the external muscles, leading to their exhaustion, especially if the general physique is below par. This exhaustion in turn leads to indistinct images which further irritate the fusion centres. In many headaches due to ocular conditions, "the trouble," according to Doyne, "arises from a vicious circle."

Other errors of refraction may act in a similar way by lowering nutrition and depressing the general health. Indeed, under favourable circumstances, any form of ametropic asthenopia may establish "the vicious circle of cause and effect: eye-strain, with its pain and nervous disturbances, producing interference with assimilation and nutrition, which in its turn so reduces the general physical condition as to induce an increase in the asthenopia."¹⁶

Frequently heterophoria complicates the ametropia and aggravates its pernicious effect:—"Just as it is true that ametropia and heterophoria can and do produce impaired health, so conversely will impairment of health give rise to heterophoria and exposure of ametropia."¹⁷

These examples of the reciprocal relations existing between ametropia and lowered vitality illustrate a pathological condition by which any form of eye disease may be complicated. For what disease of the visual apparatus exists which does not more or less detract from the full standard of health, and which is not in turn aggravated by impaired health. This is in truth but the modern version of the famous aphorism of Hippocrates: "The whole body sympathises with every member, and every member with the whole throughout its structure."

It is interesting to note that many vicious circles arise from a failure of Nature's beneficent provisions for counter-acting disease and restoring the equilibrium of health. Those

provisions are often blind in their *modus operandi* and disproportioned to the object in view. Indeed they may be so perverted as to aggravate, in lieu of remedying, the primary disorder. The beneficent becomes a maleficent influence. The *vis medicatrix* becomes the *vis devastatrix naturæ*.

A few examples of this perversion may be given, and will serve to illustrate a principle.

The blepharospasm frequently associated with keratitis is a beneficent provision doubtless intended to screen the inflamed surfaces from light, dust, and other irritants. The blepharospasm, however, often ends in a spastic entropion, which causes the cilia to be directed backwards, and thus increases, instead of diminishing, the corneal irritation which formed the primary trouble.

Again, where there is some obstruction to the canaliculi, the epiphora is a means of getting rid of the surplus tears which are unable to escape through the natural channels. But in many cases, when the skin is sensitive, the lower lid, in consequence of the constant wetting with the tears, is attacked with eczema, which draws down the lower lid, everts the punctum, and renders the canaliculi even less competent than before.

Lastly, in glaucoma, where the angle of the anterior chamber is shallow and ciliary, and congestion has choked the circumlental space, the lens and iris are pushed forward by the fluid that has accumulated in the vitreous humour. This forward movement is doubtless beneficent in purpose and intended to relieve the excessive tension. But inasmuch as the same movement further blocks the anterior chamber, it does but aggravate the mischief. The *vis medicatrix* has, in truth, become the *vis devastatrix*.

CONCLUSION.

The study of vicious circles has hitherto been singularly neglected. Yet such study is full of suggestion and guidance for those whose labours lie in the field of medicine. Breadth of insight and a philosophic appraisalment of all the factors concerned in pathological processes form a reward well worth the winning.

It is not necessary to describe the treatment of the morbid

conditions referred to above, since such treatment may be found in every text-book. But the watchful practitioner will do well to remember that he may sometimes prevent the development of a circle if he is thoroughly familiar with the course disease tends to follow, and intervenes at the right moment. Accuracy of diagnosis is of paramount importance in ophthalmology as in other departments of medicine, and the old maxim remains true as ever:—"Qui bene diagnoscit bene medebitur."

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- ⁴ Graefe-Saemisch: *Gesammte Augenheilkunde*, 1908, II., V., p. 368.
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- ⁶ Panas: *Maladies des Yeux*, II., p. 333.
- ⁷ Berry: *Diseases of the Eye*, p. 58; Fuchs: *Text-book of Ophthalmology*, p. 65.
- ⁸ Swanzy: *Diseases of the Eye and their Treatment*, p. 193. In the latest edition, Swanzy and Werner, *Diseases of the Eye*, 1907, p. 277, the same reciprocal condition is described, although the term vicious circle is not used.
- ⁹ Lawson: *Diseases and Injuries of the Eye*, p. 459.
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- ¹¹ Norris and Oliver: *System of Diseases of the Eye*, III., p. 209.
- ¹² *Refraction and Accommodation of the Eye*, p. 454.
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- ¹⁷ Norris and Oliver: *System of Diseases of the Eye*, IV., p. 420.



