

change the condition of the blood; and chill tends to change the condition of the blood, in some such way as follows: When the surface of the body is strongly contracted, the blood is driven from all the surfaces, the circulation is impeded, the blood parts with some of its fluid, and, with it, the salts, which pass into the urine; then there comes a demand of the tissues for blood, thirst is great, which, when satisfied, again fills up the blood-vessels. This rapid changing of the proportion of fluid in the blood tends, I believe, toward the solution or breaking up of the red-blood corpuscles. My belief is that the destruction of the red corpuscles is greater than it would be if only the proportion of water in the blood was changed,—that the destruction occurs partly through a disturbance of the proportion of certain salts in the blood. It is not difficult to see how this may be: Excessive perspiration takes out salts, especially sodium chloride, in considerable quantity; the urine passes out salts in considerable quantity. On the other hand the water drunk to quench the thirst, does not ordinarily take salts into the blood. (Except in cases where common salt is given as a remedy, which is sometimes done by non-professional persons.) According to experiments made many years ago, in the circulating blood, in health, the red corpuscles are preserved by sodium chloride from being dissolved in the albumen.<sup>6</sup> As this paper is not an exhaustive treatise on this subject, but is intended to be suggestive to other investigators, I do not now attempt to collate recent evidence on the changes in the blood. In order, however, to account for the destruction of the red corpuscles, the formation of the pigment, and for the phenomena of intermittent fever, I see no need for the micro-organism which is alleged to be parasitic in the blood, in intermittent fever. It seems to me that all of the phenomena can be accounted for about as well without the parasites as with; but it seems to be a general fact in nature that whenever a highly-organized being commences to break down, there are generally organisms that await the occurrence, and when the breaking down process is of elements microscopic in size, I believe that microorganisms are generally there. I accept the evidence of the eminent men, who have reported that they are present in the blood in intermittent fever.

But if we grant that malarial fever *is* caused by microorganisms, parasitic in the blood, it has remained to be explained how it is that the microorganisms only cause intermittent fever under certain conditions of the atmosphere. That intermittent fever does occur under some conditions, and does not occur under other conditions, has long been positively known. I claim that the statistics which I have collected prove what those

conditions are; and that the relation of those conditions to intermittent fever is quantitative and causal. I refer more especially to the evidence (exhibited in Diagram No. 1) relative to the half million and more cases of intermittent fever which occurred in the United States Armies, during the war, in 1862-4; and to the evidence of the recorded experience of physicians in Michigan, during eight years, which is exhibited, in graphic form, in Diagrams Nos. 2 and 3.

### SOME OBSERVATIONS ON THE CORRECTION OF LOW DEGREES OF ASTIGMATISM.

*Read in the Section of Ophthalmology, at the Forty-first Annual Meeting of the American Medical Association, Nashville, Tenn., May, 1890.*

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Perhaps no two men entertain identical views, or have like experiences in all particulars in the matter of correcting ametropia. All fixed rules must bend to the inevitable exceptions, and certain general principles only can be said to obtain upon which experience and judgment found creditable results.

It was taught by Donders that it was seldom necessary to correct an astigmatism of less than 1 D. This hypothesis was based upon the practical sharpness of vision. It was considered that when vision is so nearly normal a slight error should give rise to no appreciable annoyance. Larger experience and more extended observations have led to quite different conclusions. We now know that an astigmatism so slight as to be scarcely appreciable by ordinary tests may be the source of very considerable discomfort when the eyes are much employed.

Since so few eyes are absolutely free from corneal astigmatism, the question arises: Where shall the line be drawn between the normal and the abnormal? To every one of large experience in this class of work the answer readily comes up: It is largely a matter of clinical experience and not of optical perfection; since we observe many persons with much astigmatism who make little complaint, while in others, with the smallest appreciable degree, there are the most distressing symptoms.

In the earlier years of my ophthalmic work I was disposed to follow the great master, whose text-book was my sole guide, and ignored all cases where the astigmatism was appreciably less than 1 D. The trial cases made at this time contained no cylinder less than about 1 D. I found myself, however, recording accommodative asthenopia, hyperæsthesia of the retina and various neuroses for which I could not account and for which I could find no remedy. Shrewd observers were

<sup>6</sup> Dalton's Human Physiology, First Edition, page 56. Human Physiology, Flint, Fourth Edition, 1888, page 432.

not slow to find a clue to these troublesome phenomena. The more that low degrees of ametropia were corrected the less were the number of cases of hyperæsthesia of the retina, accommodative and retinal asthenopias and like obscure conditions.

It is probable there are not so many more persons now possessed of astigmatism than in former years, but the higher development of the perceptive centres has created a demand for greater sharpness of vision and, at the same time, universal education has imposed greater tasks on the eyes than ever before.

Together with these demands come the enervating influences of a high grade of civilization, rendering doubly susceptible all the reflex centres. In addition to this the widely known successes of ophthalmologists lead people to consult them who would in former years have suffered their inconveniences and annoyances of sight in silence. These are doubtless the prominent factors in the immense requirement for astigmatic spectacles.

The eye that is highly trained has a very keen sense of the relative distinctness of test objects. In correcting astigmatism I find it very important to be as exact as possible. I formerly had much of my work to do over by thinking relief would follow if only approximate correction was made, just so the strain was taken off. They sometimes complained worse than without a glass. A person may have an error of 0.25 D. and, with normal, perhaps more than average, sharpness of vision suffer no inconvenience whatever; while if he has an astigmatism of 0.50 D. or 1. D. and an error of 0.25 D. or even less is made in the correcting glass, he will surely make complaint.

A young man once consulted me for eye-strain and nervous troubles, pronounced spinal in origin by his family physician. I discovered a myopic astigmatism for which I prescribed — 1. D.c. 180° for each eye. These were worn for two years, but gave very little relief. Vision was sharp with them too. He was then tried for some time with — 0.50 D.c. 180° each eye, with which he seemed to see equally well as with the first glass. These gave only partial relief. Finally a — 0.66 D.c. 180° each eye was ordered, and with these he has had perfect comfort, all eye-strain completely disappearing in a short while, and now, after nearly a year, he expresses himself as still delighted with his great boon in the possession of the magical glasses. The last change made in his glasses, which brought such relief, amounted to only about 0.16 D.

In another instance I found 0.50 D.c. too strong and 0.25 D.c. too weak, and obtained perfect comfort with 0.33 D.c. This gentleman is to-day one of the most grateful friends I have. A lawyer by profession, he had nearly decided to abandon his profession for some non-literary pursuit on account of persistent and troublesome asthenopia

whenever he would read. With his glasses he now has no trouble, and has started afresh with his professional work.

These may seem very fine distinctions, but they are correct observations accurately and faithfully made. I can very readily conceive how less degrees of astigmatism than are ordinarily corrected may give rise to annoyance in highly neurotic persons, but I rarely find use for the 0.25 D.c. some persons are now prescribing so extensively. There are very few persons whose vision will not be sharpened by a + or — 0.25 c. at some particular angle. In my own case a + 0.25 c. 90° for O. D. and 135° for O. S. materially sharpen Snellen, but I cannot wear these glasses for even a few minutes without distress. I have never felt the need of glasses in my work.

My experience leads me to the employment of a mydriatic in determining astigmatism. I am becoming more and more convinced of its importance. I use atropine only. Homatropine has so often misled me I have altogether abandoned it. It will rarely completely paralyze the accommodation, which is essential if a mydriatic is used at all.

It is sometimes necessary to instil into the eyes a 1 per cent. solution of atropine three times daily for several days before complete relaxation of the accommodation will be produced. The astigmatism found in total paralysis of accommodation is, according to my experience, the actual astigmatism of the eye, and the glass that corrects it will, in the end, prove the most satisfactory glass.

I believe that the partial correction of corneal astigmatism by some undefined manner of irregular contraction of the ciliary muscle, by which an astigmatism found during paralysis of accommodation disappears on the return of accommodation, is the cause sometimes of incorrigible asthenopias. According to my experience an astigmatism found under atropine exists in reality without it, however much it may be masked by accommodative action, and the persistent wearing of the correcting glass will eventually suspend the action of the no longer necessary compensating accommodative effort and with it bring perfect comfort and rest to the eye.

The opposite of this rule will not hold, for an astigmatism found in full accommodation will often disappear under suspension of this power.

A girl 15 years old consulted me by advice of her physician for headaches, to see if they were not due to eye-strain. I found that a + 0.50 D.c. 90° very decidedly sharpened V. in both eyes. These glasses were repeatedly tried with the same results every time—almost doubling the acuteness of V. They were ordered. At first they suited admirably. At the end of a week she returned with the complaint that her glasses no longer gave comfort. A 1 per cent. solution of atropine was instilled into each eye three times daily for three

days and she was again examined. There was now no astigmatism to be found, but only a total hyperopia of 0.75 D. Since the return of accommodation there has been no further astigmatism found and no further complaint. Such cases as this are right often met with, and offer another argument for the use of a mydriatic in determining all errors of refraction and especially astigmatism. This so-called lenticular astigmatism has received a good deal of attention of late. As to its correction a question is involved bearing upon the theories I have here advanced.

The importance of atropine in ascertaining the exact error of refraction is well illustrated in the following case: Mrs. H., aged 26 years, was ordered + 1. D.c. 90° for each eye nine years ago by a well-known ophthalmologist. Two years ago the same gentleman prescribed for her + 0.50 D.c. 90° for each eye. Neither of the glasses relieved a peculiar weariness more or less constant in the eyes. On consulting me not long since, I found she saw best with the + 1. D.c.; it raising V. from Sn.  $\frac{1}{4}$  to  $\frac{1}{8}$ , and with it she could read J. 1 fluently.

I told her I could not be positive whether the trouble was in her eyes or not without using atropine. She consented to it, and a 1 per cent. solution was dropped in each eye three times daily for three days. I now found astigmatism = 1.75 D. 180° in O. D. and astigmatism = 1.50 D. 165° in O. S. Glasses were ordered as follows: O. D. + 1.75 D.c. 90°; O. S. + 1.50 D.c. 75°.

She was directed to wear these constantly. A little awkward at first, her eyes became more and more comfortable, and at last accounts she was highly pleased. In low degrees of astigmatism I have often found V. =  $\frac{3}{8}$ , with full play of the accommodation, reduced to  $\frac{2}{8}$  or  $\frac{2}{8}$  under atropine, when the astigmatism becomes an easy problem.

Each of the points brought out in this paper could be fully illustrated from my record book were it worth while. I trust that the narration of my own experiences and observations will call for expressions of opinion from others of larger experience in this particular line of work.

DR. FROTHINGHAM said: As the results of experience are of such importance in the consideration of a question of this kind, I wish to say that I now correct low degrees of astigmatism in nearly all cases of persistent asthenopia. I use atropia less often than formerly, as I find that in many instances I can sufficiently correct the ametropia without resorting to its action. In many cases the patients will not submit to a sufficiently prolonged use of it, or even to a brief action of it, so long as it is possible for them to use the eyes at all. They plead that it is impossible for them to stop work and suffer the inconvenience its action would cause them. In cases of severe

and persistent asthenopia the thorough action of atropia becomes almost imperative and the action of more transient mydriatics possesses no advantage, for prolonged rest of the ciliary muscle becomes necessary. There are cases, however, in which it becomes necessary to know the exact static refraction of the eye in order to prescribe even temporarily. Here the action of homatropine is very valuable. By its action we can often get the desired information in the case of patients who would not submit to the action of atropine, which lasts so much longer.

DR. RANDALL stated that his paper dealt with several of the points raised, and he would forestall it by speaking as to them now. He wished to reiterate the points elsewhere made that ametropia is the rule—astigmatism as well as hypermetropia being found in the majority of cases. Adults as well as children show these errors, the assumption that they are outgrown being wholly unproven. Refraction error is to be expected, therefore, in most cases, whether eye-patients or not—whether it needs correction is, however, a question to be decided only on the merits of each individual case. Small errors may be very important. Accuracy often demands a mydriatic, and hyoscyamine seems the best in most cases, as it is less apt to cause constitutional symptoms than duboisine, passes off in half the time required by atropine, yet gives full three days of total rest after the last instillation (where atropine gives but two), and enforces only two days of returning accommodation instead of eight or ten days, as after atropine. Many cases cannot be measured under mydriatics, even homatropine, but the refraction as measured under full paralysis of the accommodation is the true basis of our study.

DR. LEARTUS CONNOR, of Detroit, Mich., said that 1. If possible the examination of all cases of asthenopia should be conducted under the influence of atropine, as this saves time and promotes exact accuracy. 2. But practically such use is impracticable, owing to the engagements of patients. Further, an experience with several thousands of cases shows that the results of correction of refractive error are usually satisfactory when made without atropine. In fact, a comparison of these results with those obtained under atropine is favorable—the relief to the patient being equally satisfactory. 3. Atropine I have found far more satisfactory than other mydriatics. 4. The use of small degrees of astigmatism I esteem more highly with extending observations of their results. But I do not use them unless the general condition of the patient is normal and a distinct asthenopia continues.

DR. J. H. THOMPSON said he could not agree with the custom of fitting in a routine manner very small degrees of astigmatism, inasmuch that an appreciable astigmatism of low degree, 0.25,

is not by far the cause of the asthenopia complained of. The more I practice the more I am convinced that atropia is not necessary in all cases. In children under 14 years atropia may be advantageously used, but in adults its use may be more annoying than beneficial. Astigmatism and hypermetropia may be corrected very early in adults without a mydriatic. In presbyopia with astigmatism it may be sometimes necessary, but should be avoided if possible. I have reasonably good results without atropia. Low cylinders, especially in minus, are fascinating and will be in many cases accepted, but that is no indication that the glass is necessary or proper for asthenopia. Many cannot, with an anatomically normal eye be dependent upon lowered muscular or nerve tone. Correcting the astigmatism in such cases will not give permanent relief.

DR. HÖRZ, of Chicago, said that he uses homatropine and saw no reason from his own experience to question its efficiency and reliability, and if it answers the purpose for our refraction tests it certainly is preferable to atropine. Though the result under suspended accommodation gives the true refraction, it is seldom practicable to give the glasses this refraction calls for. The astigmatism can and must always be fully corrected, but for the common hypermetropia I find the patient will not accept a full correction; the glass has to be  $\frac{1}{2}$  D. less, and sometimes even more of the hypermetropia must be left uncorrected; if you correct more, the glasses will cause as much discomfort as a faulty correction. Perfect vision and the comfortable use of his eyes is what our patient wants, and therefore correct the error of refraction—no matter how great or how little—so far as necessary to attain this end.

DR. LEWIS H. TAYLOR, of WilkesBarre, Pa., said: I have been much interested in listening to the paper just read, and am glad to hear the speaker say that he uses atropine in correcting astigmatism. I almost invariably use it, and for some years past have discarded other mydriatics, homatropine and dubosine especially in my hands being unsatisfactory. I do not quite agree with the speaker as to the uselessness of the quarter dioptre cylinder. I have had considerable experience in its use and have found in many cases most beneficial results, especially when the correction has been made with atropine.

DR. LIPPINCOTT said: In regard to the use of a mydriatic, the circumstances of many of my patients do not permit me to paralyze the accommodation. In such cases I endeavor by repeated examinations to estimate the refractive error, on the principle that half a loaf is better than no bread. However, I consider the use of the mydriatic desirable wherever possible, not only because it tends to secure an accurate result, but because it enables us to obtain the result rapidly, thus saving much time.

As regards the correction of low degrees of astigmatism, I not very infrequently prescribe a cylinder as low as a quarter of a dioptric. It may be remarked that even if the glasses are subsequently laid aside, this fact does not argue against the correctness of the prescription, because it sometimes happens that the necessity for a glass arises from a neurasthenic condition which may last only during a short period, during which the patient is tided over his difficulty by the use of the cylinders.

DR. JACKSON: I believe there is a state of static refraction revealed by the efficient use of any of the mydriatics named. On account of the brevity of its action I, therefore, prefer homatropine for purposes of diagnosis only. It is very generally forgotten that the glass giving the best vision at 15 or 20 feet is not the correction of the ametropia but for hyperopia, an over-correction of  $\frac{1}{4}$  D. This over-correction will be annoying as long as it lasts. But the true correction, if annoying at first, will in time disappear entirely.

## ON THE UNITY OF DIPHTHERIA AND MEMBRANOUS CROUP.

*Read in the Section of Laryngology and Otology at the Forty-first Annual Meeting of the American Medical Association, Nashville, Tenn., May, 1890.*

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The discussion of this apparently trite and timeworn question would seem out of place at this meeting, were it not that, even at the present day, we are still unable to speak with certainty concerning it.

The failure to have secured a more definite conclusion regarding it is in no wise due to lack of care on the part of those who have investigated it. On the contrary, it has engaged the attention of a large number of earnest students; the subject has been studied collectively as well as by individuals, and, finally, the diseases in question are of such common occurrence that abundant material has always been forthcoming upon which deductions could be based. With all this accumulation of material and of effort it would seem strange that sufficient doubt should remain to warrant discussion.

We find, however, in studying the differential diagnosis between diphtheria and croup as commonly given, that there are many conditions which are far from being constant.

Thus, it is tolerably well established that in diphtheria the disease is usually due to some apparent cause of infection; that the diphtheritic poison is itself highly infectious; that the membrane may not be confined to the larynx, but may appear in the throat above that organ; that its presence is generally attended with swelling of the cervical glands; that albuminuria is a fre-