An Esmarch bandage is applied. An incision exposes the joint, which is opened. All of the cartilage is removed and the bone laid bare, by spoon, or by the use of chisel and hammer. Some operators remove a thin slice of bone to entirely eradicate the cartilage cells, which, by reproduction, would favor return of motion. The soft parts are sutured with catgut, and a plaster dressing applied. Strain must be avoided for six months or more, as after transplantation. In old cases of calcaneus, astraglectomy is more serviceable than arthrodesis.

V. Linear osteotomy or cuneiform osteotomy are too well known to require a special description. They are sometimes indicated at the tarsus, knee or hip in severe cases.

In closing, emphasis is laid on the fact that the results of infantile paralysis are of a mechanical nature. It is often possible to predict what deformity will ensue, according to the groups of muscles involved. The general practitioner has a duty to perform which has been too much neglected in the past, i. e., to prevent deformity. Each case differs from the others in the area involved and the severity of the paralysis. The treatment for the individual patient should be instituted only after a careful examination to determine what is indicated. The great tendency, of late years, has been to operate more often and to dispense with apparatus. The instrument maker is no fit person to have charge of such cases. Patients must be watched for years, at intervals of six months, because conditions change and vicious habits may be adopted.

DISORDERS FROM EYE-STRAIN.*

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Notwithstanding that much has been presented on this subject, it is a lamentable fact that a large percentage of the medical profession fail to appreciate the nature and consequences of eye-strain. Thousands of patients are annually being subjected to a medicinal treatment of reflex disorders, arising from eye-strain, while the etiologic ocular defect remains unappreciated by both the patient and his attending physician. Fortunately, this state of affairs does not obtain throughout the profession. Scattered here and there, like oases in a desert, are physicians who, having personally suffered (like the writer) from the torture of ocular defects or intelligently observed them among their clientele, are appreciative of their significance and rational treatment. When it is learned on investigation, however, that a large majority of text-books and monographs on internal and nervous disorders are silent as to the importance of eye-strain in the production of certain neuro-gastric diseases, it is small wonder that the etiologic ocular defect is so often unappreciated by the general practitioner in the treatment of these disorders.

The usual symptoms of eye-strain may, for the sake of brevity, be grouped under three headings: Phenomena of (a) muscular asthenopia, (b) conjunctival and retinal irritation, (c) defective vision. With the former condition the patient complains of pain or pulling sensation within the orbital cavity, temporal or frontal regions, or within the eyeball itself, which is due to an abnormal tension of either the extraocular or ciliary muscles or both.

With irritation of the conjunctiva, however, the eyeball and lids become injected, aggravating any existing acute or chronic inflammation of the lids, and attended with a hyperlachrymation which may be so pronounced as to simulate epiphoria due to stenosis of the lachrymal duct. The symptoms of asthenopia, irritation and blurring of vision may obtain constantly or only on doing near work, but are usually accentuated by a close application of the eyes, e. g., sewing or reading. Aside from myopia, normality of sight does not exclude the existence of refractive errors, especially the more moderate degrees of hypermetropia and astigmatic conditions, particularly in the young who enjoy the necessary accommodative power to overcome the defect. With the advent of presbyopia, however, when the accommodation becomes physiologically impaired, the refractive error usually becomes manifest with an attending lowered distant vision. So far as symptoms are concerned, furthermore, it is impossible to differentiate an imbalance of the extra-ocular muscles from an error of refraction, excepting when an extra-ocular muscle becomes so weakened that it can no longer cope with its opponent, when a diplopia occurs or it is corrected by an inclination of the head. Sensations of dizziness and nausea frequently obtain as a result of these conditions, although they may also be produced by astigmatic conditions, particularly when the axes exist at oblique angles.

The normal eye often tires with a physiologic amount of work, but when a prolonged effort is made to employ a defective visual apparatus the task becomes not only unpleasant, but oftentimes distressing to a marked degree with more or less reflex disturbances, depending on the nature and extent of the ocular defect, together with the systemic condition of the individual. Hence, a muscular or refractive defect which produces few or no symptoms in one instance may so affect the health of another person that a serious impairment of the vital functions occurs. The heart, which we are wont to regard as unceasing in its work, enjoys a longer period of rest than activity, but in instances of eye-strain the correcting muscles are under a constant tension during all the hours of visual activity. So long as there obtains a sufficiency of reserve force to supply this continued expenditure of nervous energy, the symptoms are latent, but finally in many instances an exhaustion occurs, accompanied by manifestations of a varied symptomatology.

It is to the importance of these systemic disturbances resulting from eye-strain, therefore, that I wish specially to direct attention. As previously indicated, these disorders are so varied, complex, and oftentimes pronounced that the symptoms of the causal ocular defect are quite unappreciated, in many instances, by both the patient and his attending physician, until by accident or design the etiologic condition is recognized and corrected. Thus it is that the ophthalmologist frequently meets with instances of chronic headache, gastric disorders, nervous exhaustion, insomnia, epilepsy, chorea and hysterical conditions which have resulted wholly from eye-strain, and continued in spite of the medicinal treatment which has been so erroneously employed, but have obtained permanent relief after the correction of an ocular defect.

To illustrate briefly the validity of my contentions in this direction, I append a few characteristic instances of reflex disorders which have often been encountered in my practice as an ophthalmologist:

CASE 1.—Mrs. H. W. W., aged 35, presented the following history: Since childhood she has suffered from nearly constant headaches and a nervous condition, although she has

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employed the advice of several physicians with no relief. She finally concluded that trouble originated in her eyes, inasmuch as near work increased her symptoms, and consulted a prominent oculist, who gave her the following lenses for constant use: O. D. +.50 +.25 x 90, O. S. +.75 x 90. Obtaining only partial improvement, she finally consulted me, when an examination of the eyes revealed the following refractive condition: O. D. —.25 +.75 x 90, O. S. —.37 +.88 x 90. Since wearing this correction she has enjoyed a complete cessation of headache and a gradual improvement in general physical condition during the past two years without the use of internal medication.

CASE 2.—Miss G. M., aged 30, for several years has complained of constant and intense headaches, pain in eyes, and nervous symptoms. Has received medicinal treatment from several physicians without avail. An examination of eyes showed the following conditions: O. D. +.50, O. S. +.25 +.25 x 90. Right hyperphoria 2° (tendency of right eye to turn upward). Glasses were prescribed to be worn constantly, with which the muscular imbalance was corrected as well as the refractive defect. During the following year she informed me that the former symptoms had entirely disappeared, but a year later the symptoms began to return, when an examination showed that the hyperphoria had increased to 4°, for the permanent correction of which I advised a graduated tenotomy, but this was declined, so the former prismatic correction was increased to meet the condition, since which time she has not come under observation.

CASE 3.—Mr. P. B. J., aged 25, presented history as follows: For several years he has complained of constant dull frontal and occipital headaches, pains within the orbit, loss in weight, and pronounced nervous symptoms which were increased by a prolonged use of the eyes. Riding on the cars, attending the theater, or watching rapidly moving objects invariably increased the above symptoms, attended with a sensation of nausea. He had employed the advice of several general practitioners, without permanent relief. Was wearing O. U. +.50 sph. An examination of the eyes revealed the following conditions: O. U. +.50 x 90, and 12° of esophoria (tendency of eyes to turn inward). Advised a graduated tenotomy of both internal recti, which was accordingly performed, leaving but 1° of imbalance of muscles. So great was the relief afforded by the operation and correction of the astigmatism that the patient was enabled to follow with comfort his clerical work, and rapidly gained in vigor and weight, without the aid of medication.

CASE 4.—Mr. G. S. M., aged 31, consulted me, presenting the following history: Marked headaches, neurasthenia, a growing insomnia, and gastric disorders. During the previous ten years he had consulted several general practitioners and oculists regarding his condition, but had obtained no permanent improvement. To account for the symptoms one physician informed him that he had "congestion of the brain," while an equally mistaken prominent oculist corroborated this diagnosis because a "retinitis" was found to exist! Examination of his ocular condition revealed to me the following conditions: O. D. +.25 +.25 x 90, O. S. +.50, and 18° of esophoria. When I informed him that, in my opinion, his condition was due largely, if not wholly, to the imbalance of his extraocular muscles, he was astonished, as none of his medical advisors had suspected or made a test for heterophoria (imbalance of eyes). I advised a graduated tenotomy of both of his internal recti, which was performed. Although previous to the operation and wearing of correction for his refractive error, he was particularly distressed by insomnia, during the past two years he has frequently expressed his gratitude for the great relief afforded him; and is now carrying on his multitudinous duties with satisfaction.

CASE 5.—Mrs. M. S. W., aged 35, presented the following history: Since childhood she has been subject to periodical headaches, which she regarded as hereditary, inasmuch as her mother and an aunt had suffered similarly without relief. During the past few years she has complained of heart trouble, dyspepsia, marked constipation, and periods of extreme nervousness. While suffering from an attack of headache an uncontrollable nausea and vomiting would occur which so ex-

hausted her strength that she was often compelled to keep her bed for several days. Several physicians had been consulted regarding her condition, but no permanent relief was obtained. Finally her refractive symptoms became so evident that she was led to consult me regarding her ocular defect. Examination of eyes revealed the following facts: O. D. —1.00 +2.25 x 60, O. S. —.75 +2.25 x 120. Normal balance of extraocular muscles. The above correction was prescribed to be worn constantly. Although she experienced in the beginning some difficulty in wearing the glasses, she soon became accustomed to them; and although several years have elapsed since this defect was corrected, she has enjoyed a complete cessation of her former distressing symptoms.

CASE 6.—Mr. J. R., aged 43, a man of broad scientific attainments, presented the following history: During the past ten years he has suffered frequently from periods of nervous exhaustion, gastric disorders, constipation, and a marked insomnia, which of late had become more pronounced in spite of the advice and treatment of several physicians. He had concluded that possibly his symptoms might originate from an eyestrain, and accordingly consulted me in regard to his condition. An examination of the eyes showed the following conditions: O. D. +1.00 +.25 x 180, O. S. +.75 +.25 x 180, and 1° of left hyperphoria and 2° of exophoria (tendency of eyes to turn outward). Glasses were prescribed to be worn constantly, correcting both the refractive and hyperphoric conditions, while prismatic exercise was advised for improvement of the weakened internal recti. A marked betterment in both the ocular and systemic disorders was obtained thereby, but a couple of months later he again consulted me, stating that he was still conscious of some strain in the use of his eyes. A further test of his condition revealed the fact that the hyperphoria had increased another degree while the exophoria had disappeared. Being persuaded that my patient was suffering from a latent hyperphoria, the prismatic correction in his glasses was gradually increased until the imbalance became stationary at 4°, when I advised a graduated tenotomy of the left superior rectus to permanently correct the defect. At a subsequent date the operation was performed, leaving only ½° of hyperphoria, while the lateral recti were in balance. The cessation of his former systemic symptoms under this treatment was interesting and gratifying, both to the patient and myself. While previous to the correction of his ocular defect he was confined strictly to a simple diet of bread and milk and suffered greatly from his insomnia, in the course of a few weeks he was able to relish an ordinary mixed meal, his bowels became more regular, the insomnia disappeared, and a rapid increase in weight was observed.

CASE 7.—Mr. M. H. G., aged 28, presented the following history: During the past ten years he has been suffering from headaches, gastric disorders, and nervous symptoms, attended with a marked loss of weight. While in college some six years ago his symptoms became so marked that he was compelled to abandon his work. He placed himself under the care of several physicians, but obtained no relief until by accident he learned from a fellow-student, who had suffered a similar experience, that possibly his physical condition was due to an ocular defect. He accordingly consulted a prominent oculist, who gave him for reading O. U. +1.00 +.50 x 90, from the use of which he obtained some relief. After wearing this glass for four years he came under my care, and an examination of his eyes showed the following conditions: O. D. +.25 +1.00 x 90, O. S. +.37 +1.00 x 90, and a slight exophoria. He was instructed to wear his correction constantly, since which time his symptoms have entirely disappeared, and he is in robust physical condition. No medication has been employed by him since wearing this correction.

CASE 8.—Mr. C. A. H., aged 26, gave the following history: Previous to entering college he had passed the greater part of his life in out-of-door pursuits, but during the past two years, since devoting himself to study, his health has gradually failed until now he complains of a drawing sensation about the head, dizziness, gastric disorder, and a marked nervous condition. No definite refractive symptoms were noticed in use of eyes. He has consulted several physicians without obtaining permanent improvement. Examination of eyes showed the following

conditions: O. D. + .25 + .62 x 90, O. S. + .25 + .50 x 90, and 3° of exophoria. Prescribed above glasses to be worn constantly, in addition to which I advised employment of prismatic exercise for the improvement of his weakened internal recti. Within one month he noticed a marked betterment in his physical condition, which, without the use of internal remedies, continued to so improve that he was finally enabled to pursue his professional course of study with satisfaction.

CASE 9.—Miss E. S., aged 16, presented a history as follows: Since 6 years of age has had indistinct vision for distance and difficulty in reading which has gradually become worse, attended with a rolling of eyes, twitching of lids, spasmodic contortions of the face and shoulders, and an increasing nervous irritability. Examination of the eyes revealed the following conditions: O. D. — 3.00 — 1.50 x 180, O. S. — 3.00 — 2.00 x 180, and 1° of left hyperphoria. She was instructed to wear the above correction constantly whereby the muscular imbalance was also remedied by deceleration of left lens. In the course of a year, without the use of any medication, the above symptoms practically disappeared and she gained markedly in weight. Two years later, however, she began to notice an irritation of the eyes, a blurring of distant vision, and some twitching about the eyes. Examination showed the following conditions: O. D. — 4.00 — 1.25 x 180, O. S. — 4.00 — 2.25 x 180, and 3° of left hyperphoria instead of above. With the correction of these defects the symptoms again disappeared in the course of a few months.

CASE 10.—Mr. C. L. C., aged 28, gave the following history: During the past five years he has complained of a pulling sensation in his eyes, feeling of constriction about the head, gastric disorder, loss of weight, and a marked nervous exhaustion, which finally terminated in an acute attack of melancholia. During the past six months he has been unable to use his eyes for ordinary reading. An examination of his ocular condition revealed the following: O. D. + 3.00 + .88 x 90, O. S. + 2.00 + .75 x 90, and 4° of esophoria. A partial correction was prescribed for constant use, and gradually increased until he was able to employ the full correction. In the course of a few months his former symptoms practically disappeared, and he was enabled to carry on his former occupation with satisfaction. Occasionally he would notice a return of some of his symptoms; but these were readily traced to a malposition of his lenses, due to a bending of his frame, on the correction of which the symptoms would disappear.

In conclusion, I wish to emphasize the fact that the foregoing illustrative cases of eye-strain are not rare in occurrence nor are the reported favorable results of ocular treatment exceptional, but they are frequently being encountered and successfully treated by those ophthalmologists who are doing thorough, scientific and conscientious refractive work. In contradistinction to these facts, however, I am sorry to admit that there is an alarming amount of humbuggery practiced in the "fitting of glasses." In making several thousand examinations of the eyes I have found that over 90 per cent. of refractive errors are astigmatic, one-quarter of a diopter or more, while 50 per cent. of the lenses prescribed from various sources are merely spherical. In other words, probably 75 per cent. of the glasses worn to-day do not accurately correct the ocular defects of the wearer, not taking into consideration muscular imbalances. When it is remembered, however, that the greater percentage of these glasses are furnished by pseudo-specialists, "jewelers and opticians," "optical specialists," "doctors of optics," "optical companies" and quacks in general, whose chief equipment consists of gross pretensions, commercial aggressiveness and the ubiquitous sign:

EYES EXAMINED FREE,

whereby the gullible and credulous are led to believe that they will receive something for nothing, it is small wonder, indeed, that the anticipated results of

ocular treatment are so frequently unrealized and that the uninformed laity and indiscriminating physician often confuse the claims of the ophthalmologist with those of the pseudo-specialist.

It is gratifying to note, however, that during the past few years an increasing interest and broader knowledge has been exhibited by the medical profession in the diagnosis and rational treatment of eye-strain. Even in the conservative medical centers of Europe, as I recently learned in an extended tour of her hospitals, considerable importance is being attached to ocular defects in the production of neuro-gastric disorders, but there is plenty of room for improvement in this direction, both at home and abroad.

AN ANALYTIC STUDY OF UREMIA.

WITH SOME GENERAL CONCLUSIONS IN REGARD TO ITS CAUSES AND TREATMENT.*

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CRITIQUE OF CURRENT UREMIA THEORIES.

If the current belief that uremia is due to renal inadequacy and the retention in the blood and tissues of excrementitious urinary bodies were correct, then (1) complete anuria should always produce uremia, and (2) the blood of uremic patients should always show an increase and the urine a corresponding decrease of urinary substances.

Anuria Without Uremia.—Many cases of complete anuria, due to various causes, are, however, recorded, in some instances persisting for several weeks, in which none of the characteristic phenomena of uremia developed. Most of these patients for days complained of nothing more than a feeling of extreme lassitude, death resulting suddenly from heart failure without preceding coma or amaurosis, and without eclamptic spasms or typical changes of the blood pressure. On the other hand, uremia not infrequently occurs when the flow of urine is abundant and the excretion of urinary solids and water does not appreciably deviate from the normal.

Similar results are seen in animals after experimental nephrectomy or occlusion of both ureters. The animals die, but not uremic.

Uremia and Urinemia.—Death produced in animals by the injection of urine also produces a syndrome that differs materially from the uremic symptom complex. One must, therefore, distinguish clinically between uremia and urinemia. In uremia we often, but not invariably witness many of the signs of urinemia, but also many other signs besides. These other signs are the most constant and the most characteristic symptoms of uremia and the fact that they do not occur in urinemia forces one to the conclusion that they must be produced by other factors than simple urine poisoning. This view is borne out by a study of the solids of the blood and urine in uremia.

1. *The Nitrogenous Constituents.*—With the recent refinement of chemical technic these bodies (comprising chiefly urea, uric acid and its chemical congeners, the purin bases, ammonia salts, amido acids, creatin and others) have been diligently studied. The accumulated material is enormous, but disorderly. A careful sifting of the analytic data leads to a negation of the retention theory of uremia.

* This is a preliminary synopsis, full analytic data and clinical protocols will be published later.