An examination, under atropine, of the refractive state of eyes with normal vision (20/20), and which had never been affected with asthenopia or inflammation / by D.B. St. John Roosa.

AN EXAMINATION, UNDER ATROPINE, OF THE REFRACTIVE STATE OF EYES WITH NORMAL VISION ($\frac{20}{20}$), AND WHICH HAD NEVER BEEN AFFECTED WITH ASTHENOPIA OR INFLAMMATION.

By D. B. St. John Roosa, M.D.

It will be at once seen that it is a very difficult thing to procure for examination many eyes that answer to the above-named conditions; and when is added to them another, that is, that the subjects shall be between twenty and forty years of age, the difficulties are not diminished. The importance of such an examination is, however, I think, considerable, for it has been claimed by some that latent hypermetropia and astigmatism are the causes not only of asthenopia, conjunctivitis, blepharitis, etc., but also of chorea and lachrymal disease, while on the other hand, as good an authority as Dr. E. Hansen, of Copenhagen, is very sceptical as to the universal or even general value of the correction of hypermetropia for the relief of asthenopia. In a conversation with Dr. Hansen, last summer, he informed me that he found that glasses in very many instances seemed to utterly fail to afford relief to asthenopia associated with and apparently caused by hypermetropia. Dr. Hansen has peculiar opportunities for observation upon this subject, for he enjoys almost a monopoly in ophthalmic practice in the Danish capital; and patients have not the same liberty that is enjoyed in American, English, or German cities, of roaming about from one oculist to another when their glasses do not suit, or their eyes do not get well. We have had abundant statistics as to the existence of myopia and as to the apparent refraction of unatropinized eyes. I have thought it desirable, however, to learn the refraction of those that have been classified as emmetropic. It is claimed, however, that there is a source of error in drawing conclusions from this kind of an examination. It has been said that we almost invariably flatten the lens in putting an eye under the full influence of atropia. If this be true, we always either diminish myopia under such circumstances, or convert emmetropia into hypermetropia.

My statistics show that there was a certain proportion of cases among those examined that continued to reject even the weakest convex glasses, after atropia had been thoroughly used. Besides, I

think every one of us had seen cases of myopia which were not at all reduced in degree, after the drug had been employed long enough to test the matter. I cannot, in the face of these facts, assent to the view that atropia flattens the lens except in so far as it acts by paralyzing the ciliary muscle, and thus brings out the true length of the eyeball in a state of rest. Apart from this view, however, there is another importance to such an examination as I have made.

It has been generally, if not universally conceded, that, if atropia reveals hypermetropia in cases of inability to use the eyes for continued work, glasses are to be given somewhat in accordance with those taken when the eyes are atropinized. Some authorities even advise full correction. Now, if we find that a large proportion of eyes that have never suffered from asthenopia take convex glasses which were rejected before the mydriatic was used, we may suspect that the mere existence of lessened refraction or latent hypermetropia is no positive proof that asthenopic eyes are to be cured by positive glasses—in other words, that there may be other factors producing the trouble. The amount of latent hypermetropia revealed in these cases thus rigorously selected is in many instances equal to that for which oculists all over the world, ever since the publication of Donders' book, have been prescribing glasses. Indeed, I think it has been pretty generally assumed that the cause for a given case of asthenopia had been found if atropine revealed hypermetropia. In later times it has been claimed that the etiology of headaches, of chorea, of lachrymal disease, has been very largely traced to latent and uncorrected refractive errors. Whatever the subjoined statistics may be worth, they at least show, few as they are, that a decided amount of latent hypermetropia is entirely consistent with uninterrupted and painless use of the eyes. This, however, is a fact that I commented upon some two years since, having deduced it from other grounds, namely, that we were quite often called upon to fit presbyopes who were also hypermetropes, with glasses for the first time when their accommodation began to fail, they never before in all their lives having had any necessity for glasses.

We cannot any longer assume, I think, that latent hypermetropia is necessarily the sole factor in the production of asthenopia, much less of troubles of the head and nervous system. That hypermetropia does often produce many of these things, and that its correction will often relieve them, I am of course very far from denying. But I am unable to say why it does not in all of them, especially when in looking over my statistics I find that, in some of the cases that have

never suffered for an instant from asthenopia, all the conditions for the injurious influences of strain of the accommodation have existed in feeble organizations and weak muscular systems.

Had I not had the facilities afforded by a large class of medical students, who are very ready for physiological experiments, I should never have succeeded in getting the cases that I now present. I must here present my grateful acknowledgments to the members of the Class of 1877–78 in the University of the City of New York, who so kindly submitted to the troublesome tests. It of course goes without saying, that all the cases now about to be quoted conform to the conditions stated in the foregoing, *i. e.*, the patients were not presbyopic; they had also passed the age during which, in the opinion of some authorities, hypermetropia is always found; they had V. $\frac{20}{20}$, that sight was blurred by convex glasses of $+\frac{1}{60}$, and in some cases of still weaker power, they had never in all their lives suffered from asthenopia or ocular inflammation, and their accommodation was paralyzed by a four-grain solution of sulphate of atropia.

Observation.

I.—Dr. S., æt. 30. V. R. E. $= \frac{20}{15}$; L. E., $\frac{20}{20}$. After a four-grain solution of the sulphate of atropia had been used four times in twenty-four hours, the vision of the right eye was reduced to $\frac{20}{50}$. It became $\frac{20}{15}$ with $+\frac{1}{60} \supset \frac{1}{60}{}^{c}$ 90°. This gentleman used atropia for four days, and had some marked constitutional symptoms. The final examination showed H. $\frac{1}{36}$ with H. as $+\frac{1}{60}$ axis 90°.

II.—J. C. M., æt. 21. Began to go to school at seven, and has used his eyes as a student nearly ever since; V. $= \frac{20}{13} +$. All positive glasses blur. After the use of atropia, gr. four solution, three times in two days, vision with the right eye became $\frac{20}{20}$ with $+\frac{1}{42}$; L.E., $\frac{20}{40}$ without glasses, and $\frac{20}{20}$ with $+\frac{1}{30}$.

III.—W. H., æt. 34. After atropia four times in twenty-four hours, L.E. having been atropinized, V. $= \frac{20}{20} +$ before atropia, $\frac{20}{20}$ with $+\frac{1}{60}$; two days after, $\frac{20}{20} -$ with $+\frac{1}{60}{}^{c}$ 90° $\frac{20}{20}$.

IV.—H. J. H., æt. 29. Has used his eyes as a student and teacher since he was six or seven years old; is thin and pale, only moderately well developed; right eye examined after atropia instillation twice a day for two days. Accepts $+\frac{1}{24}$ on the second day the day after $+\frac{1}{30}$ with which V. $= \frac{20}{20}$. Left eye of same patient was tested in the same way a month before; vision was $\frac{20}{70}$ under atropia without a glass, and $\frac{20}{20}$ with $+\frac{1}{24}$. The subject is anæmic and thin; has bronchitis every winter; one member of family died of phthisis.

V.—W. H., æt. 32. Has not been a very constant student; never the slightest trouble with his eyes, except occasionally after reading very fine print by gaslight for several hours, eyes have felt tired and he has been inclined to rub them; never obliged to stop work on account of his eyes. Is in good health and of robust appearance. After the use of atropia three times a day for three days, V. = $\frac{20}{20}$ and all glasses are rejected.

VI.—W. F. C., æt. 27. School at an early age; has studied medicine for a year. Interval of ten years, when his eyes were used only in ordinary reading. "Fatigue" of eyes after three hours' work. Is robust and in good general health, V. = $\frac{20}{20}$ R.E., accepts + $\frac{1}{12}$, rejects + $\frac{1}{60}$; L.E., $\frac{20}{20}$ + $\frac{1}{12}$, blurs; atropia two days, L.E.V. = $\frac{20}{40}$; with + $\frac{1}{30}$, = $\frac{20}{20}$.

VII.—H. R. D., æt. 21. At school until eighteen; writing for a year after; has studied medicine since. V. = $\frac{20}{20}$ + $\frac{1}{12}$, blurs; after one use of atropia, V. was not $\frac{20}{20}$ unless with + $\frac{1}{30}$.

VIII.—R. D. B., æt. 22. Has always been a student; = $\frac{20}{20}$, rejects + $\frac{1}{60}$. Atropia for three days, V. = $\frac{20}{20}$, declines + $\frac{1}{60}$.

IX.—C. A. V. R., æt. 22. At school regularly in Germany from sixth to seventeenth year; studied medicine three years; never the slightest asthenopia. L.E., V. = $\frac{20}{20}$, all convex glasses blur.

Four-grain solution atropia four times in eighteen hours. V. = $\frac{20}{40}$, with + $\frac{1}{30}$, = $\frac{20}{20}$.

X.—D. M., æt. 26. Has been a student since five years of age. V. $\frac{20}{20}$; atropia in left eye for two days. V. = $\frac{20}{40}$, with + $\frac{1}{12}$, = $\frac{20}{20}$; third day $\frac{20}{50}$; with + $\frac{1}{30}$, $\frac{20}{20}$.

XI.—W. A. W., æt. 24. Always a student. V. = $\frac{20}{20}$; + $\frac{1}{80}$ blurs. Atropia in left eye for two days. V. = $\frac{20}{100}$; with + $\frac{1}{24}$, $\frac{20}{20}$ — (it is a dark day), and the observer's vision is also $\frac{20}{20}$ —.

XII.—G. M. B., æt. 23. Went to school from five till eleven; then salesman and bookeeper; has studied medicine two and a half years. R.E., V. = $\frac{20}{25}$; L.E., $\frac{20}{20}$; all convex glasses blur; atropia one day. R.E., V. = $\frac{20}{50}$; with + $\frac{1}{30}$, = $\frac{20}{20}$.

XIII.—B. W., æt. 27. Went to school four months a year until fifteen; then to an academy two years for eight months in a year; taught school for four years; has been studying medicine for three years. V. = $\frac{20}{20}$, + $\frac{1}{12}$, blurs; atropia one day in each eye. V. = $\frac{20}{50}$, each eye, with + $\frac{1}{24}$, $\frac{20}{20}$.

XIV.—Dr. S., æt. 22. V. = $\frac{30}{20}$, each eye. Was for two weeks under the influence of a four-grain solution of sulphate of atropia;

suffered from great dryness of the throat; atropia did not alter vision, and + $\frac{1}{80}$ blurred before and after its use.

To these fourteen cases I will add one of a lady thirty-two years of age, who consulted me on account of neuralgic pains about the eyeball and orbits. There was also asthenopia, and she complained of muscæ. She had been unable to do fine work for the past two months. The patient is a nervous lady who is somewhat overworked with household cares. The refraction seemed to be H. by the ophthalmoscope. V. = $\frac{20}{200}$, and all glasses blur; after atropia was used for six days the vision was $\frac{20}{200}$, and the patient still rejected all glasses.

Summary.—Total number, 14.

Emmetropia, 3.

Hypermetropia, 11.

Degrees of H.:

$\frac{1}{36} \subset \frac{1}{60}$ c a 90°.

$\frac{1}{42}$, L.E., $\frac{1}{30}$.

$\frac{1}{60}$ c, 90°.

R.E., $\frac{1}{30}$, and L.E., $\frac{1}{24}$.

$\frac{1}{36}$.

$\frac{1}{36}$.

$\frac{1}{30}$.

$\frac{1}{30}$.

$\frac{1}{24}$.

$\frac{1}{30}$.

$\frac{1}{24}$.