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AN ORIGINAL AND ACQUIRED FIXA-  
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WITH THE COMPLIMENTS OF

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# THREE CASES OF STRABISMUS WITH ANOMALOUS DIPLOPIA:—AN ORIGINAL AND AN ACQUIRED FIXATION-SPOT IN THE SAME EYE.

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The development in certain cases of strabismus, in the squinting eye, of a spot to a great extent "identical" with the macula lutea of the straight eye has been described by Swanzy, Berry, and others. In the cases here presented attention is asked to the existence of two fixation-spots in the deviating eye—one the normal macula, used in monocular fixation only, and the other an acquired fixation-spot to which reference is made by the patient in binocular fixation only.

The first two cases were divergent strabismus, and were studied with me by my friend, Dr. Edward Jackson, before and after operation; the third was a case of convergent squint. All of them were treated by operation, successfully as regards cosmetic effect; but in none was orthophoria attained. In none, it may be added, did the ophthalmoscope reveal anything characteristic of the condition under consideration.

E. M. F., female, aged 11 years. Referred to me by Dr. W. H. H. Githens. V. = R. and L. = 6/6 ÷. H = .50 D. Marked divergent strabismus—intermittent. Generally fixes with the right eye, but occasionally with the left; is able to continue in binocular fixation for a considerable time.

With the eyes in a position of *divergence*, under a light-red glass, there is *homonymous diplopia*, requiring prisms 10° with their bases out to correct. Prisms aggregating 35° with their bases in arrest movements of recovery under the cover test—not complete cessation of all movement, but rather an irregular vibratory movement from side to side, lasting a few seconds, and aptly termed by my associate, Dr. Schneideman, a "search" movement. With vertical prisms, and also with red glass, the *eyes remaining in apparent divergence*, responses as to the char

acter of the diplopia are *contradictory, changing from homonymous to heteronymous*. P. P. of convergence, four inches. Apparent binocular fixation while reading; squint equals  $25^{\circ}$  to  $30^{\circ}$  prism measure.

Tenotomy of left externus complete; result, abolition of deformity; but there remained recovery from divergence neutralized by prism  $17^{\circ}$  base in and diplopia as produced by red glass is crossed, requiring prisms of like strength to correct.

The strabismus being no longer manifest, and in its latency giving no discomfort, by wish of the patient, further operation was postponed.

The alternating responses as to the character of the diplopia showed that the patient was referring at one instant to the macula and at another to the false fixation-spot, thus proving that the latter had not become predominant. After the operation the macula was alone referred to and the false spot abandoned, as was shown by the agreement between the responses of the patient and the position of the eye.

C. E. H., aged 14, male. Vision, R. 6/8 and L. 6/20; emmetropic. Has divergent strabismus, fixes with the right eye, but on covering this eye, fixes centrally with the left and can continue such fixation for a time after removing the cover from in front of the right eye, which, meantime, remains in divergence.

Tenotomy, left externus completely divided; result, lessened divergence, but it is still marked under cover test, notwithstanding which, he now has homonymous diplopia. Three days later, the condition of divergence under cover continued, except at the outer limit of the field of fixation on the left side—the side of the severed tendon—where there is recovery from convergence under the cover test. The diplopia has disappeared, except at the outer limit of left field, where it is homonymous. With the red glass, however, there is homonymous diplopia over the entire field. Though there is manifest *divergence*, the vertical prism test—phorometer—indicates  $7^{\circ}$  *esophoria*.

At a subsequent examination divergence continued, requiring prisms of  $14^{\circ}$  base in to abolish visible recovery under the cover test. At the same time prisms base in—even  $2^{\circ}$  or  $3^{\circ}$ —

produced homonymous diplopia, making it plain that further correction of the exotropia would result in constant diplopia and, therefore, that the attainment of perfect parallelism was impracticable.

It may be thought that an attempt ought to have been made by perfect adjustment of the muscular balance to compel the use of the normal macula to the entire exclusion of the false fixation-spot. But the immediate effect of further correction, as shown by the use of prisms base in, would have been the production of an annoying diplopia (homonymous). This might or might not have been overcome in time by education; the probability of such result under all the circumstances involved being to my mind unfavorable.

E. P. C., aged 30, bank clerk, V.=R. 6/6 + L. 6/10; wearing low hyperopic correction. Has convergent strabismus, very marked; left eye deviating.

Tenotomy, left internus, complete section. Left externus advanced. Immediate result, improvement in degree of strabismus. Manifest limitation of movement inward with left eye.

Two weeks later, convergent strabismus of considerable amount remains; large recovery from *convergence* under cover test, but shows *exophoria*, Maddox rod test, 20°, but with prisms 20° base in, there is wide crossed diplopia. With prisms 20° base out, movement of recovery is abolished, and a search movement is seen, about equal in either direction.

Tenotomy of right internus, complete section. Result, abolition of apparent strabismus, slight recovery from divergence under cover test (6°) and wide crossed diplopia (30°) under red glass test.

The left eye being amblyopic and never having participated in binocular vision, the patient is not annoyed by diplopia, which, indeed, can only be elicited under special conditions.

Thus, following operation the eyes in convergence to the amount of 20°, there was at the same time present an Ex. of a like amount (20°). The correction of this Ex. by prisms base in, instead of giving single vision, as was naturally to be expected from it, resulted instead in crossed diplopia.

The operation, by giving to the eyes a position more nearly

parallel than they had formerly held, disarranged the relation of the two retinae to one another with the results here seen.

Here, again, the association of convergence with exophoria is only explicable by the assumption of an acquired fixation-spot in addition to the normal macula.

In all these cases, when either eye was used alone, the seeing eye was directed centrally, *i. e.*, either eye used alone fixed with the normal macula. On the other hand, when the two eyes were used simultaneously, the diplopia, if noticed, was seen to relate to the acquired fixation-spot. This was particularly true of the latter two cases. In the first case the alternating character of the diplopia showed that the patient could refer indifferently either to the macula or to the acquired spot.

In view of the conditions present in the cases here described, the following inferences appear justified:

(1) Binocular vision — *œil cyclopienne* — involves an additional cerebral function above and beyond that involved in monocular vision.

(2) That corresponding points of the two retinae are in binocular fusion correlated with the functional fixation-spot, whether that spot lies in the normal fovea centralis or not.

(3) That suppression of the macular image during the act of binocular vision may take place, the image upon the false fixation-spot only being regarded while the macula has its usual predominance when the eye is used alone, *i. e.*, the false fixation-spot has now no greater prominence than a similar region of the retina in a normal eye.

(4) The existence of an additional fixation-spot in strabismus is denoted when the affected eye, used alone, is seen to fix centrally, and yet when, with prisms corrective of the deviation, as shown by the abolition of movement under the cover test, there occurs diplopia contrary to rule, *i. e.*, crossed diplopia associated with convergence, and *vice versa*.

It will be seen that practical considerations of importance bearing upon the operative treatment of strabismus grow out of a recognition of the presence of two fixation-spots in the same eye.









