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SOME OF THE CAUSES OF FAILURE
IN
Operations for the Correction of Squint.

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In order that we may be in a position to advance in the study of the best means of relief for persistent squint, it is first necessary that we should clearly comprehend its nature, as well as the predisposing and exciting causes.

In 1862, Donders gave the first hint at the real causes of convergent and divergent squint. Before that time, however, central lesions of the nervous system, traumatism, and habit were regarded as the most common causes; while sudden fright, and the attempt to imitate a person already affected, were counted as occasional causes.

Graefe was quick to apply the optical principle suggested by Donders. Others took up the subject, and, in 1864, when Donders wrote his great work on the anomalies of accommodation and refraction for the New Sydenham Society of London, he presented to the world a clear and well-nigh complete analysis of all the varying forms of squint, demonstrating the causes, both predisposing and exciting, and showing wherein Dieffenbach's already universally-adopted tenotomy had not been attended with that degree of success necessary to establish it as a universally-justifiable surgical procedure. What Graefe regarded as lost physiological sensibility through psychical exclusion, Mooren had already correctly interpreted as deficient refraction. Strangely enough, however, Mooren did not establish the relations which abnormal refracting power sustains to the accommodative function.

Alfred Graefe, as early as 1858, reported a case wherein the conditions of accommodation were recognized as tending to cause a deviation of the right eye; yet, farther on in his paper, he makes the strange announcement that the squint, though coexistent and intimately connected with the deficient accommodative power, was completely independent of the existing state of the accommodation.

We may say that all cases of persistent squint are independent of the existing state of accommodation, because, the squint being already established, the eyes must continue the exercise of an amount of accommodative power sufficient to compensate as far as possible for the error of refraction.

To be more plain, the world now recognizes in all cases of squint, whether convergent, divergent, sursumvergent, or deorsumvergent, a certain relation to the acuity of vision, depending upon irreconcilable obstacles to the harmonious fixing of the two eyes upon a single object.

The focusing power and the accommodative power are not the same; yet, they are intimately associated with each other, and any disturbance in their normal relations may create the predisposing cause of some form of squint. Active accommodation implies the power of harmonious convergence of the optical axes of the two eyes, and a normal power of fixation. The fixing power will depend, mainly, upon the state of the perception, while the converging power will depend upon the normal state of the recti muscles, and this state, in turn, of course is dependent upon normal nerve and blood-supply, as well as constitutional vigor. Central nerve-lesions may, by disturbing motor branches, create spasm in the muscle, or *paresis*; the pressure of morbid growths may exercise a similar power; impairment of the power of perception in the retina, or of the power of transmission in the optic nerve, or of the sensorium, will prevent fixation of the eye upon an object, and thus tend to produce squint. Opacities of the cornea, occlusion of the pupil, or displacements of the pupil, opacities of the lens or its capsule, diseases of the vitreous humor, all tend to predispose the eye to squint.

It is easily understood, therefore, why, in many cases, tenotomy can not be relied upon as a remedy for squint. I have long been impressed with the difficulties attending this means of correcting squint, and I am persuaded that the first step, in all cases, should be directed toward the correction of errors of refraction—first to the acuity of vision, and subsequently to the inharmonious muscular action.

If the subject of squint have hypermetropia, which means insufficient power of refraction in the eyes, it will be observed at first that the

subject, on looking at near objects, approaches too closely, and develops a squint by overtaxing the converging power of the eyes, and the squinting, at first, will be observed to come on with general cerebral excitement, followed, in most cases, by severe headache and general neurotic phenomena. If the subject have no organic defect, other than the insufficient power of refraction, the squint may be corrected by suspending the patient's accommodative power and correcting the error of refraction. If organic change of structure has already occurred in the recti muscles, this must be corrected by tenotomy carefully done, the error of refraction being, at the same time, overcome by the use of suitable glasses. I have many times observed in young persons a perfectly satisfactory tenotomy accompanied by the use of lenses to correct the error of refraction mislead the patient, who, for a time having regained a vigorous accommodative power, laid the glasses aside, and gradually the eye having the least acuity of perception deviated outward.

Dr. Hermann Scheffler and Giraud-Teulon have demonstrated clearly the importance of muscular co-ordination of the eyes which have not nearly or exactly equal perceptive power. Since the acuity of perception always depends upon normal refraction, we must understand that eyes naturally endowed with normal perception may, in those who have congenital errors of refraction, never both be called into activity at the same time, and, by habitual use of one eye, the perception of the unused eye gradually fades as the child grows, and, after mature growth of the individual, this can never be regained. It is, therefore, obviously important to correct squint as soon as possible after it has become manifest.

The tendency to squinting is often observed for weeks, and sometimes months, before the deformity is established. During this period little or no excuse may, in the present state of our knowledge, be allowed for neglecting to determine the refraction of the eyes. The aversion to spectacles can not weigh against the dangers to physical comfort of a person deprived of the use of one eye, with the horrible countenance which squinting produces.

Many a child, the subject of some trivial error of refraction, has been denied the opportunity of educational qualifications for a brilliant and useful career in life because ignorant parents, and equally ignorant family physicians, have said: "This child, whose nervous system is abnormally excited, and who suffers headaches, and who, at times, exhibits vertigo with nausea after prolonged attempts at study, must not be permitted to continue his studies; the brain is over-sensitive, the

blood-vessels supplying the outer structures of the eye are flushed; there is danger of brain-disease. Further attendance at school must not be permitted."

This state permitted to go uncorrected, however, will, when the child grows older, if the mind be active, lead in many cases to spasm at first, and subsequently to structural changes in one or more recti muscles; and this is squint.

Now, five minutes' attention to the state of refraction in the eyes will disclose the cause of all these disturbances. Suspend the accommodative power, and a test of refraction not only determines the necessity for the glasses, but, at the same time, the acuity of vision and the character of glasses necessary.

With the involuntary accommodation of the emmetropic eye, no cerebral excitement beyond that which accompanies the idea suggested by what the eye sees will occur. In all cases of defective refraction, there must be added to the normal accommodative power a certain tension of mind in the attempt to see with sufficient clearness to trace the object in view. This antagonizes the power of thought, retards the consentaneous exercise of the faculties of reason, and one eye is sacrificed in the attempt to see where great strain is required to maintain fixation of the eyes upon the object. On the other hand, persons who have but one eye gradually become educated into the habit of dispensing with that power of the mind which discriminates angles, distances, and comparative size of objects. It robs the mind of its best faculty in all logical processes of thought. Children educated in the use of one eye must have remarkable intellectual endowments to enable them to acquire any profound degree of original reasoning power.

Claudius Ptolemy's first book on astronomy was devoted to an explanation of the causes and uses of single vision with two eyes. In all accurate visual exercise there must be constantly present before the mind a single point in the projected field, and this necessarily depends on the position of the eyes and the direction of the visual line. In eyes having defective refracting power, the projected point of the field of vision must correspond to identical points in the retinae of the two eyes. If the image is not formed in identical portions of the retinae, the two eyes can not see singly, and it is a strain upon the mind, as well as the eye, to overcome the confusion which this condition produces. Whatever may be said concerning the influence of constitutional diseases or of traumatism in the development of squint, this mental strain necessary under the attempted exclusion of inharmonious images so

irritates the sensorium as at times to disturb and limit the powers of thought. All errors of refraction do not lead to squint, however, nor even to the formation of images in eccentric portions of the retina; but they do lead to the necessity for abnormal intensity of mental processes, and bring on headaches, with the accompanying depression of spirits, disturbed sleep, and impaired appetite, producing malnutrition, which, when fully established, constitute the sum of that group of neurotic phenomena now described as neurasthenia. With this foundation, drawn from actual observation, do you wonder that merely surgical procedures often fail to produce permanent correction of the squinting eye?

In the haste to dispatch the business in hand, to say nothing of the obliging disposition one feels toward the other patients who are waiting in the reception room, is it surprising that one should, at times, neglect some important detail in the preliminary examination of the eyes of the patient who has come for the radical cure of squint? A little introspection may be as useful for the doctor as it is wholesome to the Christian. The study of the causes of failure may lead to their elimination, and thus broaden our sphere of usefulness. I find it convenient to make frequent reference to the little case-books in which I have carefully kept the record of all cases of errors of refraction which I have attempted to correct, since March, 1877. This often serves to point the way in searching for the cause of failure.

Soelberg Wells expressed a glowing truth in the statement that the first effects of an operation for the correction of squint are seldom permanent. A little inquiry as to the reason for this robs ocular tenotomy of all its simplicity, and consigns it to a place high in the list of the more grave and serious operations in surgery. True, any mere tyro may cut a tendon, and cut it well; but it takes an ophthalmic surgeon, well trained in the study of the anomalies of refraction and accommodation, to estimate the character of a tenotomy which shall permanently establish the necessary conditions for the exercise of binocular vision. I am persuaded that tenotomy, unaccompanied by correction of existing errors of refraction, should never be done in persons under thirty years of age, and then only in such as have lost the sight in one eye. To correct the squinting of a blind eye is, in fact, a very simple proceeding; but where it concerns the establishment of a harmonious exercise of the visual power of both eyes it is a serious business, and should always be done with deliberation. The mechanical devices are not numerous, nor difficult to apply, provided, always, the optical properties of the eye are first inquired into.

To recapitulate briefly: Failures in attempts to correct squinting are to be attributed to neglect on the part of the surgeon to rectify, at the same time, deficiencies in the refractive and accommodative powers of the eye; neglect of the patient to observe the rules laid down for this purpose; and, more rarely perhaps, to bungling and unskillful execution of the tenotomy. It is a great mistake to suppose the eye operated upon for the correction of squint should be excluded from the light, or bound up as one would bind a breach of continuity in the skin, and it is a mistake of greater import still to permit such exercise of the visual power as attempting to see near objects.

With the newly-discovered anæsthetic, cocaine, general anæsthesia is no longer to be thought of in operating on strabismus. The operation being done with as small an opening in the conjunctiva as will conveniently admit the points of the scissors, the eyes should at once be bathed in cold water, which always proves grateful to the sensibilities of the patient, and the glasses, which have been previously devised for the correction of the error of refraction in each eye separately, should then be put on, to be removed at such intervals as may be desirable for bathing the eyes to soothe the irritation from the wounds. The accommodative power should be kept suspended by the use of a mild mydriatic, just sufficient for that purpose, until complete recovery from the operation.

It will be found that few persons, indeed, are able to make regular and continuous use of the eyes within a month after such an operation; it should in all cases be allowed, not only for the firm attachment of the cut tendon to its new position upon the surface of the eyeball, but for the complete absorption of the provisional callus or plastic effusion which nature provides for the cementing of the cut tendon to the scleral surface. If the eyes be used too early, permanent impairment of muscular function may be developed thereby, and the result of an otherwise perfect operation materially altered. All eyes that tend to squint should be treated upon the first discovery of the defect. In this way many may be corrected without operation. After the squint is confirmed, operative procedures should not be delayed, because the unused eye of a child always loses acuity of perception from the lack of use or natural exercise of the vision. Slight impairment of the perceptive function may, if treated before the mature growth of the individual, be in a great measure corrected; but the dimness of sight due to lack of use in an eye that squints can, in an adult, rarely be improved, and never wholly overcome. It is hardly necessary to say that the tendons should always be divided close upon the surface of the sclerotica. The scis-

in which this may be done should have thin and narrow blades, the points being so smoothly rounded as to prevent pricking or wounding of any of the structures with which they may incidentally be brought into contact. The hook used for lifting the muscle should be small and of delicate pattern. It should be angular, rather than curved. Finally, the patient should be cautioned not to exercise the muscles of the eyes for the amusement of inquisitive people, nor to encourage comments about the apparent results of the operation, before complete recovery is established.

