Chisolm (J. J.)

NEUROTOMY:

A SUBSTITUTE FOR ENUCLEATION.

A NEW OPERATION

IN

OPHTHALMIC SURGERY,

BY

JULIAN J. CHISOLM, M. D.,

Professor of Eye and Ear Diseases in the University of Maryland, and Surgeon-in-Charge of the Presbyterian Eye and Ear Charity Hospital, of Baltimore, Md.

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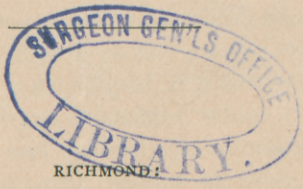

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NEUROTOMY INSTEAD OF ENUCLEATION

A New Operation in Ophthalmic Surgery.

The case which is now before you for operation is that of a woman fifty years of age, who has been suffering severely with her right eye for the past four months. Twenty-seven years since, she injured this eye so seriously as to lose all use of it. When the inflammatory attack induced by the accident had passed, all pain disappeared from the eye, and in the course of time it ceased to give her any anxiety. In this painless condition, twenty-seven years have elapsed; when four months since, from no known cause, it became very painful. The lost eye has kept her in such constant trouble from that time, that she desires to get rid of it, so as to be freed from pain. Upon examining the eye you see her shrink from the slightest touch. The conjunctiva is injected and the iris discolored, with a little blood in the anterior chamber; but the cornea is clear, and the eye full. She has no perception of light in this eye. Recently, the left eye has become fretful upon use, and strong light annoys, which points to irritation through sympathy—a warning that should never be overlooked, as blindness in the good eye will be the consequence. The lost eye looks too good to enucleate, which should be the proper course to pursue, and yet is too painful and useless to be retained.

It is just for this class of cases that the new operation of cutting all the nerves entering the eye at the back of the eyeball has been suggested, so that the lost visual organ may be retained in the head for appearances, while it is deprived of all power of doing harm to the other.

A law laid down in eye surgery, which should have fewer exceptions than are found, is, *that an eye lost from accident, and which continues to be painful, is a dangerous organ.* On account of the nervous sympathies which tie the two eyes together, such a lost and painful eye cannot be retained, except at the risk of injuring, sooner or later, the good one. When sympathetic inflammation is once set up in the heretofore good eye, no course of medication, nor of surgical proce-

dure can stop it in its onward progress to the painful destruction of the visual organ. Blindness for the remainder of life must be the portion of the unfortunate individual, and we recognize no greater bodily affliction.

The general practitioner does not lay sufficient stress upon the dangers incident to carrying a lost eye; hence, the number of blind persons who might, at least, have retained one good eye, if this law in eye pathology had been better known. These observers come across men who have lost one eye in the pursuit of their occupation, still busily engaged in the daily task of making a support for their families, and continuing in the same, month after month, until a life-time slips by. No special annoyance seems to have been caused by the lost eye, the presence of which they have often forgotten. If such an experience had no exception, there would be no ground for anxiety for the remaining eye, when an individual has, by accident, lost one of them.

Even the dread of over-work could do it no harm. The widely accepted belief that one eye does double duty when used alone, is altogether without foundation. An eye does its whole work whenever used, and can do no more under any other condition. The two eyes, when used conjointly, give us a greater range for lateral vision, and enable us to appreciate distance, solidity and perspective. What is still more important, the two eyes give us a double chance for seeing, in case of accident to one. But when it comes to sharp sight, one perfect eye can do, and does do, all that two are able to accomplish—no more, no less. There is, therefore, no strain when one eye has been removed, even should the one-eyed person read, write or sew all day long.

When an eye has been lost, especially from a penetrating wound which has cut into the eye-ball, then danger threatens. The lost eye resembles a keg of dynamite—safe enough if nothing disturbs it, but fraught with terrible consequences from slight provocation.

Sometimes it happens in the experience of a physician that one of his patients gets a cut or thrust in the eye from a piece of broken glass or stick, or receives a puncture from an article of every-day use, as a pair of scissors or a fork. Inflam-

mation is excited by the injury. After weeks of suffering, the eye quiets down, and although no useful sight comes back in the injured eye, it gives no special annoyance. Weeks, months, years may elapse without trouble or interference with daily labor. Suddenly, from no known cause, the useless organ becomes painfully inflamed—the eye becoming red and sensitive to pressure. The physician, when consulted, satisfies all parties with the familiar expression of a "cold has fallen in the eye," and prescribes the usual astringent remedies. Often the case exhibits a rebellious disposition, but the obstinate attack yields to treatment, and the pain, watering and redness subside. An interval of repose, more or less long, is now enjoyed; then a second inflammatory attack ensues, with its accompanying pain in and around the lost eye. On account of this, it is irksome for the patient to read or do any near work; for the good eye is weak from sympathy, and strong light annoys. Seclusion in a dark room, with the continued use of remedies, again restores quiet, and enables work to be resumed after a few weeks of confinement.

Another interval of irregular duration, and then another attack occurs, and now the good eye may also become inflamed, painful and watering. Sight is somewhat blurred in it, and pressure upon the heretofore sound organ sends a sharp twinge of pain through it. A "very severe cold," says the family physician, and prescriptions for catarrhal ophthalmia are again given. An improvement from the injected and painful condition is long and anxiously looked for; and, when it finally comes, sight continues very defective in the good eye. A careful examination of the recently involved eye would show a discolored iris and a small pupil, which has lost its peculiar and appropriate blackness. If a solution of atropia be applied to this eye, the pupil either does not yield or it dilates with a very irregular outline, showing that adhesions of the pupillary opening to the contiguous lens prevent expansion. The anterior chamber will also be found shallow, and the iris appears to bulge forward as if pressed from behind. From this appearance, the surgeon recognizes a condition called sympathetic iritis. *It has been induced by the irritated nerves within the opposite and lost eye*

Such an inflammation, when once excited, is prone to extend to the entire uveal tract, involving the ciliary region, and also the choroid membrane. *It means, always, destructive work.*

These cases occur so seldom in the experience of any one general practitioner, that he does not trace the trouble in the second eye as a logical consequence of injury to the first. He often discourses upon the frightful affliction of his patient, who, from a simple cold in the eye should lose the valuable organ, made doubly precious, since the loss by accident of the other. That "troubles never come alone," he also quotes, not seeing how he has himself innocently played a conspicious part in the tragedy.

The specialist in eye surgery, who collects these individual cases from many physicians, and supplements them by the many who seek aid primarily at his hands, has often to notice the intimate relations which exist between the accident to the one, and the subsequent irritation of the other. He has also become aware of the fruitlessness of all medication, when applied to the saving of the good eye. When the iris and ciliary region is sympathetically involved in acute inflammation, blindness is sure to follow, regardless of the most active interposition of the surgeon.

Persons have been brought to me, with head enveloped in many cloths for the total exclusion of every ray of light, so irritable had the good eye become from a recent accident to the other. So impossible was it to admit light enough for examining the eye, that an anæsthetic was needed to permit an investigation as to the extent of the injury. Under its quieting influence, the injured eye was found completely torn across, and so full of blood as to be utterly destroyed, and from which not even light can be detected. I removed the injured organ, and in twenty-four hours—what a transformation! A child, struck in the eye with a sharp piece of metal, who, for days, has had his head buried in pillows, crying out in agony, should the door of the darkened room be left ajar—is seen at the open window the day after the enucleation, with every trace of the distressing sympathetic irritation gone from the good eye. *The extirpation of the destroyed eye has been the active means of cure, and is the only one.*

Although the sympathetic attack has no fixed time for coming, this is no reason why it will not put in an appearance when least expected. I have seen an intense irritation excited by an eye that had only been injured a few days; and again I have seen thirty-five years elapse before a shrunken ball would take on inflammation and excite serious trouble in the good eye. For this very long interval, the patient has carried a useless, deformed organ, and the sequel has proved it a dangerous one.

Ophthalmic surgeons who have studied most carefully this subject, agree that, although a person may carry through a long life a lost eye which some penetrating wound has destroyed, he is at any time liable to have attacks of destructive inflammation in the good eye, induced by nervous sympathies which nature establishes between these twin organs; and that safety alone resides in breaking up these sympathies by the removal of the lost eye. By this operation, the good one remaining is made permanently safe, as if no accident had occurred.

We therefore lay down the rule, and recommend as the only safe course, the enucleation of lost eyes, knowing that, in this particular instance, the ounce of prevention is worth more than all other so-called curative remedies.

While every one shrinks in horror from the contemplation of blindness, and is ready to accept any alternative to escape from so frightful a doom, the extirpation of an eye is not to them a pleasant contemplation—notwithstanding the assurance that it is a safe operation, and, under some anæsthetic, altogether free from pain, and one calling for only a few hours' confinement. Unfortunately, there are too many who cannot be made to believe that so serious an injury to one eye can cause extension of danger beyond its own side of the face. Such persons resist, until too late, the good advice given to have the lost eye enucleated. This is more especially the case when the lost and painful eye retains, to all appearances, its good looks. A marred and white stump is given up much more readily.

It does not always need an extensive disfiguring wound to destroy eye-sight, and make the lost organ a dangerous one.

A wound of small extent, provided it perforates the eye-ball at the ciliary region, where the colored and white parts join, will destroy sight amidst much suffering, and yet not leave any very perceptible deformity to the casual observer. In such cases, the owner of the good-looking eye battles against mutilation, and is backed up in his false position by hosts of relatives and friends, as if they could or would share his blindness when trouble comes. Were it not that the ophthalmic surgeon foresees the great risk for the other eye, he would do, what the general practitioner so constantly does, and side with the friends. By yielding to the wishes of the patient, he would, however, expose him to great danger. The injured man has no objection that you do what you think proper to relieve him of pain and danger, provided you do not remove the eye-ball. It is to meet these very cases that the new operation has been suggested.

It was in a case of this nature that I first put into practice the conciliatory course of protecting my patient, and at the same time save him a good-looking but useless eye-ball, which he did not wish to give up, although it had caused him so many sleepless nights of intense suffering. The course pursued was to cut all the nerves entering into the injured eye from the ophthalmic ganglion, and thereby end abruptly all sympathetic connection between the offending organ and the rest of the body. This leaves the living eye in place, acting, as far as movements go, with the other, keeping up its relations with the lids and lachrymal apparatus, but deprived of all internal nervous connection likely to cause future annoyance.

Those who dissect eyes in their natural position, find that most of the nerves which enter the eye-ball perforate the sclerotic coat in the immediate neighborhood of the optic nerve entrance. A very small area at the very back of the eye-ball will cover this entering region. The nerves which perforate this space are, first, the optic nerve for special sensation, and then the many offshoots from the ophthalmic ganglion, carrying with them motor, sensative and sympathetic influences. When these numerous threads have entered the ball, they meander forward between the choroid and sclerotic

coverings to reach the ciliary region and iris, to which they are so very freely distributed. If destructive inflammation arises within the eye, these are the peripheral nerves within the eye-ball which cause the agony and excite outside sympathies. It is from this small posterior area that the eye-ball receives its chief nerve supply. Arteries and veins have entrance and exit through the same region, but not so exclusively as the nerves. Many vessels perforate the sclerotic in the front of the eye-ball, and, passing inwards, give, also, nourishment to the eye contents. The muscles which move the eye-ball hug the walls of the socket, in their course to the apex of the orbit, where they seek a bony support. In their backward course, they enclose quite a large conical space, filled with fatty tissue, in which these nerves and vessels entering the back of the eye are imbedded.

It is easy to sever all of these nerves and vessels without injury to the muscles which move the eye-ball. In this way, nerve-connections can be effectually and permanently cut off from the interior of the offending organ. The blood-vessels which feed from the front are quite numerous enough to keep the eye well nourished—the uninjured muscles preserving to the ball all the natural motions, and the surface nerves still giving it all the protection needful from the presence of foreign bodies on the conjunctiva. By this neurotomy of the ciliary nerves, the patient is to gain protection, escape from pain, and yet receive no mutilation. Although recognizing the uselessness of an organ in which there can be no sight, he still values the retained eye beyond all price.

The first case upon whom I operated was a bright lad, 14 years of age, who was brought to me by his family physician to have an injured eye removed. The sclerotic had been cut open in a clean wound, running from before backwards, and, with a free escape of vitreous humor, the eye-shell had collapsed. Hæmorrhage within the chamber refilled it, and the lips of the scleral wound having come in contact, healed up most kindly. Two weeks had passed, and the physician was congratulating himself upon the unusual good result obtained, when the eye became painful, with some injection. Atropia solutions were tried in vain to ease the suffering. The patient then came under my care. I found a clear cor-

nea, with a pupil distended to the full capacity of the corneal border. No fundus reflex could be obtained by ophthalmoscopic examination, and the patient could not detect light with the injured eye. For two weeks he had been crying, night and day, from constant pain, and had sought the seclusion of a dark chamber to escape some of the suffering. A scar on the temporal side of the eye-ball indicated the location of the sclerotic wound. It stopped short of the ciliary border of the cornea, and lost itself in its backward course under the fold of conjunctiva. As the eye was good-looking, and the child had a long life before him, with much annoyance and expense from the prospective wearing of an artificial eye, I determined to test for him the efficacy of a neurotomy.

Chloroform having been administered, a vertical incision was made over the tendon of the internal rectus muscle, one line from the margin of the cornea, and the exposed tendon was carefully dissected from its sclerotic attachment. This made quite an opening at the inner canthus, through which the back of the eye-ball could be reached. A little shelf of tendon left on the sclerotic was now seized, and by its means the eye-ball was rotated forcibly outwards. This rotation brought the optic nerve area nearer to the nose, and the posterior portion of the eye within easy reach of a heavily curved scissors, introduced into this opening made between the eye-ball and the internal rectus muscle. Between the open blades of the scissors, the nerves and vessels were caught, and all were divided by one single stroke. The scissors were then drawn partially out, the blades opened, pushed forward, and again closed, so as to divide any structures which might at first have escaped. Precautions were taken not to allow the blades to reach across the conical cavity and disturb the bellies of the eye muscles on the opposite side of the socket. The scissors were now withdrawn from the opening; a gush of blood escaped—an evidence that the retinal and ciliary vessels had also been severed, along with the optic and ciliary nerves. A suture, with a needle at each end, was thrust through the inner rectus muscle—the needles being made to perforate deeply from within the recently-made orifice, and coming out near the caruncula. Then, by passing the needles anteriorly through the wound and under the conjunctiva, the point of one was made to protrude over the site of the superior rectus, and the other through the mucous membrane over the inferior rectus. Upon tying the noose, the muscle was drawn forward into its natural posi-

tion; and its raw edge came in contact with the scleral surface, from which it had been dissected. When the muscle had been secured in its place, the eye-ball bulged considerably forward, on account of a quantity of blood accumulating behind it, and now exhibited a very decided prominence, but the sutures, so deeply placed, held it firmly in position, and prevented any appearance of squint. A compress bandage was applied over the eye, and cold water dressings were ordered.

A good deal of nausea and vomiting ensued from the chloroform. This increased the bulging of the eye from post-ocular bleeding, but did no damage. After some hours, when all the anæsthesia had passed off, the patient found himself free of pain. He slept well the first night after the operation, and had an uninterrupted convalescence. The presence of the suture excited much injection of the conjunctiva, with some muco-purulent discharge; and the extravasated blood, after some days, found its way into the lids, giving them a much bruised appearance. In three weeks this had all disappeared. The replacement of the muscle had been so satisfactory, that the movements of the eye-ball were perfectly natural, and, to all appearances, no operation had been performed upon the eye. From the moment of operation, all pain ceased in the eye. Five months have now elapsed since the operation, and the patient has not had the slightest discomfort. Upon examination, an external squint of one degree is present—just enough to show that the eyes are not perfectly parallel. An ophthalmoscopic examination now shows the chambers perfectly clear. The pupil is still dilated. The lens was luxated by the blow. Its suspensory ligament was torn from the outer side of the eye, which allows the outer edge of the lens to divide the pupillary area. It retains its transparency. In the fundus, near the optic nerve entrance, is the evidence of a large rent in the choroid, the edges of which have become pigmented. The optic disc is grayish—the vessels upon its surface having shrunk to the finest pink lines. No other change could be observed in the interior, except some palor in color of the choroid. The tension of the eye was normal. The cornea retained its sensitiveness, and the general nourishment of the eye-ball seemed perfect.

The second case was that of a woman, aged 25, who had lost an eye from choroido-iritis. The pupil was closed, and the cornea hazy; all light had disappeared from the organ, and the slightest touch indicated active cyclitis, and caused sharp pain. For four weeks her suffering had been intense,

so that she was quite willing to give up the eye, to escape further torture. A similar operation was performed upon her with like results. The severity of the pain at once ceased, and only the soreness of the traumatic conjuctivitis remained the day after the neurotomy.

The third case was similar to the second. A man, 35 years of age, had lost his right eye from iritic inflammation, which had extended backwards to the ciliary region and choroid. He had lost sight for over a year, and for the last three months his life had been one of torment, from the continued pain in the lost eye. The good eye had become very weak, and was the seat of sympathetic irritation. Neurotomy of the optic and ciliary nerves was determined upon in his case, and performed in the manner already described. He also secured prompt relief, and has had no return of pain from the time of operation. The blood extravasation in his lids was excessive, but in good time was absorbed.

The fourth case was one of great interest. A gentleman, aged 25, occupied in the construction of iron bridges, was struck in the right eye by the end of a broken bolt, driven from a steam punch. The piece of iron resembled, in size and appearance, a Minie ball. Why it did not crush up the eye and break into the skull, cannot be explained. I saw him a few hours after the accident. The face had been tied up with cloths, which were saturated with blood. I found the upper lid slightly cut, but not enough to explain the free flow of blood from beneath its under surface. I had great difficulty in checking this hæmorrhage, and finally had to use compresses and careful bandaging, without being able, at the time, to discover the wound from which the blood so freely flowed.

By the next day I was able to examine the eye. I found the anterior surface normal. A cut was seen in the upper part of the sclerotic, three lines distant from the corneal border, from which the free hæmorrhage had taken place. There was only perception of light in the eye. There was a little blood in the anterior chamber, and the vitreous was so turbid that no fundus definition or reflex could be obtained by ophthalmoscopic examination. By the use of atropia drops and cold water dressings, all redness passed away, and in one week the patient returned to his supervising work; sight was not regained. For one month, the eye gave him no trouble, when, from no exposure that he was aware of, the eye became injected and painful. He applied at once for treatment. I used the artificial leech, gave opium

freely, and applied atropia and iced cloths. These failed to give him more than temporary relief. During the day he would feel tolerably comfortable, but would pass nights of agony. After three weeks of suffering, he came to the conclusion that the pain was more than he could endure, and that he must get relief, even if the eye-ball had to be taken out. Sympathetic irritation had, by this time, made its appearance in the good eye, which prevented any use of it, or even exposure to light. In this case, the cornea was clear, and the iris of good color. The pupil was black, the lens not having been injured. The ciliary region was of a deep pink injection, and could not bear the slightest touching.

Under chloroform, I practised tenotomy upon him, making the usual opening at the inner canthus by separating the inner rectus muscle from its line of adhesion to the eye-ball. In this case, hæmorrhage was free upon making section of the posterior tissues, and the after exophthalmic condition was very decided. The day after the operation, I found him singing joyously. He had had such a splendid sleep, and was now absolutely free from all pain. For five days, he was kept in doors, and, before the end of the week, he was actively at work supervising the construction of a long iron bridge. The sutures were removed on the sixth day, and he has had an uninterrupted convalescence. The eye to-day looks as well as it did two weeks after the accident, when he thought it quite recovered, barring the absence of sight. It possesses all the motions of the other eye, without exhibiting the slightest trace of squint. He is delighted with the superb results, and so am I.

The fifth case was that of a police officer who, in arresting a disorderly person, was stabbed with a knife. The blade perforated the upper lid of the left eye, and, entering the ball, passed through the ciliary region and transfixed the lens. When he came under my observation, seven months after the accident, I found the left eye lost to even the perception of light. The eye was cataractous, with cornea and iris still good, and the eye-ball very desirable to be retained. He was extremely anxious for the good eye, and came to me from a distance to have the lost eye removed. The case seemed in every way a proper one for neurotomy. Under chloroform, the ciliary and optic nerves were divided, and the internal rectus muscle replaced as usual. The results were as heretofore reported. No trouble ensued from the neurotomy, and a good looking eye, in its natural position, has been retained.

The sixth case was one of unusual interest. The patient, a man 40 years of age, had lost the right eye six years since from corneal ulceration. A perforation in this membrane was stopped by a hernia of the iris, and, in time, a leucoma was left, in which the iris was incorporated, covering two-thirds of the cornea. One month before I operated, he was brought to me suffering from very foggy sight in the good eye, which he said was becoming, day by day, more smoky. He had suffered no pain in either eye, nor was there any injection. A careful ophthalmoscopic examination gave no sign of disease to explain the daily increasing amblyopia. Finding no tangible pathological lesion in his trouble, I advised strychnia, and placed him under the influence of this powerful drug. He continued the medication for two weeks, with no benefit, the sight undergoing a daily reduction, until he could only count fingers at four inches. As the ophthalmoscope indicated no cause for the deterioration in sight, nor were there any evidences of cerebral disturbance, I turned to the lost eye for a solution of the trouble, explaining it by some obscure sympathy. The lost eye was very markedly strabismic, and he was quite willing to give it up, if any benefit could be derived from its enucleation, for the good eye. I practised upon the lost eye neurotomy, but instead of bringing the muscle back to its old position, I left it free to permit the eye to straighten itself from the 5° of squint. Hæmorrhage was excessive, and great bulging of the eye-ball took place. The results of the neurotomy in this case fully sustained the belief that, in some way, the good eye had been seriously oppressed by the lost one, for reaction at once ensued after the operation, and within a week the very cloudy eye had regained much of its visual power. Fingers could be counted at fifteen feet and No. 16 of Jaeger's test types could be made out, with the eye strengthening every day. There is every reason to expect in this case a complete restoration of the lost visual function by the removal of nerve influence from the lost eye.

Now, gentlemen, you see before you the seventh case applying for neurotomy. My experiences in substituting neurotomy for enucleation have been so extremely flattering, that I am anxious for you to spread the good tidings, and to offer this great boon to such suitable cases of eye accident as may come under your care.

Some of you are aware that nerve-section is not always a permanent remedy. The temporary relief can always be se-

cured, as shown in section of the supra- or infra-orbital nerve, in cases of severe tic douloureux. In many of these cases, the pain comes back, and, in time, regains all of its intensity. The ends of the nerves, when simply separated by the knife, can, in time, re-unite and permit the nervous excitement to be conducted across the place of union, as if no severance of the nerve fibres had ever been effected. The position of the posterior eye nerves seems to be peculiarly fortunate to prevent this return. In the first place, these nerves are many. In the second place, they lie imbedded in loose, fatty tissue. In the third place, the cutting of the vessels along with the nerves, ensures an amount of blood extravasation and clot, which forces the socket tissues backwards, while it forces the eye-ball forwards. This blood effusion must separate the ends of the nerves for at least an inch apart, and at the same time so change the direction of the free cut ends as to mash some against the eye-balls, while the posterior free ends are pushed back out of line in the fatty tissues of the socket, where they become firmly fixed prior to the absorption of the blood clot behind the eye-ball. There is, therefore, every reason to expect, by this process, not only immediate relief from suffering, but permanent protection from all sympathetic irritation.

I can here offer this new operation, already well tested, as a substitute for enucleation in a certain class of cases, of great interest to all of us. It is not designed for all cases of ost eyes; for many are so marred in appearance, that their removal and after-use of an artificial eye is still the best course to pursue. It is when the lost eye retains its good looks that the neurotomy is especially applicable, and can be made use of early after the accident, as a preventive remedy of great value. Great care is necessary in readjusting the divided muscle, and also in limiting the socket section exclusively to the nerves and their "vascular companions." Experience will soon guide you aright in this matter.

As our seventh case is now under chloroform, and on the operating table, I will show you how the various steps of the operation are carried out.

(It is now four weeks since this seventh operation has been

performed. The results in this case confirm all that has been said in favor of the new operation. The patient was promptly relieved of the pain which had been her constant companion for four months. The eye moves well; has no squint deviation, and has already lost nearly all the injection consequent upon the division of the conjuctiva and the readjustment of the rectus muscle.)