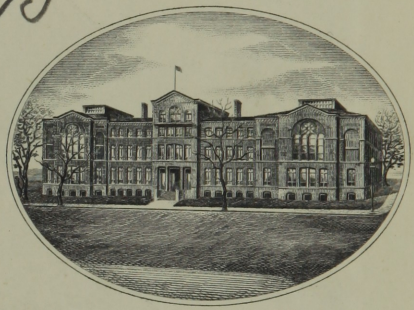
HAMILTON (F.H

monograph on strabismus



MONOGRAPH

ON

STRABISMUS,

WITH CASES.

BY FRANK H. HAMILTON,
Professor of Surgery in Geneva Medical College.

BUFFALO:
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1845

TO THE

Students of Geneva Medical College,

THIS BROCHURE,

PREPARED EXPRESSLY FOR THEIR USE,

IS AFFECTIONATELY DEDICATED.

F. H. HAMILTON.

Buffalo, Nov. 1845.

STRABISMUS.

INTRODUCTION.

SYNONYMS.—Strabismus, cross-eye, squint-eye, cast in the eye.

DEFINITION.—Strabismus, (from the Greek *strabizo*, to squint,) is a loss of parallelism in the axes of the two eyes.

VARIETIES.—First, congenital and non-congenital. Second, convergens, divergens, attollens, depressens, obliquens. Third, the eye perhaps never deviates more than 60° from its proper axis: allowing then 15° of the circle to each degree of distortion, we have strabismus of the first, second, third and fourth degree. Fourth, simplex, (confined to one eye,) duplex, (existing in both.) Fifth, mobilis and immobilis.

Congenital Strabismus is so exceedingly rare some have doubted the authenticity of such few cases as have been recorded. Mr. Duffin has

never seen a case, Mr. Lucas has seen but one, and Mr. Hall from two hundred cases saw but four which he termed congenital. Of the sixty-four cases upon which I have operated, I have marked four as unequivocally congenital.

Of the varieties dependant upon the direction of the eye, the convergent is by far the most common, while in point of frequency the others preserve the following order: divergens, obliquens, (upwards and inwards) attollens, depressens.—The eye may also be turned in either of the other diagonals, but such cases are rare.

The existence of the double variety is denied by Sir Charles Bell. "A patient," he remarks "cannot squint with both eyes, though he may squint alternately with one or the other." I am confident, however, that Sir Charles is in error, and no less than my friend Prof. Gross, who believes the duplex variety is almost constant: it occurs doubtless, but as an exception.

I employ the term "mobilis" not as synonymous with the constant vascillation of the eye occurring in amaurosis and in some other affections, but only to indicate that condition of strabismus in which by a proper effort the eye may be moved more or less; and especially to contradistinguish this condition from the "immobilis" ("the luscitas," from *luscus* blind of one eye, of

Beer and others; which term from its lack of appropriate signification, I reject) in which the eye is fixed in consequence of paralysis or adhesions.

There is a condition of the eye called by Galen "hippos," and by others "nystagmus bulbi," (winking of the *ball*) to which I have just alluded as occurring sometimes in amaurosis, and which has occasionally been found to accompany strabismus. I shall call it "oscillitans bulbi"—it is not a variety of strabismus.

ETIOLOGY.

The causes of congenital cases have not been determined; we can readily imagine, however, that several of the causes which are known to produce strabismus post-natum, might equally produce it ante-natum.

The causes of non-congenital cases are generally apparent.

1. Direct mechanical injury of a muscle, as by the thrust of a sharp instrument, which pro-

duces lesion without entire section of the fibres, and is followed by inflammation and contraction.

2. Similar injury inflicted upon the cellular and other textures in the vicinity of the muscle, with or without injury of this latter. In which case numerous and firm cellulo-fibrous bands are formed between the ball and all the neighboring parts, and which when the muscle is divided, continue to hold the eye in its unnatural position.

3. Complete paralysis of some of the motor nerves supplying the muscles of the eye. Paralysis of the third pair may produce divergent strabismus and paralysis of the sixth convergent.

In the three causes now enumerated we find the principal sources of the variety immobilis: and since the two first may generally be improved, if not certainly cured by an operation, while the third cannot, it seems highly necessary that some mode of diagnosis should be discovered. The history of the case, the absence or presence of paralysis in any part of the face, may furnish some light: in the two first cases also an unusual depression or preternatural bands are occasionally found at the diseased border. But my own observation has led me to place most confidence upon a sensation of tension or drawing experienced by the patient when, the oppo-

site muscle not being paralyzed, he attempts to straighten the eye, but which is never present in cases of paralysis.

This paralysis may be temporary or permanent, and may have its source in affections of remote organs. Thus teething, gastric irritations, as well as intoxication, fevers, injuries of the head, may directly or indirectly be followed by cerebral congestions and paralysis. It may also result from cerebral tumors, tubercles &c. That the sixth pair should suffer oftener than the third from affections of the remote organs, its connection with the sympathetic nerve might render probably, and this might help to explain the greater frequency of the convergent variety.

4. Complete section of a muscle when the antagonizing muscle retains its full power may also produce strabismus immobilis: yet as the muscle generally becomes attached again to such a point of the sclerotic surface as to enable it in some degree to move the ball, complete immobility does not usually result.

5. The same circumstances which produce cerebral *congestions* and muscular *paralysis* may at an earlier stage and under other circumstances produce cerebral *irritation* and muscular *spasm*. In hysteria, epilepsia, tetanus and various other convulsive affections, the muscles of the eye

consent with the muscles in the whole system and contract violently in different directions.—But as in all the convulsive affections of the general muscular system the contractions are not permanent but cease in a few hours or days, and whatever permanent distortions ensue are known to be in consequence of *paralysis* of antagonizing muscles, so we feel compelled to reject the opinion that "*spasm* generally produces permanent strabismus:" if permanent strabismus ensues it must be ascribed generally to partial or complete *paralysis* of one of the muscles. It is thus that I have often found the history of the case a valuable means of diagnosis.

6. Inflammations of the eye produce strabismus not only by condensing the textures, but also, it is said, "by rendering the retina so intolerant of light as that involuntarily the pupil is drawn towards the glabella to conceal itself beneath the lid whenever the eye is exposed, and which habit soon becomes persistent."

Whether we admit the above explanation or not, certain it is, that opthalmic inflammations, and especially strumous opthalmia, opthalmia neonatorum and opthalmia occurring during the exanthemata, are among the frequent causes of strabismus. Perhaps the explanation may be found in the *diminished* sensibility of the retina, or

partial opacity of the cornea, or a change in the condition of some or all of the refracting media, with or without alteration of their transparency, an obscurity of vision being the result, in consequence of which the patient involuntarily turns the eye aside to avoid the double vision which would be caused by the unequal powers of the two eyes when employed together; an opinion which seems to gather probability from the fact that both amaurosis and myopia are often followed by a squint and that an imperfection of vision generally accompanies all cases of strabismus, but in this latter case sometimes as an effect rather than as a cause.

7. Among the causes assigned by parents, looking at the nose, or at a mole or mark on the nose, attempting to imitate another, are not the least common. Searching for light also through a transparent spot in a nearly opaque cornea, and even habitually turning *both* eyes in one direction, may secure a defect in the one eye, while the other remains unimpaired.

8. Cases are often presented of occasional strabismus, the squint occurring only when the person is agitated or indisposed, and again, other cases recurring at regular periods, in one instance only during pregnancy. The causes of which are to be sought sometimes in the nervous,

sometimes in the vascular system, at others in the correlation of function with other organs.

9. The size, position and insertion of the rectus internus favors the production of strabismus convergens. This muscle is usually larger than either of the other recti, and its insertion into the sclerotic more advanced. Moreover, all objects not larger than the space between the eyes are seen at an angle more or less acute, and the nearer and smaller the object, the more are the axes of the eyes converged; so that in reading ordinary print at the usual distance, and in a thousand other occupations the eyes are constantly crossed. This is especially true of short sighted persons, the object to be seen being brought very near to the eye. Hence a predisposition is established in the internal recti to strabismus.

10. It is occasionally hereditary; so at least my own observation has led me to conclude.

PATHOLOGY.

WHILE enumerating the causes of strabismus I have unavoidably entered considerably into its pathology, and I find it here necessary to make only a brief recapitulation, confining myself to that portion of the pathology which immediately pertains to the distortion.

The pathological conditions are, spasms, irregular innervation, paralysis, partial or complete, fibrous or cellulo-fibrous bands between the sclerotica and neighboring structures, permanent shortening and elongation of opposite muscles, hypertrophy and atrophy, with corresponding *strength* and *debility*. This latter fact is demonstrated by the general result of our operations and is of great importance, since it forms the basis of all our success. If the elongated muscle possessed its natural strength, the section of its antagonist would always be followed by an opposite distortion, and so also by reverse if the lengthened muscle was completely paralyzed, the section of its antagonist would produce no change in the position of the eye.

ANATOMY.

That portion of the anatomy of the eye only which relates to strabismus and its cure, will be described.

Muscles.—The four recti arise almost in common at the bottom of the orbit, pass directly forward, and becoming tendinous are inserted by a thin, flat and firm tendon into the front of the sclerotica, the central fibres approaching nearer the cornea than the lateral. The rectus internus is the shortest and strongest of the four; its insertion is also most advanced. Its tendinous portion is two lines and a half in length, and its breadth at its insertion, nearly four lines, while the middle of its insertion is two lines and a quarter from the cornea. The rectus externus is the longest straight muscle; length of tendinous portion, two lines; breadth of insertion, four lines; distance of middle of insertion from cornea, two lines and three quarters. Rectus superior, length of tendon, two lines; breadth at insertion, three lines and a half; distance of central fibres from

cornea, three lines; it is also inserted nearly one line nearer the internal than external rectus.— Rectus inferior, length of tendon, two lines; breadth at insertion, three lines and a half; distance from cornea, two lines and a half. The superior oblique arising at the base of the orbit, passes forward to its trochlea, near the anterior superior and internal angle of the socket, which so far as the direction of its action is concerned, may be considered as its origin; where, having formed a small, round tendon, it traverses the trochlea and is then reflected upon itself, and passing between the rectus superior and the ball of the eye, has its insertion, eight lines (Lucas says 11) from the cornea, and four and a quarter from the optic nerve, and one and a half lines external to a line drawn from the centre of the optic nerve to the centre of the insertion of the rectus superior. The inferior oblique arises from the orbitar process of the superior maxilla, near the anterior, inferior and internal angle of the socket, passes between the rectus inferior and the socket backwards and outwards, to be inserted into the sclerotica seven and a half lines from the cornea, (Lucas says 15!) four and a half lines from the optic nerve, and three lines external to a line drawn from the centre of the optic nerve to the centre of the insertion of the rectus infe-

rior. These admeasurements were made two years since, with great care, in connection with my intelligent pupils F. B. Hastings and Caleb Green, the latter of whom has since published a highly interesting memoir upon the action of these muscles, in the 32d vol. of the Boston Medical and Surgical Journal. The object of our examinations was to determine, if possible, the function of the obliqui, now so much in dispute; since according to Dieffenbach, the superior oblique turns the pupil *upward and inward*, according to John Bell, Dunglison and Velpeau, *downward and inward*, according to Chesseldon, Sœmmering, Wistar, Paxton and Pancoast, *downward and outward*. While the inferior oblique is said by Sir Charles Bell, Dunglison, Wistar and Paxton to turn the pupil *upward and inward*, by Chesseldon, Velpeau, John Bell and Pancoast, *upward and outward*. Our conclusion was inevitable that Chesseldon was right, viz: that the superior oblique "directs the pupil outward and downward," and the inferior oblique "turns the pupil upward and outward," and that the anatomy of these muscles had been more carefully examined and known in 1714 than a century after. See to what stupid mistakes upon the subject of strabismus the errors of modern anatomists have led: operators have again and again en-

deavored to rectify an upward and inward squint by cutting the superior oblique! Dieffenbach advises the section of this muscle when the eye will not turn out after a section of the rectus internus! or when it turned up after the operation! Doubtless some also advise its section when the eye is turned downward and inward!

There are also other points in relation to these muscles which remain undetermined. It is clear that they both give the whole ball a "partial rotation" in opposite directions, but do they in any way antagonize the four recti, by advancing the ball in its socket? We cannot, we confess, see the force of the arguments employed, by others as well as by our friend Dr. Green in the article already referred to, who is persuaded that they do not. We believe, on the contrary, that when the obliqui act together, they must necessarily from the relation of their attachments have some effect in advancing the ball in the socket, and thus antagonize the recti. If this be true then the protrusion of the eye which sometimes follows a section of one or more of the recti may be in part attributable to the action of the obliqui, as well as in part to the loss of the actual retracting power of the severed muscle.

It is also in dispute whether the obliqui are voluntary or involuntary muscles. The exper-

iments of Sir Charles Bell upon the eyes of a living monkey to determine this point and by him deemed conclusive, must, we think, appear to every one else any thing but satisfactory. I have no evidence that when the rectus superior was cut and the animal still retained the power of "rolling the eye up" when it was irritated, it was owing to the involuntary action of the inferior oblique—it might have been an involuntary action of the upper fibres of the rectus externus and rectus internus, for I am certain that a contraction of the inner fibres of the rectus superior and rectus inferior turns the eye inward when the rectus internus is cut, and all the voluntary muscles are liable to involuntary contractions, which contractions also are generally more powerful than the voluntary. Beside is not the inferior oblique supplied by the same nerve which supplies three of the recti, viz: the third pair? I will not say the obliqui are not involuntary muscles—it is a point yet to be determined. But whichever opinion we adopt, one thing is certain, they are not to be cut except when the eye is turned either upward and outward or downward and outward, unless indeed we should conclude to cut both when after cutting the rectus externus the eye still remained turned out: but in fact until the question of their voluntary or involuntary

action is settled, it will not, I think, be proper to cut them in any case.

Fasciae.—It is only since the discovery of the operation for strabismus that any description of the ocular fasciae has been by anatomists deemed necessary; their importance is, however, now well understood.

A loose cellulur fascia lines the posterior surface of the conjunctiva becoming more condensed as it approaches the cornea, and being reflected from this point upon the anterior surface of the sclerotica, along which it passes to the insertion of the recti, covering their whole anterior and external surfaces to their origin, from thence it is reflected forward along the walls of the orbit until it reaches the point from which it started; forming thus an irregularly triangular space between the muscles, orbit and conjunctiva. (The portions of the fascia which cover the obliqui we omit for sake of clearness.) This fascia I call the *anterior orbital fascia.*

A second fascia commences upon the periphery of the optic nerve where it emerges from the cranium, passes to the sclerotica, invests closely its entire surface to the insertion of the recti, whence it is reflected upon the posterior surface of the recti and is stretched across the intermediate spaces, continuing along the whole extent of

the muscles to the point from which it commenced, forming an irregular triangular space between the optic nerve, sclerotica and muscles. This fascia I name the *posterior orbital fascia.*

Where the two fasciæ are expanded between the muscles they are in contact, forming thus a complete sheath for each muscle and a strong web between them; from which arrangement it is easily understood how, unless the space between the muscles is fairly entered with the scissors it will be extremely difficult to pass the blunt probe under the muscle; it also explains the necessity of cutting generally something beyond the borders of the muscle to remove the obstacle which this fascia, passing from each muscle to the sclerotica, presents to the restoration of the eye.

These fasciæ are most dense and firm as you approach the insertion of the tendons into the sclerotica; they are also much more fibrous in adult than early life.

Vessels.—The arteries of the orbit all arise from the opthalmic, and as they advance toward the tendons of the muscles and the conjunctiva they become so small that their section is never, unless in a peculiar hæmorrhagic diathesis, attended with any thing but a slight haemorrhage.—It should, however, be borne in mind that the

arteries are larger the farther we proceed from the ball, and especially as we approach the inner canthus. The same is true of the veins.

Nerves.—The third pair (motor oculi) supplies the rectus superior, inferior and internus, and also the levator palpabræ and obliquus inferior. The fourth (pathetic) supplies the obliquus inferior. The sixth pair, the rectus externus. The ciliary nerves proceeding from the opthalmic are found lying close upon the outer surface of the sclerotica, covered by the thin fascia which we have before described. They can only suffer injury in the operation, when the probe is made to press with violence against the side of the ball.

MEANS EMPLOYED TO RESTORE PARALLELISM WITHOUT AN OPERATION.

Since habit has occasionally induced the deformity, it is not unreasonable to suppose that proper practice and education may occasionally effect a cure. Closing the sound, and using only the squint eye has been known to succeed; but care must be taken lest the sound eye, being too long unexercised, in turn be made to squint; a few hours in each day is sufficient. I have seen the obliquity also decidedly improved by the following practice: the sound eye is closed while the squint eye is directed to a black spot half an inch in diameter, upon a white ground, and at the proper distance of distinct vision for the squint eye—when the object is distinctly seen and the eye becomes steady, the other eye is opened and directed to the same point. In the first attempts the defective eye is immediately turned away when the sound eye rests upon the object, but after a few trials some degree of success usually attends the effort. Goggles, painted

so as to form artificial pupils, have been recommended, but in my experience they have failed of effecting any good. Indeed, while the sound eye is directed properly to the transparent portion of the glass, the defective eye is either nearly closed or turned involuntarily, and the patient is in fact using but one organ. In one instance a highly respectable clergyman, of Castleton, Vermont, assured me that the use of common concave glasses, which he was obliged to wear from an early age on account of nearsightedness, had effected in a few years an entire cure of a bad strabismus. In incipient cases only, accompanied with myopy, would this plan deserve a trial.

In the divergent variety, a black patch may be laid upon the nose, and the person directed to keep, as much as possible, both eyes directed towards it. Also the examination of small and near objects will have a tendency to bend inward the visual axes. On the contrary, in the convergent variety the subject must be removed from his books, and from every thing requiring close application of the eyes, and his vision should be directed only upon larger and remote objects. In either case, where the deformity is recent, the patient should be permitted to exercise abundantly out of doors; he should be constantly reminded

of the fault, and if young, removed at once from those who squint.

If gastric or intestinal derangements exist, antacids, purgatives &c. may be necessary. If encephalic congestions are suspected, venesection, leechings, blisters, setons, issues, &c. are proper: and if the patient is feeble, or his nervous system disturbed, cold baths, vegetable and mineral tonics may prove useful. Galvanism, electricity, strichnyne &c. have been proposed, but of their actual value in these cases, having never used them, I am not able to judge.

SURGICAL OPERATION.

It is upon record that as early as 1737, Taylor, an English charlatan, if he did not actually make the operation, at least declared that he did cure strabismus by cutting "the tendon of the superior oblique muscle." This was long forgotten when in 1818, Gibson, of Philadelphia, suggested the operation of dividing the internal rectus in a case of convergent strabismus, and actually made the operation upon four different patients, but not

with sufficient success to encourage him to proceed. Not until October 26, 1839, did Dieffenbach, of Berlin, demonstrate by a first successful operation its practicability; and when in 1840 he published his first report of operations, so palpable were its benefits, surgeons every where ceased their accustomed caution and tardiness, and hailed it at once as a memorable triumph. Five years of severe probation have now elapsed, during which time, a vast number of operations have been made both by charlatans and skilful surgeons, yet its reputation has scarcely abated; and we are at a loss to know, considering the unskilfulness of many of the operators, the little discrimination used in the selection of cases, and the large number of accidents already recorded, why it has not fallen into utter disrepute. Certainly it is, in such hands, undergoing a fearful ordeal, and I shall be happy if I may by this brochure contribute somewhat towards the rescue and ultimate establishment of an operation which may justly rank among the most valuable surgical improvements of this age.

Circumstancee which contra-indicate an operation:

1. If the strabismus is recent, or occasional, occurring only when the mind is much excited, or the stomach deranged, or the brain disturbed,

or if it exists only when the eyes are closely applied to an object, or if it is periodical.

2. If the distortion is at one time divergent and at another convergent.

3. If the eye is turned less than the first degree.

In either of the above cases, whatever care and skill may be employed in the operation, there is danger of producing an opposite deformity.

5. If there is complete paralysis of a muscle, I cannot think with Velpeau, that the operation has or ever can prove of any service.

6. If produced by an opacity of one part of the cornea, or a vicious pupil, and the new position is found to subserve better the purposes of vision.

7. If the strabismus, not greater than a second degree, is evidently diminishing, (however slowly) I would not operate.

8. If either eye is suffering under acute inflammation or is peculiarly prone to it. A chronic form of opthalmia, however, rendered more obstinate doubtless by the constrained position of the eye and the fatigue which its use induced, I have occasionally seen sensibly diminished by the operation.

9. If the eye is turned *decidedly* in either of the diagonals, it will generally be necessary to

cut more than one muscle and an unsightly exopthalmia will be likely to follow.

10. If the eye is immovably fixed by cellulo-fibrous or fibrous bands the operation does generally succeed, yet it is uncertain, since some of the adhesions may be too deep to be safely cut.

11. If the eyes are very prominent the disfigurement produced by the exopthalmia is more frequently observed; yet it should not constitute a very weighty contra-indication, especially, when, as is usually the case in strabismus of long standing, the squint eye is less prominent than the sound.

12. If the patient is younger than five years, the difficulty of making the operation is greater, owing to the restlessness of the patient, and the deformity is more likely to recur. No reason has yet appeared why it may not be deferred to a later period. Strabismus in children is sometimes rectified spontaneously.

13. In very old persons the operation is of little service nor is it so generally successful.—I would limit the operation generally to from the fifth to the sixtieth year of age.

Preparatory Treatment.—If the patient is in health, with no peculiar inflammatory diathesis, no preparatory treatment will be necessary: but if on the contrary he is in any way disordered,

especially if the stomach is suffering, or the bowels; or if general plethora exists, or such a morbid state of the system as, without special derangement of any organ, indicates inflammatory predisposition; the operation should be delayed until by appropriate means a healthy condition is restored. Too little attention, I am persuaded, is paid by operators to that state of the system, which is indicated by no functional or organic disturbance of any internal viscus, but only manifests itself upon the surface by the occurrence of boils, pimples, &c., or by the tardy and painful cicatrization of slight wounds, and is generally accompanied with an unusually good appetite, and unwonted fulness and vigor of the whole body.—Such symptoms so far from indicating, according to popular belief, the existence of high health, do, as I have often had occasion to prove, only announce that condition in which the system is highly charged with the elements of fever and inflammation; and they demand in all cases, at least a respectful attention. Cathartics, low diet, and in some cases bleeding, alteratives &c., are the proper correctives.

Operation.—Various modes are recommended and practiced by the different operators, differing chiefly in the number of assistants, and in the number, kind and complication of the instruments.

Not assuming to criticize the plan of Dieffenbach who employs at least three assistants, and seven instruments in each operation, nor refusing to others much ingenuity and skill in the invention and application of their various instruments, I shall merely describe the few simple rules and instruments which I have found necessary in the operations I have hitherto made.

All violent restraint, by application of straps, or incarceration in sacks, as recommended by Lawrence, and others, I am forced to deprecate; since in the performance of an operation which is mainly for the relief of a deformity, and which neither the health, nor life of the individual renders requisite, and especially in which delay never increases the difficulty or hazard, it is with me an aphorism that the full consent and perfect submission of the patient is necessary.

A small table is placed within reach of the operator's right hand, upon which is arranged a pair of toothed forceps, a pair of probe-pointed curved scissors, a firm steel hook, with its point blunt but sufficiently flattened to enable it readily to pass under the tendon, a basin of warm water, a soft sponge, towels, &c.

The patient should be seated facing a good light, on a chair of such height as that the eyes shall come opposite the eyes of the operator.—

An assistant is then placed behind the patient to steady the head and elevate the upper lid; while the operator, seating himself in front, takes in all cases the forceps in his left hand, the scissors in his right, with the little finger of his left hand resting upon the lower lid and at the same time depressing it, he directs the patient to look steadily (if strabismus *convergens*) outwards; at the same moment he seizes firmly a fold of the conjunctiva near the base of the plica semilunaris about five lines from the cornea, and one line below the transverse axis of the eye, and with the scissors divides it to the extent of half an inch in a perpendicular direction: Having made two or three more incisions in the same direction through the fascia and cellular texture, taking especial care to divide the fascia just below the edge of the tendon that the hook may easily penetrate behind, the forceps may be removed and the eye be permitted to rest a moment.

The wound should now be carefully washed with cold water, and the tendon will generally be distinctly seen. The probe carried in the left hand is then introduced freely below and behind the tendon, and the handle being depressed across the bridge of the nose the point will be made readily to appear above—while if carried directly down upon the face the point

will emerge against the under surface of the upper lid and considerable embarrassment will result. It is not, however, always necessary to see the point of the hook, but if the muscle is well secured, the probe point of the scissors may be introduced and the muscle severed.

If we operate for a slight strabismus, (1st degree) the fascia and cellular texture both in front and behind the muscle must be disturbed as little as possible, and the tendon must be severed between the probe and the cornea. If the strabismus is greater, (2 or 3 degrees) the muscle is to be divided just behind the probe, and if it is a very bad squint, (4th degree) the scissors must be carried two or three lines farther back and the cellular texture and fascia freely incised, exposing at least half an inch of the sclerotic surface.

This will enable us to avoid in a great degree, the danger of an opposite squint in slight cases, and to regulate in general with considerable accuracy the amount of eversion in all cases. If now the eye assumes its natural position and the patient is able to invert it but *slightly*, the operation is complete: for through the contraction of the inner fibres of the rectus superior and and inferior, it will still retain a slight power of inversion. It is already explained that all ca-

ses, taken indiscriminately, are not expected to be relieved; and we are therefore not always to infer because the eye does not resume its position that any bands remain to be divided, if however the inversion has been produced by violent inflammation, or direct mechanical injury of the inner canthus, and after a free division such as we have now directed, the eye still delays to restore itself, the hook may again be introduced, taking care that while we press its point with some degree of force against the ball of the eye to sever from its surface every shred of tendon or condensed cellular texture, we do not press so hard as to penetrate its coat, as has twice been done, or as to wound and inflame the ciliary nerves which course along the outer surface of the sclerotica.

It should also be remembered that in proportion as we enlarge the wound at the inner canthus, will be the size of the subsequent fossa at this point, and the apparent protrusion of the ball.

However much others may choose to complicate this operation by assistants, instruments. &c. I have always found the above simple method the most convenient. The knife is an awkward substitute for the scissors, specula add to the pain of the operation, but it is against sharp pointed

tenacula, recommended by many clever operators to seize and evert the eye, that I enter my loudest protest.

If the patient cannot evert the eye sufficient for the operator to reach the tendon, the operation would generally fail, however thorough the dissection, and if he *will* not, we have no right to compel him with barbarous hooks. The tenaculum adds to the complexity and severity of the operation and may do injury by wounding the sclerotica or by penetrating the choroid coat, and even retina, or by slipping its hold and lacerating the cornea, as in one instance I have myself seen.

The "subconjunctival" mode as it has been termed, was devised by M. Guerin, to avoid the scar and fossa at the inner canthus; and undoubtedly where it can be done, the subsequent deformity will in a few cases be somewhat less, yet it is an error to suppose that the difference will be great, since it is not the conjunctiva but the fascia and other textures underneath, the free incision of which allows the eye to bulge; and the only effect of an extensive incision of the conjunctiva is to increase slightly the depth of the fossa at the inner canthus.

The subconjunctival operation requires much more care and accuracy, and even when the op-

erator has succeeded in dividing the muscle, it will often fail from the limited extent of the dissection among the neighboring tissues. It is liable also to be followed by extensive subconjunctival infiltration of blood or serum.

But slight modifications of the rules we have given for operating in cases of strabismus convergens, will be necessary in the other varieties. Dieffenbach has spoken of the operation for the divergent as more difficult than the convergent. We can see no reason why it should be so considered—the insertion of the tendon is farther back by one or two lines, yet from its situation it is much more accessible. We have neither found the operation as difficult or painful, or attended with as much hæmorrhage, yet it is generally unsuccessful. That variety in which the eye is turned directly up is most difficult, for the tendon is least accessible. In cutting the rectus superior or inferior the hazard of wounding the obliqui is considerable.

Gross would cut both eyes in most cases of strabismus, under the impression that both eyes are generally affected. I have already stated my dissent from this opinion, and will add, that where it does become necessary to operate upon both, I prefer generally delaying the second operation at least three weeks, until the position of

the eye operated upon becomes settled, that I may know better how to proceed with the second.

Directions to the Patient after the operation. Linen cloths wet in moderately cold water should be applied to the eye during the first six or eight hours, chiefly with the view of preventing extravasations, and perhaps somewhat with the view of abatiag the subsequent inflammation. A few hours each day the sound eye must be closed and the eye operated upon employed exclusively: the remainder of the time both eyes may be in use. The patient need not be kept in a dark room, but simply excluded from strong light, wind or dust, and not be permitted to exercise his eyes upon any thing requiring close application. The diet should be light during the first two weeks, and perhaps a gentle laxative may be occasionally necessary. After the second day the eye should be washed gently three or four times a day with tepid water until the wound has healed.

GENERAL RESULTS OF THE OPERATION.

1. The axes of the two eyes become parallel in most cases immediately, rarely yet occcasionally not until after the lapse of a few hours.

2. Vision is improved. Strabismics frequently see double, owing sometimes to the unequal sensibility of the entire retina in the two eyes, or the unequal refracting powers of the humors, &c: in such cases the operation does not remove the diplopy. But when the diplopy is in consequence solely of unequal axes, the two retina possessing equal sensibility, but the image in the sound eye being received upon the most impressible point, while in the distorted eye it is received upon a point less impressible, a restoration of the parallelism immediately or very soon corrects the diplopy.

Myopy, we have already remarked, usually accompanies strabismus, and a section of either of the recti is generally followed by a manifest and immediate extension of vision. We believe the recti act not only as motors and retractors but also as compressors, diminishing when in ac-

tion the transverse diameter of the eye and of course increasing the antero-posterior diameter, and necessarily, according to the laws of optics, producing myopy: the section of either of the recti must therefore shorten the antero-posterior diameter, diminish the convexity of the cornea, and extend vision. We do not deny the agency of other causes in the production of long and short sightedness, but the almost constant results of the operation indicate that in this matter the recti perform a material part.

Amblyopy, or confused vision, easily distinguished from myopy, is also a frequent accompaniment of strabismus; it is attended with a sensation of fatigue whenever an attempt is made to use the eye alone. Amblyopy is generally relieved by a successful operation.

3. Inflammation, extending usually over one half of the conjunctival surface. Not such however as to produce pain, or more than a slight degree of soreness, accompanied after a few days with a moderate purulent discharge from the wounded surface. The inflammation begins to abate, if left to itself, during the 2d week, and mostly disappears at the end of the 3d or 4th week. The *treatment* has already been noticed.

4. A single fungus growth generally arises from the wound, and in the course of 10 or 12

days attains the size of a small pea; having a narrow pedicle and broad flattened summit; soft and flabby, possessing scarcely any sensibility, but red and bleeding easily. If unmolested it usually becomes detached or absorbed by the third or fourth week: but since it always excites some irritation, if it has already attained consi- derable size it must be excised with the scissors and then treated by an occasional application of the nitrate of silver: if seen early, the nitrate of silver alone is sufficient to repress it.

5. Exopthalmia or protrusion of the ball of the eye, with a proportionately increased separation of the lids, occurs probably to some extent in nearly all cases; yet where the distortion was moderate, and the dissection not extensive it is too slight to be readily detected; while in others, it is not observed, because, as is not unfrequently the case, the eye was previously a little sunken.

I know of no means which promise much in the treatment of this defect. Moderate pressure has been suggested, but if made sufficiently firm to effect any good, it must endanger the integrity of the eye and perhaps reproduce the squint.— Mr. Lucas thinks it occasionally diminishes spontaneously, and some of my patients upon whom I noted immediately after the operation a "slight protrusion," now write me that "the eye does

not protrude." It is not improbable that after the separated muscle has renewed its attachment to the ball it will again gradually recover a portion of its retractive power. It may be also that the lids at length come to close over the eye more perfectly, and thus conceal the protrusion.

OCCASIONAL RESULTS.

The parallelism may not be entirely restored: which may be owing to the partial section of the muscle, fascia or cellular texture. In such cases the scissors will complete the operation.—Again, (supposing it to be the convergent form) it may be owing to a contraction of the inner fibres of the rectus superior or inferior, or both. Here it has been recommended to cut these fibres, but without sufficient warrant: for certainly it is not easy to decide whether the persistence of a slight degree of distortion is owing to the action of these muscles or a partial paralysis of the rectus externus; beside it is impossible to estimate how much it will be necessary to cut; we may cut too much or too little, possibly we may entirely sever the muscle before we are aware of it, and

we are not without danger of cutting the obliqui: at all events the dissection must necessarily be extensive and an operation, simple and beautiful when confined within its proper limits, is made by such mutilations complicated and repulsive. We must enter our protest against this and all similar, more than doubtful expedients, to some of which I have yet to allude, which tend only to bring our operations and our art into disrepute.

If the eye does not restore itself because the opposite muscle has become too much elongated, and its contractile power is not complete, time and use may possibly increase its power and straighten the eye; generally, however, time effects but little change in this respect. If the paralysis of the opposite muscle is complete, nothing can be done—the operation was improper.

Generally it happens when the parallelism is not made perfect that the eye operated upon seems straight, but the sound eye is found to converge a little. Whether *both* eyes were originally convergent, or the sound eye became so immediately, in an involuntary effort to restore the old relation of the two axes, is perhaps not easily determined; it may be either. Without settling this question, I have in such cases, where the convergence was yet considerable, operated upon the opposite eye and with most perfect success:

and here the patient has generally the advantage of having both eyes equally prominent.

If after the operation the convergence is slight no second operation should be made upon either eye at any period, since it would be attended with the hazard of producing a "leer."

2. The eye may by even a first operation be made to diverge beyond its proper axis. For this very serious accident we are advised to cut the opposite muscle, and without doubt, the practice does occasionally succeed, but not always; when, then, we consider its uncertainty, the danger of producing permanent vascillation, as I have myself seen, or, as has sometimes happened, permanent immobility, and the certainty that exopthalmia will be produced or increased, giving to the eye a wild, unmeaning stare, we are compelled to place it also among those surgical expedients already alluded to, against which we must enter our decided protest.

Nor does the singular practice of Dieffenbach in such cases induce us to look with any more favor upon the attempt, who, having cut the rectus externus, ties "a thread as fine as a hair upon its tendon,—the portion attached to the ball—and with this pulls the eye forcibly inwards." The end of the thread is then secured to the bridge of the nose with adhesive plaster. In addition to

this he sometimes cuts out a portion of conjunctiva at the inner canthus, depending upon the contraction of the cicatrix to assist in turning the eye back! It is curious that the same operation precisely,—cutting out a portion of the conjunctiva—has been practised for the purpose of *releasing* the eye when it was slightly turned in.—Both, I am satisfied, are empirical, being more likely to fail than to succeed. In short, it is a bad matter, and meddling does not often mend it: perhaps as the muscle on the inner side contracts new adhesions it may be restored, yet often it rather becomes worse than better. Possibly some good may result from frequent attempts to turn the eye inward, or from very moderate pressure on the outside of the ball.

3. The pupil may be made to turn upward and inward. If a free dissection of all the bands of fascia above the tendon does not remedy this, it must be left to itself. It may be certainly cured by cutting the rectus superior, but only at the hazard of producing an obliquity downward and outwards. Fortunately this accident is rare.

4. Vascillation, or a tremulous motion of the eye, such as may be seen in cases of amaurosis, has, in a few instances, resulted from the section of a single muscle. Time generally remedies the fault.

5. Immediately after a successful operation, the eye operated upon is generally able to follow to a limited extent, aided by the action of the rectus superior and inferior, the motions of the opposite eye. Sometimes however, it cannot be rotated at all in the direction of the detached muscle, and this motion is not restored until the muscle has again united itself to the ball. I have never seen this immobility permanent, except where more muscles have been cut than a judicious surgeon would have ventured to cut.

6. Double vision is not uncommon, occurring the moment the eye is straightened, and lasting a few hours, days or weeks, and particularly observed when objects are on the nasal side of the eye operated upon. In a few instances the double vision noticed when looking in this direction has remained permanent.

7. Impairment of vision is too rare properly to deserve a place among the occasional results.

8. Extravasation of blood under the conjunctiva; removed by the absorbents in a few days without treatment.

9. Slight nausea and retching with vertigo, continuing but a few minutes or hours. Sometimes a severe pain in frontal nerve.

10. Opening eye with blunt hook, suppuration and destruction of the eye. Each have been recorded.

11. Return of the squint. This usually occurs within the first two or three weeks, and is most effectually prevented by keeping the eye open and in use, and thus by its opposite motions preventing a too short union of the muscle. If this does not succeed and the squint remains considerable, the parallelism must be restored by cutting the muscle upon the *opposite* eye.

OTHER DISEASES OF THE EYE IN WHICH MYOTOMY HAS BEEN PROPOSED.

It is a venerable and consecrated custom whenever a new remedy or a new operation is presented, to attempt to canonize it at once by representing it as "*the catholicon!*" At present, tenotomy or myotomy, is in the ascendant; and while there are few muscles in the body which the tenotomist's knife has not reached, the number of surgical diseases to which tenotomy is ap-

plied is scarcely less numerous. Among them, we have here to enumerate:

Amaurosis.—Under the impression that certain forms of amaurosis are produced by a spasmodic retraction of the muscles of the eye, Adams, Petrequin, Ruete and others have cut one or more of the recti. Independent of the fact that there is no evidence of the correctness of this doctrine, and the almost uniform want of success where responsible operators have made the attempt, the operation deserves our condemnation on the ground that it is exceedingly liable to produce a strabismus or exopthalmia, or both.

Myopy.—That myopy has in some instances a dependence upon the action of the recti and perhaps the obliqui, we have already expressed our belief, based chiefly upon the effects of our own operations where myopy was associated with strabismus. We have little doubt therefore but that myopy uncomplicated with strabismus might often be remedied or cured by a section of the recti. We declare against the operation, however,

1. Because myopy does not always depend upon this cause: several cases upon which we have operated have not been relieved perceptibly of the myopy And we are inclined to believe

that where strabismus does not also exist, the short vision is even much less frequently a consequence of muscular contraction.

2. As already stated when speaking of amaurosis, the operation is very liable to produce strabismus, exopthalmia, diplopy, &c. Let us read the case reported by Velpeau in his work "du Strabisme ;"published in 1842. M. Velpeau had long been convinced of the action of these muscles in producing *staphyloma*, and he thought—naturally enough—that they might also produce myopy. Accordingly he proceeded to operate upon a man aged forty-six, who had both nystagmus and myopy from infancy. "I practiced," he says, p. 169, "the section of the internal straight muscle of one side only. The next day he could see much farther. I waited twelve days and then cut the external straight muscle in order to correct a strabismus divergens and a troublesome diplopy, *both of which were already established in consequence of the operation*, as well as to complete the operation." Velpeau now ascertained that the myopy had diminished one half, but the diplopy persisted, to relieve which, he next cut the rectus internus of the opposite eye. At first the myopy in this eye diminished also, but soon vision became *vague and confused*, and the double vision which for a while

ceased, again returned. The eye first operated upon now began to *turn in*, and Velpeau cut the rectus internus the second time, but the rectus externus having been also already divided, the eye would not turn back, and he was obliged to force it out by pressure upon the inner side of the ball through the lids. The eyes were now again straight but *almost immovable*, they could neither be turned to the right nor left but very imperfectly.

Six months after, M. Velpeau saw the patient again, and he then had *double vision, confused vision and double strabismus*—"diplopie tres prononcee et une amblyopie incontestable, un leger strabisme convergent l'etait etabli des deux cotes." Again, M. Velpeau divided the rectus internus of both eyes; the eyes became straight but the double and confused vision and the restricted motion persisted: and here the unfortunate patient was left, in a condition infinitely worse than before the first operation.

Vascillitans bulbi.—It has been proposed to cure this affection also by cutting the recti or inferior oblique. Without entering into any examination of the character, causes and probable remedies of vascillitans bulbi, we will merely state that although several operators have made the attempt, not one well attested case of cure

has been published, effected by a section of the muscles.

Section of the muscles has been recommended and practised as a *substitute for artificial pupil.* This idea was first suggested to M. Cunier by the fact that nature occasionally herself produced a strabismus to accommodate the pupil to a partially opaque cornea, bringing the transparent point of the cornea, the pupil, and the retina into the same line. We must not be in haste however to substitute for imperfect vision a deformity so serious; certainly we ought never to make this operation when an artificial pupil will accomplish the same purpose equally well: but when the pupil is *sound* and the opacity of the cornea is exactly in front, an artificial pupil might indeed admit the light as completely as the formation of a squint, yet the impairment of the motions of the iris consequent necessarily upon its laceration, might in the estimation of the surgeon constitute a more weighty objection to this operation, than the deformity produced by a section of a muscle. But if the pupil has already suffered injury, generally the operation for artificial pupil must be preferred.

Before, in any case, we decide to act, it will be prudent to direct the ball steadily, by mechanical means if necessary, in the direction in

which it is proposed to carry it, to determine whether more light will actually be admitted, lest, unfortunately, we produce a squint without any advantage to vision.

CASES.

I have thought that I could in no way render this brief memoir of so much practical value to my pupils, as by a somewhat detailed account of the cases which have been brought before me, many of which they have indeed themselves seen, and will remember when referred to. I consider them of the more value and worthy of record, because I have always been careful to note in a table all material circumstances, both before and after the operation; and from the great majority of them I have received communications after the lapse of months or years, or have been able to see them personally. They may therefore measurably tend to establish certain mooted points in relation to *results*, and which points are of the highest moment to the reputation of the operation.

STRABISMUS INTERNUS.

FIRST DEGREE OF DISTORTION.

Jan. 10, 1842. Miss ——, of Geneva, aged 32; left eye; vision slightly impaired; occurred when quite young; cause unknown; has been gradually getting more straight for several years. Declined operating, as a divergent strabismus might be produced, and a fair probability existed that the eye would eventually adjust itself.

Oct. 29, 1843. J. M., of Clyde, Wayne Co., aged 25; *congenital;* left eye; vision not impaired. Refused to operate.

SECOND DEGREE OF DISTORTION.

Mrs. O'Konolly, Geneva, aged 34; occurred when young; cause unknown; left eye. Operated Jan. 17, 1842; eye became straight; no perceptible exopthalmia; double vision lasting half an hour; vertigo.

Josephus Robison, Taffts village, Vt., aged 35; left eye; produced by a burn and opthalmia when 5 years old; vision impaired. Operated

April 20, 1842; eye became straight, but a slight deviation of opposite eye remained; vision immediately improved. 15 months after operation, Mr. R. writes, "the eye was inflamed about one week; left eye straight; right eye nearly so; no projection of the eye operated upon; vision is much improved; I have never had double vision; I would not change my eyes as they now are, for what they were for five hundred dollars."

George V. Harvey, Woodstock, Vt., aged 9; caused by scarlatina when 4 years old; both eyes; myoptic. Operated April 7, 1842, upon one eye, cutting tendon close to its insertion; eye returned to first degree. Three days after, operated upon opposite eye; restoration complete. In a letter written by the lad himself, 16 months after the operation, he says, "I saw double about one month; my eyes are perfectly straight; vision is some improved; eyes do not protrude."

Maria Halverson, Rochester, N. Y., aged 19; left eye; myoptic; at eight years of age her eye was violently inflamed in consequence of a severe injury, and when it was "uncovered" the eye was turned. Operated Aug. 27, 1843; restoration complete; no perceptible protrusion; for some days saw all distant objects double. Three months after, diplopy had ceased and no deformity existed. A brother has strabismus also.

Joseph Kenyon, jr., Pittsfield, Mass., aged 30; produced by convulsions when 3 or 4 months old; left eye; amblyopic. Operated Sept. 23, 1842; perfectly successful; vision improved. Have not heard from him since.

Eliza Richards, Penfield, aged 35; produced when 3 or 4 years old by "looking at nose;" right eye; myoptic. Operated Jan. 5th, 1843; right eye became straight; left eye turned in very slightly; sight not improved. Five months after, left eye remained slightly turned in; right eye straight; not prominent; vision much improved.

James Knapp, Newark, Ontario Co., aged 18; produced by attempts to "look at nose" when 5 years old; left eye. Operated Jan. 2, 1844; sixteen days after, he writes that the eye is sound and "almost straight;" "it is as strong as ever." His brother has strabismus also.

THIRD DEGREE OF DISTORTION.

William Smith, Castleton, Vt., aged 17; *congenital;* left eye. Operation perfectly successful. Heard of him about one year after operation; no change.

Orson Willis, Lenox, Mass., aged 12; produced when 3 years old by measles; left eye; vision impaired. Operated Oct. 4th, 1841; successful;

vision improved. Four months after operation he writes, "the eye is straight; does not project; do not see double; sight improved one half."

James Harris, Albany, aged 23; produced by "fever" when 2 years old; left eye; myoptic with both eyes, but mostly with left. Operated Oct. 11, 1841; eye became straight; does not protrude; sees double. Have not heard from patient since operation.

Edward Harkness, Rochester, N. Y., aged 7 years; produced by a "fit" when three years old; right eye. Operated Nov. 20, 1841; operation perfect. Have not heard from patient since.

Henry Matson, of Castleton, Vt., aged 22.—Caused by the thrust of a sharp stick into inner canthus when 5 years old; left eye, third degree, myoptic. Operated May 20th, 1841; muscle hypertrophied, eye restored to strabismus 2d degree; vision slightly improved. I regard this as a nearly unsuccessful operation; the adhesions at the inner canthus were too extensive to be relieved. I saw him about one year after the operation and no change had occurred.

Caroline Price, of Rutland, Vt., aged 18.—Commenced when 3 years old "in consequence" says the mother, "of attempting to imitate her father who had strabismus also;" left eye, third degree, myoptic. Operated March, 1841; eye

immediately restored, vision improved, no sensible protrusion of ball; opposite eye turns in very slightly.

Nancy Dunklee, of New Fane, Vt., aged 20. Commenced when one year old, in consequence of inflammation of lungs; left eye, third degree, sight impaired. Operation May 12, 1842; eye became straight, slight exopthalmia, vision not improved. In a letter from this patient fourteen months after the operation, she says, "every thing remains as it was immediately after the operation; I *can now roll my eye either way, but could not before the operation.*"

Mrs. Ann Young, aged 35, from Sherburne, Vt. Caused by opthalmia neonatorum; left eye, 3d degree, myoptic. Mrs. Y. had been operated upon a few weeks previous by an excellent surgeon, but without even a temporary change of position. I operated April 15, 1842, first upon left eye; muscle hypertrophied, eye returned to strabismus 1st degree. I then cut the rectus internus of right eye and the parallelism was immediately restored; sight much improved. A letter dated 15 months after the operation, says, "I have seen double most of the time since the operation, especially when fatigued, or when looking at a distance, yet it is not troublesome; both eyes are straight or nearly so. Sometimes

I think the eye operated upon protrudes a little; vision is improved greatly."

Charlotte Coit, Carthage, aged 21. Left eye; produced by imitating a playmate when 7 years old; occasionally sees double, eye easily fatigued, myoptic. Operation Nov. 25, 1841; eye became straight, vision extended, no double vision, slight exopthalmia.

J. B. Edson, Geneva, aged 31. Right eye; occurred without apparent cause when 15 years old. Father has strabismus also, and one sister; was not living at home at time of commencement of strabismus. I consider this an *hereditary* case, whole family have a nervous temperament. Operation Jan. 9, 1842, completely successful. One year from date of operation, eye remained perfect, no projection.

Martha McPherson, Geneva, right eye, aged 18. Produced by scrofulous opthalmia when 4 years old, vision amblyoptic. Operation Jan. 17, 1842, eye restored, slightly protruded, double vision. In a letter dated six months after operation, she says, "the eye stands out a little; I saw double about three weeks; I think I can see better than before the operation."

Charity Stewart, aged 21, from Montezuma. Operation Jan. 9, 1842, successful. I omitted

in this case and the following, to make the usual memoranda.

Miss ——, in care of Dr. Cady, Sennet, Cayuga Co., aged 20. Operation Jan. 9, 1842, successful.

R. P. Carr, Kingston, U. C,, aged 31. Produced by opthalmia when 4 years old, right eye, vision not impaired perceptibly. Operation March 3, 1842. Muscle hypertrophied, was obliged to expose the sclerotica extensively before the eye began to turn out; shortly after the operation he had a slight *divergence;* next morning eyes parallel, eye protrudes. Have seen him within the last month, eye still protrudes, axes parallel, vision not changed; never saw double.

Irene Harvey, Woodstock, Vt., aged 19.— Her mother says she "saw the strabismus the moment she first opened her eyes;" brother of George Harvey, upon whom I have already operated. Right eye. Operation April 7, 1842. Eye became nearly straight, turns up a little, projects slightly. Her father writes 16 months after operation, "she saw double two or three weeks, the eye is straight except that it turns up a little, it projects a little, vision is greatly improved, she is delighted with the operation."

Sarah Phelps, Rochester, aged 23, left eye. Produced by convulsions when 2 years old, vision impaired. Operation Aug. 21, 1842; eye became nearly straight, vision not improved, slight exopthalmia.

Mr. Evans, from Pomfret, Vt., adult. Operation April 5th, 1842; successful.

E. D. Gibbs, Pittsfield, Mass., aged 41, right eye. Caused by an epileptic convulsion when 16 years old; nearly blind in squint eye. Operated Sept. 23, 1842, cut fasciæ extensively, turned out reluctantly, but at length after several incisions, it became straight; vision improved one half, no diplopy.

Lydia Whitmarsh, Windsor, aged 14. Commenced when three weeks old, both eyes, right eye most turned. Operated Sept. 30, 1842, upon right eye. Perfectly straight, left eye remains at first degree, vision not improved. A letter dated ten months after operation, says, "I have not at any time since the operation seen double, the left eye remains crooked, right eye protrudes a little; I think I can see better than before the operation."

Watts D. Dewey, Richmond, Berkshire Co., aged 23, left eye. Commenced when eight years old, in consequence of close application to study; can see as well with left eye as with right. Ope-

rated Oct. 11, 1842; nearly straight, can see some farther than before operation. In a letter dated 9 months after operation, he writes, "I saw double during the first day or two, and not since. The eyes are exactly parallel and perfect, no protrusion. No one has perhaps stronger vision; my eyes not only look better but feel better. Before the operation, if they were fatigued by constant application, or if I was excited by any cause, there was a feeling of contraction within the eye, which was not only disagreeable but actually painful. I have none of this since the operation."

Patrick Short, Rochester, aged 12, right eye. Produced by opthalmia when 2 years old; scrofulous. Operated Nov. 10, 1842, became nearly straight, slight exopthalmia. Feb. 10th, 1845, the eye remained as immediately after operation; never saw double; were but slightly inflamed by operation.

Graves, Seneca Falls, aged 30. Produced by a burn. Operated Dec. 12, 1842. Having cut the muscle, the eye did not change its position in the least. I then cut the conjunctiva very freely both upward and downward; no change occurring, I proceeded to dissect the fasciæ and cellular texture extensively, and even then the eye moved out but slightly. In about two hours after

the operation the eye became perfectly straight, but the next morning it had nearly resumed its old position! From this time it gradually turned out again until it became finally settled in a position nearly parallel with the opposite eye: a moderate exopthalmia exists. I think I incurred great risk by these extensive dissections, of producing a divergent strabismus. It would have been most prudent after a section of the muscle and fasciæ immediately connected, to have waited for the rectus externus to recover its tone, yet it must not be forgotten that in the large majority of cases, if the eye does not at once resume its position it will not afterwards.

Samuel Norris, Geneva, aged 12, right eye. Operation Dec. 30, 1841; successful. (No farther mem.)

Moses Raymond, Geneva, aged 32. Caused by a severe injury at inner canthus when four years old, myoptic, eye not as prominent as the opposite. Operated Dec. 22, 1842. Eye became straight; as full as opposite. Sight improved.

Stephen T. Hume, of Riga, Monroe Co., aged 22, right eye. Eye became turned during an attack of fever when 4 years old, cannot read or distinguish letters with the affected eye. Operation Oct. 12, 1842; eye became straight, double

vision, sight not improved. Two years after operation, the eye remained straight, no improvement of vision, occasionally saw double during first year, some preternatural sensibility of eye.

Mary Elizabeth Larue, Lyons, aged 7, right eye. Caused by measles when 18 months old. Operation Dec. 29, 1842; completely successful, vision not changed. A letter from the father dated 13 months after the operation, reads, "she saw double two or three weeks; the eyes are perfectly parallel, the right eye is a little the fullest, yet the difference is scarcely perceivable, vision is improved. We would not for any amount of money have it as it was before the operation."

Nancy Ballard, Webster, Monroe Co., aged 19, right eye, immobilis (luscitas) says it is congenital, squint eye myoptic. Operation Feb. 1, 1843; position rectified one half, immediately cut rectus internus of left eye, (more experience has taught me that it is safer to defer the second operation,) parallelism restored at once, sight not improved. Four months after, I learned that the left eye had turned in again slightly and that the right eye remains rather weak.

E. Jane Davis, Mount Morris, aged 16, left eye. Produced by measles when 4 years old.—Operated Aug. 11, 1843; straight, double vision.

She writes me herself, July 29, 1845, "my sight is much improved, though the eye operated upon is rather near sighted, and when using it alone a speck appears directly before the vision. The operation has evidently given more strength to the other eye, so that I can read, &c., without much fatigue. It is perfectly straight, it is rather more prominent than the other, yet not enough to make it appear very different from the other; it looks brighter than before. I can, by an effort, produce the squint, but not without much pain."

Geo. L. Thomas, Mill Port, Chemung Co., aged 19, right eye. Commenced at school when about eight years old; frequently has double vision, myoptic, when not embarrassed the strabismus is slight, and I determined at first not to operate; but after observing the amount of the deformity when disturbed, I concluded to operate, although there was some danger of producing the divergent form. Operation Dec. 26, 1844. Did not cut beyond the muscle, eye became nearly straight, double vision ceased. In reply to my enquiries, he writes 7 months after operation, "eye remains nearly straight, sight is somewhat improved, the occasional double vision has returned, the eyes are so much improved that most people cannot discover they are not perfect."

Edwin Morse, Syracuse, aged 18. Does not know the cause or time of commencement except that he was quite young, right eye, myoptic.—Operation Jan. 12, 1844. Eye at first deviated slightly outwards, but became straight in a few minutes, (the section of fasciæ was quite free,) vision improved, slight exopthalmia. Heard from him three months after, no change.

George Vaness, Geneva, aged 19. Caused by "fits" when 2 years old, left eye, sight imperfect. Operation Feb. 10, 1844. Sight improved, no double vision, no exopthalmia, operation very perfect.

George McDugal, Geneva, aged 25. Duplex, left eye 3d degree, right eye 1st degree, sees best with left, well also with right, can read ordinary long primer type with left alone, occurred when two years old. Operation Jan. 2, 1845. Straight, double vision. Seven months after operation he informs me, "sight is improved, eyes are straight, had double vision until within a short time, has now entirely disappeared, in short my eyes are now perfect, and I feel much pleased with the change."

Sophia S. Travis, Pennyan, aged 8 years.—Caused by a protracted opthalmia when 2 years old, right, myoptic with both eyes but mostly with right. Operated Jan. 15, 1845. Nearly straight,

some exopthalmia. Dr. H. P. Sartwell writes me eight months after, "vision has improved much since the operation, yet both eyes remain myoptic, right eye most so, protrudes considerably, is perfectly straight but has a stare, general appearance of eye much improved, left eye squints a little."

Daughter of Mrs. Mary W. Field, Moravia, 7 years old, left eye. Occurred when 4 years old spontaneously. Operated Jan. 15, 1844.—Obliged to cut twice to release the eye, left became straight and right immediately turned in slightly. Four weeks after the operation, her mother writes, "the eye has not been inflamed except a little in the corner, but it was so weak the first two days, she *could not bear the light to shine upon it but a moment at a time.* It remained perfectly straight about a week, and from that time turned back a little, so that the two eyes are now in the same position, still I think her looks much improved." Three months later, she writes, "three weeks after I wrote you we discovered accidentally that she was *completely blind* with the eye operated upon; the eye has also again become straight. There has been no more inflammation." Again, more than a year after, she writes, "the eye remains the same, perfectly natural, with all the brightness of the

other, yet incapable of seeing. To your enquiry whether, as we discovered it after the operation only accidentally, it might not have existed before, I reply it is possible she might have lost the sight before the operation, yet it is to me rather singular that it should not have been discovered." This is a case to me of great interest, and I regret exceedingly that prior to the operation, we did not make the usual examination as to the amount of vision in the squint eye, as it is not at all impossible that the patient lost the use of this eye three years before, when the squint first occurred, for I find even adults are often much surprised, when we test the defective organ, to find they see so little with it—they have unconsciously always used only the sound eye: it will not be forgotten also that when it was discovered, it was only by accident, and probably some days or weeks after the amaurosis had formed, even if we suppose the operation to have formed it. However, there seems a fair presumption that it *succeeded* the operation, perhaps as a consequence of a retinitis resulting from sympathy with some of the branches of the fifth pair, or from continuity of inflammation through the deeper textures.

Mrs. J. A. Hammond, Rochester, aged 47. Produced when 4 years old by looking out of a carriage at objects almost constantly during a

long journey ; right eye, myoptic, has a chronic conjunctivitis. Operated July 10, 1845; straight, vision improved. About two months after, her son, Dr. C. Hammond, writes : "Vision is now about as before the operation, eye has turned back some, does not protrude ; the chronic opthalmia was not affected by operation; intends to have operation repeated."

Daughter of the Rev. Mr. Clark, of Stockbridge, Mass, aged 10 years. Left eye. Operated Sept. 20, 1841, successful. One year after, remained straight.

Mary A. Gorsline, Phelps, Ontario Co. Operated Dec. 1844. Jan. 20, 1845, she writes, "The sight is not improved, but the eye is straight."

Oct. 20, 1842. Henry Manley, Sandersfield, Berk. Co., aged 6 years, left eye. Caused when 2 years old by a fall upon back of head, followed by squint two days after; has had *occasional* strabismus ever since; *improving;* had a fit one year since. Advised parents to delay operation a few years at least.

Oct. 24, 1842. John Hufnagel, Stockbridge, aged 23. Duplex, sometimes both turn in, sometimes both obliquely out, sometimes one only turns in. Commenced in infancy, was very

feeble in early life, temperament nervous. Declined to operate.

FOURTH DEGREE OF DISTORTION.

Mrs. Granger, Castleton, Vt., aged about 40. Commenced when six years old. Operated May 19, 1841. Cut extensively, eye changed to 2d degree. One year after operation the eye remained in same position, vision improved.

Harriet Barlow, Lee, Mass., aged 24, right eye. Caused by violent opthalmia when 4 years old. Operated Oct. 2, 1841. Straight, and remained so until the 8th day, when on awaking in the morning, she found it turned in again half as much as before. Directed her to close sound and use only squint eye; in 15 days no change; operated upon opposite eye; eyes diverge slightly, very dizzy and faint when she attempts to look, both eyes protrude alike. One year after operation, the eyes perfectly straight and natural, vision improved.

Mary Cox, Rochester, aged 20. Thinks it *congenital;* right eye. Cannot see with this eye sufficiently to walk. Operated Dec. 5, 1841. Restored to second degree. Three weeks after, operated upon *sound* eye; perfectly straight, both protrude equally, motions complete. Saw

her one year after operation, no change had occurred, eyes look well.

Mr. Sharer, aged 40, (operated at Geneva, before the class, Jan. 5th, 1842; saw him only in the operating room, and have never seen him since,) left eye, *immobilis*. Cut very extensively. fibrous bands exceeded in firmness and extent any thing I have ever seen; not the least change produced in the position of the eye, but I dared not continue the dissection farther.

Edmund, of Honeoye (care of Dr. Munson) aged 17, right eye, vision much impaired. Operated Feb. 20, 1842. Nearly straight, slight exopthalmia, vision improved. Two years after, Dr. Munson informed me that the eye was perfectly straight.

John A. Lynd, Pittsfield, Mass., aged 28.—Caused by a "fit" when a year old; sees very little with squint eye. Operated Oct. 27, 1842. Perfectly restored, vision improved.

Lorin Oles, Otis, Mass., aged 21, left eye.—Caused by slight inflammation when five years old, myoptic. Operated Oct. 26, 1842. Restored to 1st degree. Nine months after, he writes, "eyes are now parallel, vision is improved, left eye protrudes a little, have never seen double."

Esther Ann Higbee, Penfield, N. Y., aged 22. Caused when 2 years old by "attempting to look at nose;" right eye, vision not impaired, except as she occasionally sees double. Operated Jan. 5, 1843; right eye protrudes slightly, straight, left eye turns a little, diplopy. Four months after operation, no double vision and eyes perfectly straight.

Dr. A. G. Hall, Rochester, aged 40. Caused by opthalmia when 8 years old; vision imperfect. Operated May 10, 1843. Eye perfectly restored, vision improved, no exopthalmia

A. G. Watson, pedlar, from Montreal, aged 34. Caused by convulsions when one year old; left eye. Operated Jan. 15, 1844. Successful.

EXTERNAL STRABISMUS.

Daniel D. Potter, Pittsford, Vt., aged 25. Caused by a kick of a horse and the consequent opthalmia, when 5 years old. Operated May 25, 1841, restored about one half. Two years after operation he writes: "From the time of the operation for several weeks, I was constantly riding in an open wagon exposed to the sun and dust, yet my eyes were only slightly inflamed. When my eyes become weary I see double and the eyes are not parallel, at other times vision is

correct and the eyes parallel. Eye does not protrude, have not as much double vision as before operation."

C. Harris, Canandaigua, aged 24. Occurred when 5 years old. Operated June 15, 1842. Restored to first degree.

Sylvester Smith, Rochester, aged 25. Left eye, vision impaired. Operated Feb. 15, 1844. Completely unsuccessful, although the tendon fasciæ and conjunctiva were thoroughly divided.

Several more cases of both internal and external strabismus have either been examined by me with a view to an operation or been operated upon, but my memoranda are too incomplete to enable me to report them.