

Concerning the substitutes for enucleation of the eye and the preparation of the stump after complete enucleation : with a description of some of the methods which have been advocated and practiced / by G. E. de Schweinitz.

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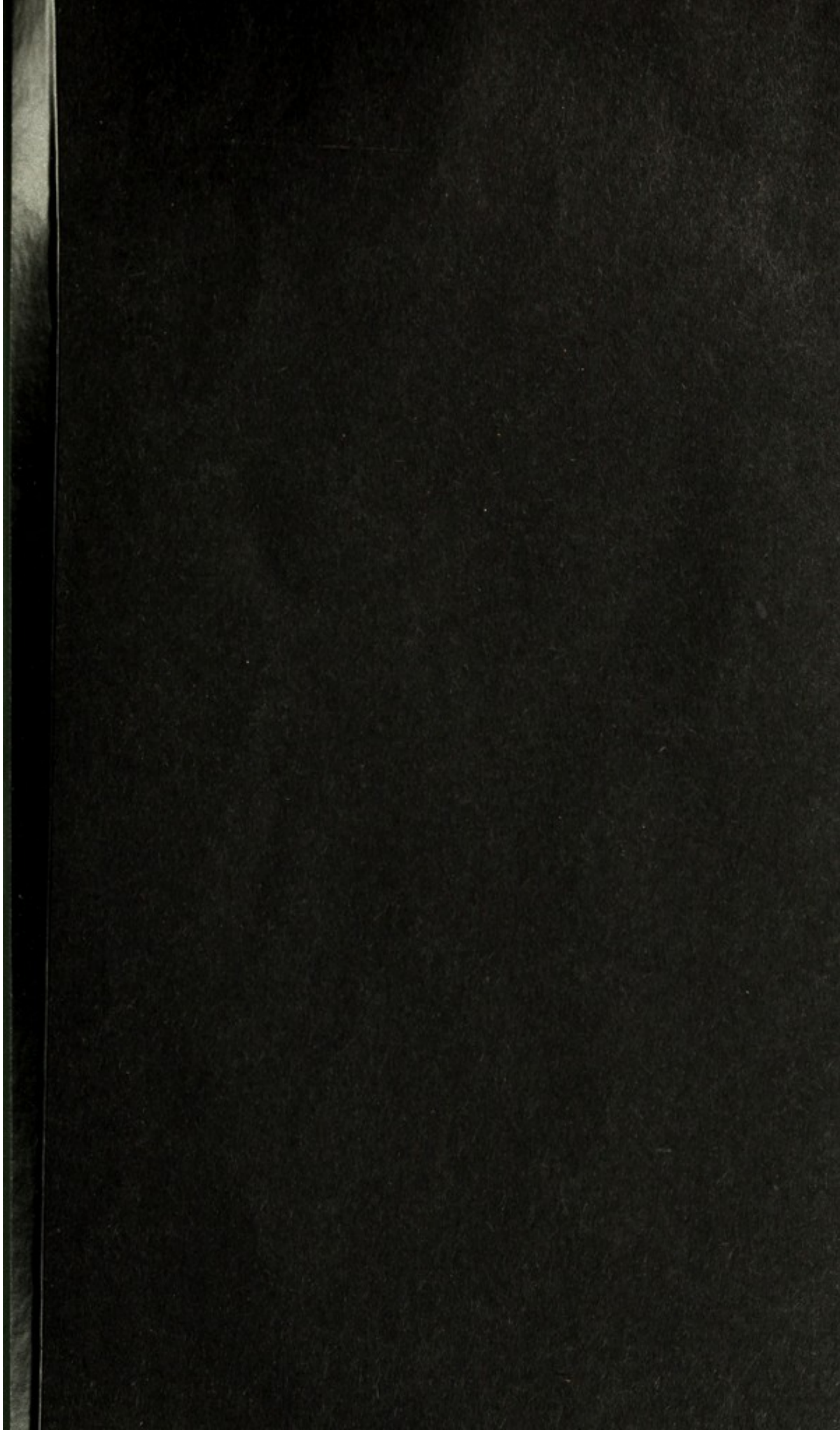
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BY G. E. DE SCHWEINITZ, A.M., M.D.

Although many experienced ophthalmic surgeons are not persuaded that any one of the operations which have been designed to replace enucleation has satisfactorily substantiated its claims, doubtless they all would admit that, from the cosmetic standpoint at least, enucleation leaves much to be desired.

Before discussing modifications of the ordinary methods of enucleation a description of some of its substitutes may be given.

Optico-ciliary neurectomy, except, perhaps, as an occasional preventive of sympathetic trouble when patients decline enucleation, or to relieve the suffering caused by a blind glaucomatous eyeball, is an operation not to be commended. As Noyes says, "at present it does not command general approval." Almost he might have said, I think, "it commands general disapproval," with the exceptions noted.

Sclero-optic neurectomy, designed by Ernest Hall,* is done as follows:

"With speculum in place, the scissors is

* *American Journal of Surgery and Gynecology*, 1895-6, viii, 96; also *Dominion Medical Monthly*, 1896, lvii, 494-98; also *Annals of Surgery*, Philadelphia, 1898, xxvii, 640-642.

inserted about 25 millimeters behind the sclero-corneal junction sufficient to include the ciliary body, and complete section made, thus removing the whole front of the eyeball. The vitreous, choroid, and retina are removed, hemorrhage controlled, and the speculum inserted within the ball, thus holding both eyelids and edges of sclerotic open. The point of entrance of the optic nerve is then grasped with two forceps and the scissors inserted as close to the nerve as is possible to avoid wounding the ciliary arteries, and a circular incision made in the sclerotic, freeing the optic nerve, which is then drawn forward and severed about 25 millimeters from the sclerotic junction, thus removing a section of the optic nerve. The sclerotic and conjunctiva are closed vertically in order to give normal tension to internal and external recti, as lateral movement is of greater importance than vertical. After the artificial eye is adapted there is perfect movement within 35 degrees laterally and 20 degrees vertically."

Under the name *Eviscero-neurotomy*, J. G. Huizinga* describes an operation which he performs according to the following method:

"Having obtained as aseptic a field of operation as is possible, the cornea is amputated and the opening thus made enlarged laterally by slitting the sclerotic up to the insertions of the internal and external recti muscles.

"The contents of the globe are then re-

* *Journal of the American Medical Association*, xxxiv, 1899, p. 394.

moved in the same manner as for simple evisceration.

"While an assistant keeps the mouth of the wound widely open, a pair of forceps is introduced into the inside of the ball, through the opening made by amputation of the cornea, and the sclerotic coat is caught about midway between the equator and the posterior pole, and buttonholed with blunt-pointed scissors.

"This opening is then enlarged laterally, parallel with the equator, until it has encircled one-half of the ball. A blunt, curved enucleation scissors is then introduced through this opening and passed back of the globe, and the optic and ciliary nerves are severed. Having thus loosened the eyeball posteriorly, this part can then be drawn forward up to the corneal opening by partly everting the sclerotic from behind by the aid of forceps, and that part of it, including the nerves, is removed by continuing the cut parallel with the equator until it extends entirely around the eye. In this manner the posterior segment of the eye, a section somewhat larger than the cornea, is removed, and all nerve connection thoroughly and permanently obliterated, while the rest of the sclerotic with its muscle attachments is allowed to remain.

"The introduction of an artificial vitreous is very desirable, notwithstanding the fact that it is not always retained, and the difficulty occasionally experienced to obtain prompt and perfect union. The use of the fenestrated aluminum ball in connection with this operation, as advised by Bryant in implantation, ought also to be followed by

good results. As a segment of the sclerotic has been removed, there is no longer any reason why the inside of such a sphere should not fill in with new connective tissue, which, being continuous with that of the orbit, would prevent its extrusion.

"The wound is closed with five silk sutures, and the after-treatment is the same as in evisceration. The local reaction following this operation has in no case been as severe as that following simple evisceration. In fact, I should say that it has been no more severe than after enucleation."

It will be observed that this procedure is in all its essential features the same as the one practiced by E. Hall, except that Dr. Hui-zinga removes a larger posterior segment of the eye and terminates the operation by the insertion of an artificial vitreous. Evidently by both of these methods it is hoped to secure the advantages of evisceration with and without the insertion of a globe, and escape the dangers, however remote, of sympathetic irritation or inflammation.

Simple evisceration, except that it has a well-defined reputation in the treatment of suppurating panophthalmitis, has not much to commend it as a substitute for enucleation in so far as the subsequent mobility of the prosthesis or the cosmetic result is concerned. Doubtless, primarily, the stump after evisceration is superior to that after enucleation; but later it contracts and shrinks, and ultimately transmits to the shell no greater movement than is transmitted by the stump of a well-performed enucleation.

Evisceration, with the insertion of an arti-

ficial vitreous, either glass or metal, generally known as Mules's operation, yields a better stump and better cosmetic results than those secured by other operations, except, perhaps, successful cases of abscission. It is unnecessary to point out in detail the advantages of this operation; they are too well known to need repetition here. But the operation fails in a certain percentage of cases (about 20 per cent*) and is not always considered safe, at least not by all surgeons. Thus, many operators would not perform this operation on an eye which has excited or is exciting sympathetic irritation, although others of great experience in this line of surgery—for example, Brudenell Carter, L. Webster Fox, Frank Allport, and Frank Buller—do not recognize this contraindication. The operation should not be performed upon an eye that has excited sympathetic ophthalmitis, and it does not do well, usually, where there is extensive laceration of the sclera after injury, or where the eyeball is much shrunk and its contents have undergone calcareous or osseous change.

Implantation of a glass globe into Tenon's capsule (Adams Frost's operation). This operation, originally suggested by W. Adams Frost† in April, 1886, was performed by him as follows:

“The conjunctiva having been divided in the usual way, each rectus in succession was

* This percentage is obtained from a large number of operations; several operators have reported a much higher percentage of success; a few with a small series of operations have had no failures.

† Middlemore Prize Essay, British Medical Association, 1886; also *British Medical Journal*, 1887, i, p. 1153.

seized with forceps, divided, and secured by a ligature passed through it and the conjunctiva; the enucleation was then completed, the four recti being held apart by means of the sutures. Mules's sphere was introduced into the capsule of Tenon without any difficulty; opposite recti, with the conjunctiva, were then united across it by passing one of the ligatures through the opposite tendon, the other ligature being then removed."

This method Frost employed in his first case, but thought it defective, as the ball came out on the fourth day. He then suggested that a single suture for each pair of muscles was insufficient, and advised that the muscles should be sutured first with cat-gut and the conjunctiva afterwards.

This operation has been practiced extensively in England by Mr. William Lang,* in Moorfields Hospital. In his method the artificial globe is placed in the socket, and Tenon's capsule united horizontally by three fine silk sutures. The central stitch is placed at about the point of section of the superior and inferior recti, well away from the cut edge of the conjunctiva, and the others on either side at the same depth. A few horse-hairs put under these sutures act as a drain. The cut edge of the conjunctiva is united horizontally by three more sutures.

In 1897 Dr. H. McI. Morton,† evidently unacquainted with the Frost and Lang methods of implantation, described an exactly similar operation. His method of tying the

* *Trans. Ophth. Soc. of the U. K.*, vii, 1887, p. 242.

† *New York Medical Journal*, Oct 30, 1897.

sutures, however, upon the importance of which he lays great stress, differs from theirs. He thus describes his operation:

"The patient being anesthetized, a circular incision is made in the conjunctiva close to the corneal limbus. The internal rectus is dissected free from surrounding tissues up to its attachment to the globe, and held by a pair of advancement forceps, after which it is cut close to the sclera. A double needle catgut suture is passed from within outward, enclosing the central bundle of the tendon, and tied to its external surface. The ends of the suture, which are cut to a generous length, are now laid aside to the nasal side of the field of operation. The external, the superior, and inferior recti are treated in a similar manner. The globe is removed and a glass sphere is placed in the cavity.

"The sutures holding the externus and the internus are now taken by the operator, the assistant taking at the same time the sutures retaining the superior and inferior recti. Before the second turn is made in the sutures held by the operator, the assistant ties the sutures together, and these are enclosed in the final turn of the knot holding the external and internal recti. The sutures are now enclosed in a common knot at their intersection."

In 1898 J. W. Barrett* suggested a method for inserting the sutures after the introduction of artificial globes into Tenon's capsule, which later he modified in the following manner:

"The operation of enucleation is pro-

* *Intercolonial Medical Journal of Australasia*, 1898, iii, 210.

ceeded with in the usual way. Then the needle is passed in through the conjunctiva about ten millimeters from the cut edge, in the position of the tendon of the inferior rectus. It is then passed from within outwards, in the position of the external rectus, at the same distance from the cut edge, back from without inwards in almost the same position; it is then passed from within outwards and back again, in the position of the superior rectus and of the external rectus, and finally from within outwards, in the position of the inferior rectus, so that the two ends of the suture are close together. The globe is inserted and the suture is tightly tied. The conjunctiva, capsule of Tenon, and tendinous expansion of the muscles are therefore drawn firmly in front of the globe, and about ten millimeters of conjunctiva and capsule are loose in front of suture. The edges of the conjunctiva are now joined by a fine suture."

In April, 1899, Dr. C. A. Oliver* advocated another modification of arranging the sutures in this operation. His method is thus described:

"After freeing the conjunctiva from the globe at the corneal limbus and dissecting it back so as to expose the tendons of the four recti muscles, each of the lateral muscle tendons is secured by a long, continuous catgut suture, and freed from the eyeball. The vertical recti muscles are dealt with in the same way. Working in between the broad loops of catgut holding the ends of the

* *Philadelphia Medical Journal*, 1899.

muscles, the eyeball is enucleated without difficulty. The capsular cavity is thoroughly cleansed, and a glass ball which is water-tight and about three-fourths the size of the normal globe is placed in the situation previously occupied by the globe. The cut ends of the lateral recti are sutured together, followed by the vertical recti, thus enclosing the sphere within Tenon's capsule. The cut edges of the overlying conjunctiva are brought together by a series of silk threads, and the operative field is covered by a gauze protective bandage upon which iced compresses are placed."

It will be observed that these operations differ from Frost's method only in the manner of applying the sutures.

Usually the implanted ball has been glass, but sometimes celluloid or silver. Fenestrated aluminum spheres were advocated and tried by D. C. Bryant,* and small balls of silk by Bourgeois.†

The implantation in the orbit of a piece of sponge after enucleation of the eyeball, on the basis of experiments on animals, was originally suggested in 1889 by J. Herbert Claiborne, Jr.,‡ and seven years later was again described and practiced by E. Oliver Belt in 1896.¶ This operation has also been tried in this city by S. D. Risley§, in

* *Transactions of the Section on Ophthalmology, A. M. A.*, 1898, p. 117.

† *Clin. Ophth.*, Paris, 1898, iv, pp. 111-113.

‡ *Gaillard's Medical Journal*, May, 1889.

¶ *Journal of the American Medical Association*, Nov. 7, 1896; *Medical News*, June 27, 1896.

§ *University Medical Magazine*, September, 1898; *ibid*, May, 1899.

New York by H. D. Noyes, in Boston by H. B. Chandler, and in Paris by Trousseau.* It is not likely to find a permanent place in ophthalmic surgery. In other words, the late results of this operation, judging from Dr. Risley's case, are no better than those of a well-performed enucleation, while the period of convalescence is too prolonged to be satisfactory. Dr. G. Suker informs me that recently he has practiced with good results a modified Belt's operation; that is, he inserts a small glass globe within the sponge, and then brings the muscles over the stump in pairs, and finally the conjunctiva over this.

Abscission, according to the Critchett, Knapp, De Wecker, or J. H. Thompson methods, or the more recently described operation of Panas, to which he has given the name *complete keratectomy*, furnishes an admirable stump; in fact, from the cosmetic standpoint it yields a better result than any other operation except a perfect Mules. It is, however, an operation which is limited in its applications, and would seem to be chiefly permissible in cases of staphylomatous eyes when all traces of disease in the anterior portion of the eye have disappeared. Even the most experienced operators—for example, Knapp—while they may not have met with sympathetic ophthalmitis after this operation, feel that they must warn that such a contingency is possible, and that calcareous and osseous change may occur in the stump, rendering later enucleation necessary. The

* *Annales d'Oculistique*, cxviii, 1897, p. 417.

operation would seem to commend³ itself particularly in dealing with staphylomas in children.

While freely admitting the great cosmetic advantages of at least three of the operations which have been advocated and practiced in place of enucleation, one of which I have performed a number of times with the greatest satisfaction, I am far from persuaded that complete removal of the eyeball is likely soon to be driven from the company of ophthalmic operative procedures. Indeed, it is manifestly unjustifiable to state, as Morton has, that enucleation is not a proper surgical procedure. Therefore, if there are any methods of preparing the stump which are an advantage over those which we now possess, it is worth while to review them.

In a well-performed enucleation the operator disturbs as little as possible the relations existing between the conjunctiva, the capsule of Tenon, and the ocular muscles, and shells out the eyeball as cleanly as possible, saving each bit of tissue which may enhance the size of the stump.

Subsequent suturing of the conjunctiva is a common but not universal practice, although few, like Czermak, would be willing to state that it does not hasten recovery and that it occasions diminution of the stump—a statement certainly not in accord with the general experience. The sutures have usually been interrupted ones placed in a horizontal line, or, as Meyer* insists is the only proper

**Rev. Générale d'Ophthalmologie*, May, 1898. It is not clear why sutures so placed should have this effect.

method, in a vertical direction, so that the insertions of the external and internal recti shall not be approximated and the lateral rotation of the stump limited. Sometimes one is inserted as is the draw-string of a purse. The last method of suturing was long ago advocated by De Wecker,* who says: "I am accustomed to terminate the operation by passing a needle armed with a thread of waxed silk through the various folds of conjunctiva which cling around the wound. I gather up the pericorneal conjunctiva on the needle, and when these folds have been threaded like a purse I simply draw on the two ends of the waxed thread and cut but do not knot it." It does not positively appear whether the muscles are included in this draw-string or not, but apparently not. For reasons which will appear more distinctly later such inclusion of the muscles is important.

This it would seem H. V. Würdemann† realized when he designed his method of closing the conjunctival wound, which is exactly similar to De Wecker's except in this important particular. He thus describes his method:

"After removal of the eyeball, with a large needle and catgut stitch I make a pouch suture by weaving the needle along the cut edge of the divided conjunctiva and Tenon's capsule. In passing the recti tendons, each one is picked up on the needle. This suture acts as a draw-string in a bag." This opera-

* *Ocular Therapeutics*: edited by Litton Forbes, London, 1879, 512.

† *Ophthalmic Record*, iii, 1893-94, 177.

tion Dr. Würdemann has been practicing for ten years; prompt healing and satisfactory prothesis are claimed.

A few years later G. H. Suker* suggested the following method of forming the stump after an enucleation:

"Prepare the field of operation as is your custom; divide the conjunctiva as close to the cornea as possible, and dissect it as far back as permissible; do the same with the capsule of Tenon. Cut the recti muscles as close to their insertion as possible. Insert into each rectus muscle a black silk suture at the time it is cut. This is to act as a guide. Proceed now as is customary—*i.e.*, severing the nerve and oblique muscles. After removing the eye, take a thoroughly sterilized catgut suture and pass it through the severed ends of the rectus externus and internus, which have previously been brought together by the silk suture guides. Now bring the superior and inferior recti down and pass a catgut suture through them. Finally suture the four together and remove the silk guides. Thoroughly irrigate your cavity with sterilized water. At the last bring the conjunctiva from above and below over the muscle stump and suture same with a continuous suture, but be sure you fasten it to the muscle stump. The use of the catgut sutures for the muscles is quite obvious, while you may use silk thread or catgut on the conjunctiva. Leave only a small part unsutured at either canthal end of the conjunctiva as a provisional drainage opening."

**Annals of Ophthalmology and Otology*, iv, 1895, 484.

Dr. Suker maintains that the stump thus formed transmits freer movement to the shell than an ordinary stump, and that it obviates in part the shrunken appearance so often presented by artificial eyes. I have twice operated in a manner analogous to this and the result was satisfactory, although I am unprepared to say whether ultimately it will be more satisfactory than is the result of an ordinary carefully performed enucleation.

In 1897 H. Schmidt in Aachen* suggested a method of enucleation with movable prosthesis which I give somewhat in detail by a rather literal translation of his own words:†

"After the conjunctiva had been divided close to the margin of the cornea around its entire circumference and undermined in every direction for a distance of about one centimeter, I caused the globe to rotate downwards by means of a sharp hook inserted into the sclera, seized the superior rectus with a pair of forceps, made an incision into the tendon in front of the forceps, as in performing an ordinary tenotomy, and drew a moderately fine catgut ligature through the tendon or muscle immediately behind the forceps; then I proceeded in the same way with the inferior, external, and in-

* *Monatsbl. f. Augenheilk.*, xxxv, 1897, p. 383.

† This translation is given so that each reader may make his own interpretation; because, as Priestley Smith says (*Ophthalmic Review*, xvi, 1897, p. 389), the description of the method is somewhat difficult to understand. De Wecker also found points of obscurity in the description and wrote for further information, which is given in a letter by Schmidt published in the *Monatsbl. f. Augenheilk.*, xxxvi, 1898, p. 67.

ternal recti. Next I severed the tendons completely from the sclera in the same order, and thus retained the globe in its normal position up to this stage of the operation and materially facilitated the prompt finding of the insertions. After I had by means of lateral incisions exposed the muscle for a distance of $\frac{1}{2}$ to $\frac{3}{4}$ centimeter backward (from its insertion), I caused it to be drawn lightly away from the globe in a vertical or horizontal direction by means of the catgut loop, so as to stretch the overlying conjunctiva, seized the latter and made an incision about $\frac{3}{4}$ centimeter in length with straight scissors at a point corresponding exactly to the middle of the muscle. Then I divided the optic nerve and the insertions of the oblique muscles and removed the globe. After arresting the bleeding, I first sewed the anterior extremity of the superior rectus into the conjunctival incision, passing each end of the suture through a separate needle and inserting the needles on either side of the angle of the wound from (the side of) the wound surface, and bringing them out about two millimeters above the angle of the wound and at a distance of three to four millimeters from each other. The sutures were tied at once, one end being left longer than the other and the short end only cut off. I proceeded in the same way with the three other muscles, with only this difference, that I sewed in the externus and internus under slight tension and therefore lengthened the incision in the conjunctiva somewhat, if it was found to be too short. Then I used

the long uncut ends of the sutures to close the conjunctival incisions with a continuous suture, beginning at the angles of the wounds, and tied the corresponding ends together. The background of the conjunctival sac now presented a cross formed by the vertical and horizontal sutures, at the four extremities of which the straight muscles were inserted at intervals of one to one and one-half centimeters from one another. Finally I packed the conjunctival sac with a narrow strip of gauze in order to force the conjunctiva to lie smooth in every direction, and applied a binocle, which was not changed until the fifth day, when it was replaced by a monocle. The wound healed in from seven to eight days, when the patient was discharged; the time required was, therefore, not much longer than after a simple enucleation."

Dr. H. F. Hansell informs me that he has operated according to Schmidt's method with entire satisfaction.

Acting on Schmidt's suggestion, Priestley Smith* has described a method of suturing the tendons to the conjunctiva after enucleation, as follows:

"The speculum having been introduced, the globe is rotated strongly outwards either with forceps or, more conveniently in some cases, by pressing the convexity of a strabismus hook deeply into the sulcus at the external canthus. A narrow horizontal fold of the conjunctiva over the internal rectus is then pinched up so as to include the sub-

* *Ophthalmic Review*, xviii, 1899, p. 123.

jacent connective tissue and muscle, and a black silk suture is carried through these structures by means of a curved needle. To pinch up the muscle it is necessary to use very fine forceps with sharp teeth, like those introduced by Stevens, of New York, and to press the tips firmly into the tissues. The suture is then tied firmly, but not too tightly, with a double knot, and cut off not too short. A second suture is applied in like manner to the external rectus. The upper and lower recti may be treated in the same way, but this is of less importance. The enucleation is then carried out with the precautions above referred to, and with special care not to cut the sutures while severing the attachments of the tendons. Lastly, the conjunctival aperture may or may not be closed by one or more vertical sutures."

The effect of this operation, according to its author, is to give greater mobility to the conjunctival bed, at least during the first few days after the operation, than is usual after ordinary enucleation. Incidentally it may be remarked that Mr. Smith commends Snellen's thickened artificial eyes.

In my earlier surgical experience I was unaccustomed after enucleation to employ sutures, and I must say that in many cases the result was admirable, but in many others the enophthalmic appearance and staring eyeball were most distressing. For some years I have practiced suturing of the conjunctiva in the ordinary manner, and for the last year have made these sutures retain the muscle in contact with the conjunctiva, very much after the manner described by Schmidt

and Priestley Smith. Briefly, I operate as follows:

After insertion of a speculum which widely separates the lids, the conjunctiva is divided as close as possible to the corneal margin; each rectus tendon is next exposed and caught upon a hook, precisely as in the operation for strabismus, and is secured with a double-armed black silk suture, which is knotted upon it. The eyeball is now enucleated with the least possible disturbance of the relations between the conjunctiva and the underlying structures, and a small ball of sterilized gauze is inserted into the capsule of Tenon, precisely in the manner in which a Mules sphere would be so placed in the operation of implantation. Each rectus tendon is now drawn forward to the edge of the cut conjunctiva and securely fastened with the ends of the same suture which had originally secured the tendon and which have been left long. That is to say, the tendon is brought forward precisely as it would be in the operation of advancement. The wad of sterilized gauze, which has served its purpose of checking entirely the hemorrhage and keeping for the time being the cavity bulged out as it was when occupied by the globe, and therefore facilitating the advancement of the tendons, is now removed, and the edges of the conjunctiva and capsule of Tenon are united with interrupted sutures.

Primarily the movement of the conjunctival bed is certainly very much greater than after ordinary enucleation, as Schmidt, Suker, Priestley Smith, and all others who have so sutured the tendons have found. Indeed,

this is to be expected, as we know that the capsule of Tenon moves freely with the movements of the eye, but that the eye does not move freely in the capsule. Now although the eye is gone, the movement of the conjunctival bed is brought about by the contractions of the straight muscles which have been sutured to it. Certainly it is reasonable to suppose that sutures, which may be applied in any of the ways described, will prevent the tendons from retracting, which they will do to the extent of seven to ten millimeters (Bock, Meyer) after ordinary enucleation. This retraction Meyer* thinks he prevents without suturing the tendons by great care in removing the eyeball, and thus preserving intact the adherence between the conjunctiva and the surface of the muscles. Whether the later results of these operations will be no better than after enucleation I cannot say, as sufficient time has not yet elapsed to establish this point.†

The rotations of the shell placed upon the stump of several such cases exceed those usually obtained after ordinary enucleations, are practically equal to those after the best eviscerations, and are better than those after some eviscerations; but they are not equivalent to those after the best Mules operations, although they quite equal those after some Mules operations. If these facts are put in a tabular manner, we have the following:

* *Loc. cit.*

† In one case five months after the operation the original good result remains.

	Out.	Up.	In.	Down.	Remarks.
Average rotations.....	45	31	50	55	Average of Landolt's and Stevens's measurements.
Rotations after enucleation with suture of tendons.....	19	22	20	50	Average of three cases.
Evisceration.....	15	18	23	35	Average of Truc's and my measures.
Enucleation without suture of tendons.....	15	15	12	25	Average of Truc's and my measures.
Mules's operation.....	25	30	23	58	Average of my cases.

But the transmission of increased movement to the shell after a Mules operation is only one of the gains in the enhanced cosmetic result, the other two important ones being the preservation of the natural contour of the lids and the absence of unhealthy conjunctival secretion.

It seems to me after enucleation performed in the manner just described, that the upper lid sulcus is not so pronounced and that there is less abnormality of conjunctival secretion than after the ordinary operation for complete removal of the eyeball.

In conclusion I wish to express my belief, which is held by many other surgeons, that even omitting all forms of morbid growths, the operation of enucleation in many instances cannot be banished from the list of ophthalmic operations, and that while at the present time such operations as evisceration with the insertion of an artificial vitreous, abscission, and perhaps the implantation of various forms of globes in Tenon's capsule, furnish better cosmetic results when they are successful than the best performed enucleation can give, there is reason to believe that with improvement in artificial eyes and improved technique in preparation of the stump for the reception of these eyes, an almost equal improvement may be expected after so-called simple enucleation.

To remove the sunken appearance of artificial eyes which have been placed upon a poor stump after enucleation, Dr. L. Webster Fox practices his operation of implantation of a glass ball in the socket, and has reported most gratifying success. It would seem that

exactly the same effect ought to be secured by filling the concavity of the ordinary shell with wax or similar preparation, as has been done by Snellen,* Ira Lyons,† and others, or with the eyes which have been described by Dr. Snellen.

If, however, better results can be obtained by Fox's operation, there is no reason why it should not be more frequently performed.

**Klin. Monatsbl. f. Augenheilk.*, xxxvii, 1899, p. 71.

†*Ophthalmic Record*, viii, 1899, p. 522.



