

are less nervous and not so depressed and apprehensive as when kept quiet in bed for some time after the operation, which latter I think every cataract patient without a suture or a good conjunctival flap should be.

DR. C. H. WILLIAMS, Boston: It was my good fortune in years gone by to assist my father, H. W. Williams, in a number of cataract operations in which he used the suture in the cornea. He preferred the corneal section known as the Le Brun section, which was made entirely in the cornea, upward, the apex of the cut being just above the edge of the moderately dilated pupil, giving a large corneal wound. The suture was placed at the apex of the cut. The success of the operation depended very largely on the needle used. The needle was flat with an extremely sharp point and a cutting edge one-fourth of the length of the needle, as sharp as a cataract knife. The needle was $\frac{1}{4}$ inch long and an ordinary forceps with straight points about $\frac{1}{8}$ inch wide, strong and roughened on the surface, was used for the needle holder. There was no catch and no jump when the forceps released the needle. The suture was a single strand of the finest sewing silk. The ideal position of the suture was to pass the needle through the apex of the lower corneal flap, going in through the corneal epithelium a little more than 1 mm. from the edge of the cut surface and bringing it out on the cut surface before reaching the membrane of Descemet. The needle was again entered in the upper flap just outside the membrane of Descemet and brought out on the corneal surface, and the ends tied. The suture caused very little irritation. It was removed generally on the third day and kept the edges of the corneal wound in apposition until the process of healing had glued them together. The wound being entirely in the cornea, and not near the plane of the iris, there was very little trouble from iris prolapse. He generally avoided attempts to remove the last particles of cortical substance. The results he got were generally very satisfactory. We have with us to-day Dr. Post whose father had an extraction of this sort done on both eyes years ago and he can tell you something of the operation, the healing and the question of irritation from the stitch. The first cases reported were in 1807 when there was no cocaine anesthesia. A number of operations were done under ether, but a number were also done without any anesthetic. The insertion of this suture was not easy. It required very delicate handling, and for that reason was never generally adopted. I do not remember my father's using the conjunctival suture. I do not think he used the corneal suture in the later years of his life, but he did use it during most of his active practice. When the operation of extraction with iridectomy was the generally adopted method he preferred to keep on with the simple extraction, which, under his hands, had given such good results. I afterward used the conjunctival suture.

DR. M. H. POST, St. Louis: Historically I think the operation referred to on my father occurred in 1804. The operation was done without an anesthetic and with no iridectomy, and was done at different times on both eyes. The result was ideal, with perfectly mobile pupils and with vision normal. The operation was done when he was about 55 years old. He lived to be 76 years old. After the operations which had to be done in connection with the first operation, a needling, the eyes were never subjected to anything but the fitting of glasses, and up to the time of his death he read with perfect ease, comfort, and with very great accuracy. At the time of the operation he was confined to bed and as I recollect, his hands were confined. He said the pain of the operation was nothing compared with the pain of confinement to his back with his hands tied down.

DR. WILLIAM H. BATES, New York: I read of this suture in the publications of Dr. Williams and Dr. Kalt and it looked very promising to me. So I went to Dr. Prudden of the College of Physicians and Surgeons, and in his pathologic laboratory did some experimental work for five years on the rabbit. It is very difficult to remove the lens from a rabbit. In the first place the cornea is about one-eighth of the thickness of the human cornea. The lens of the rabbit is very much larger than that of the human eye, the anterior

chamber is deep and the operation is altogether very difficult, and during the healing afterward ordinarily one obtains a tremendous amount of reaction and a very dense secondary cataract.

I found very soon that I would need more than one suture, generally five or six, or sometimes more, but I was able to produce a water-tight closure of the wound and then by restoring the anterior chamber with normal salt solution in favorable cases I was able to obtain at the time of operation a clear, round, dilated pupil, and the healing followed without the formation of much if any secondary cataract. In some of my rabbits examined under the microscope there was no secondary cataract. After this work it seemed to me that if this suture was so necessary and yielded such wonderful results in the rabbit, in the human eye it would be equally advantageous, and I read a paper before the Ophthalmologic Section of the Academy of Medicine, recommending that this suture be used as was advised by Kalt and Dr. Williams before him. I had a talk with Dr. Herman Knapp and he told me that Schweiger had tried it in some thirty cases, a report of which was published in the *Archives of Ophthalmology*, but he had abandoned it. He said, "Why would you use it in the human eye when we get such good results with the old-fashioned operation, and the suture does not offer any advantages? It complicates the operation."

I tried it on the human eye and I must confess that I have abandoned its use, and believe that it is generally unnecessary.

DR. E. C. ELLETT, Memphis, Tenn.: I purposely omitted any reference to the conjunctival suture as I did not think that exactly bore on this matter. In one of the two papers of Dr. Williams' father I am positive he says, "I have lately been in the habit of extending this incision to include a conjunctival flap, and place the suture in its apex." But, of course, how much that was his practice or for how long he employed it I have no way of knowing. I would like to acknowledge my indebtedness to Dr. Bates' paper, to which he has referred, for a good deal of the information as to what had been done on this subject. If I remember rightly, Dr. Bates was under the impression that this in and out suture would not answer, because instead of producing apposition of the edges of the wound it would turn them in, and he advocated a through and through suture; but that probably was due to the difference in the thickness of the rabbit's and the human cornea, and the thinner cornea might readily be turned in that way, but I do not think that is apt to occur with the human cornea.

PREPARATORY CAPSULOTOMY IN EXTRACTION OF IMMATURE SENILE CATARACT

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Except to those who are prepared to extract any and every cataractous lens in its capsule, the retention of gelatinous cortex and the presence of portions of the anterior capsule blocking the pupillary area are matters of serious concern, and any procedure which will cause that loosening or complete separation of the capsule from the underlying capsule which accompanies clinical maturity must be greeted as a marked benefit and advance in method. The ripening operations which were in vogue some years ago do not seem to have remained in favor. Massage of the lens is carried out, it is true, by some operators where preliminary iridectomy is performed, but the results do not indicate any very decided, uniform or reliable effect. The only mechanically effectual procedure, that of MacKeown,

consisted in injecting fluid directly under the lens capsule and was, obviously, too dangerous to gain popularity. None of the other methods was reliable and all were slow, if effectual at all. In June, 1911, my attention was attracted by Dr. Homer Smith's essay, to which the Lucien Howe prize had been awarded, in which capsulotomy was advocated as a means of rapidly maturing senile cataract and facilitating its immediate extraction. I was not able to test this procedure for some time, but my first experience was so favorable that I determined to apply it more frequently.

It has seemed to me worth while to give a brief survey of earlier publications on this and similar procedures and to have an exchange of views on the merits of this method and on the results obtained by various operators. I am convinced that it is of the greatest value and, although my experience is very limited, the procedure seems to me to solve an operative problem which is not without its social and economic bearings.

Von Graefe and Mannhardt¹ advised puncture of the anterior capsule three to ten days before extraction in immature cataracts, for the purpose of causing complete opacification of the still transparent clear cortical masses in unripe cataract. This operation was reintroduced by Correnti,² in 1872, in a paper which speaks of the procedure as "opening of the anterior capsule preparatory to the extraction of cataract."

"Primary capsule rupture" is the name by which Drake-Brockman³ designated this method of operation in a series of case reports.

The initial step of the operation is a division of the lens capsule by a stop-needle, the pupil having been previously fully dilated by atropin. This plan he adopted at first in the case of Morgagnian cataracts in order to gain a more exact knowledge of the size of the nucleus, and accordingly to limit the section through the cornea. The risks attending the removal of cataract are hereby greatly lessened and the escape of the cataract is facilitated. Drake-Brockman subsequently applied this method of operative procedure to all kinds of cataract and found that the results justified a continuance in the operation. He says: "In no other kind of operation can either so large a surface of the lens capsule be exposed for division by the cystotome, or the iris be kept away from the lens and be rendered less liable to an injury in the division of the capsule." As soon as the nucleus in a Morgagnian cataract has escaped into the anterior chamber, it can be more readily examined as to its size, and the corneal incision can more accurately be made to permit of the escape of that body. The advantages of this plan are:

1. It allows a more extensive laceration of the capsule at the same time that the anterior chamber remains replete with its fluid.

2. It permits of a more complete exposure, and a more thorough knowledge is gained of the size and character of the cataract.

3. It diminishes the tendency on the part of the iris to contract, even after the corneal section has been completed and by this means facilitates the escape of the lens.

4. By it, the possibility is gained of more accurately judging of the extent to which the cornea must be divided to permit of the escape of the lens.

5. The less necessity there is for the introduction of a traction instrument to effect the removal of the lens, the less interference there is with the natural position of the structures of the eyeball.

Of 674 operations, seventy-nine, or 11.72 per cent., were unsuccessful. Of this number, 101 were for Morgagnian cataracts. The iris was excised in only seventy-five total cases. Chloroform was administered in 654 cases, and the iris prolapsed in sixty-four, or 9.46 per cent., the latter accident being due, in several cases, to vomiting caused by the anesthetic. Glaucomatous change occurred on six occasions, but this could not be attributed directly to the operation. In further endeavoring to render the operation still more simple, Drake-Brockman laid aside the needle and in thirty-four cases effected the capsule division by means of the cataract knife "before completing the transfixion of the corneal tissue," i.e., while making the section. Of this number, six proved unsuccessful. In the endeavor to divide the capsule of the lens fully, the iris is more liable to be injured and the lens structure cut into and broken up, so that iritis occurred in greater frequency. As no corresponding advantages were to be gained by this treatment of the lens capsule, it was abandoned in favor of the original procedure of division by the needle, prior to making the corneal section.

In a second communication,⁴ four years later, the same author reports 1,433 additional cases operated on during the previous three or four years. Of these, but 5.58 per cent. were failures, a very great improvement over the first series. These results (7.54 per cent. failures), Drake-Brockman claims, contrast favorably with any other method of operation. The procedure was applied to all forms of senile cataract, and in some cases of cortical cataracts, with entirely satisfactory results. The original crucial incision of the capsule was abandoned in the second series, Drake-Brockman having adopted, instead, a linear division along the upper papillary margin. This more simple procedure was found equally effectual. Rohmer⁵ practiced extensive dissection of the anterior capsule and paracentesis of the anterior chamber, followed by massage, through the upper lid, for several seconds. The opacity was almost complete in from twenty-four to thirty-six hours, and entirely so within three or four days. Extraction was then performed "in a day or two."

Elschnig⁶ gave up the dissection needle, as it made an easily infected wound and was not well adapted to incising the lens masses, and used a Graefe knife, which was carried in laterally in the horizontal meridian from 1 mm. outside the limbus. Elschnig disapproves of dissection for ripening senile cataracts, as all cataracts in individuals above 50, whether mature or not, can be extracted easily, no matter what the condition and proportions of nucleus and cortex. In old patients, Elschnig extracts as soon as the vision has diminished so that the day's work cannot be done.

Mooren⁷ used a narrow Graefe knife to split the capsule in immature cataracts, especially in zonular forms.

Jackson,⁸ in discussing the technic of dissection for maturation, lays stress on the importance of making a small central opening and allowing the aqueous to drain

1. Von Graefe and Mannhardt: *Klin. Monatsbl. f. Augenh.*, 1864, p. 408.

2. Correnti: *Imparziale. Fasc.*, 11, 12.

3. Drake-Brockman: *Ophth. Rev.*, 1884, III, 243.

4. Drake-Brockman: *Ophth. Rev.*, 1888, VII, 333.

5. Rohmer: *Cong. d'ophth. de Paris*, 1887; *Ann. d'Ocul.*, xcvi, p. 241.

6. Elschnig: *Wien. klin. Wchnschr.*, 1890, No. 53.

7. Mooren: *Operative Behandlung d. natürlich u. künstlich gereiften Starr Formen*, Wiesbaden, 1894.

8. Jackson, Edward: *Am. Jour. Ophth.*, 1898, xv, 9.

off, allowing the lens to be ploughed up with a comparatively small incision, as the consequent reaction is proportional to the amount of soft lens-matter which exudes through the cut capsule into the anterior chamber.

Alessandro⁹ advises multiple punctures of the anterior capsule. The dissection needle is carried in at the outer quadrant of the cornea and five to ten punctures made. Maturation takes place "in a week or two."

Page¹⁰ makes a small incision into the anterior capsule in the pupillary area, allows the aqueous to drain off, and then massages through the cornea. Maturation is complete, on an average, in three weeks. Iridectomy is not necessary. Tynen of Austin, Tex., in 1900, reported under the title of "preliminary capsulotomy," a procedure of primary opening of the capsule at the time of operation, using Bowman's stop-needle prior to the corneal section. Tynen believed this to be original with himself, it having been suggested by a case in which there had been prolapse of fluid vitreous and the lens had sunk into the posterior chamber (sic), requiring extraction with iris forceps. When it came to operating on the other eye, Tynen, fearing a similar complication, performed "preliminary" capsulotomy just before making the corneal section and was gratified by rapid and easy, almost spontaneous delivery of the lens, although here, too, a small amount of fluid vitreous escaped. The procedure was then applied methodically, and Tynen refers to thirteen cases. In all but two the healing was uncomplicated, and the final results excellent. The two exceptions were cases in which marked iritis developed, due, as Tynen thinks, to the use of too strong solution of atropin, "crowding the iris up into the neighborhood of the corneal wound." The leading point in the operation, according to this writer, is in making the capsulotomy the primary step, thereby enabling the operator to deliver the lens the very moment the corneal section is completed. When this section is finished, pressure with the flat of the blade causes the corneal opening to gape, when at the same moment counter-pressure with the fixing forceps below aids the expulsion, and the lens slides out through the still open pupil with surprising ease. "The lens, having no other avenue of escape, almost always indicates a tendency to follow the knife as the corneal incision is progressing, and when it is finished the lens is partly in the anterior chamber." Tynen adds that in cases in which the lens is to be dislocated this can be done most easily in performing his "preliminary" capsulotomy, and that the operation then resembles Delgado's. The incision is made in the upper quadrant of the dilated pupil following the curved pupillary margin of the iris. Both the point of the instrument and the field of operation are in full view.¹¹

At the 1906 meeting of the American Academy of Ophthalmology, Homer E. Smith, of Norwich, N. Y., reported a method which had as its object "to know in advance the size of the section required, and to make certain an efficient capsulotomy with a maximum of precision and a minimum of risk." The method, he says, is applicable only to such cases as one would select for the simple extraction, and is not the operation of choice when the iris lacks the lustrous appearance of health, when the lens is amber-colored or dark-gray, and when the iris is rigid, with little dilating ability to the pupil. The chief objections to the simple operation,

which, according to Smith, is indicated in 95 per cent. of the cases, namely, the difficulties of an efficient capsulotomy, of effective removal of fragments of cortex, and of easy delivery of the lens through the pupil, are met by the method proposed. As to the better visual and cosmetic results, he adds, there can be little question. He then describes a primary capsulotomy with a small Knapp's knife-needle making a crucial incision, "not only through the lens capsule, but partly into the lens-substance itself. If the cut in the capsule is practically invisible, a large nucleus is present, and the usual section of the upper two-fifths of the cornea will be required for the easy exit of the lens. If semi-gelatinous lens-matter escapes, a section of one-third will suffice, while if a milky liquid issues, the cataract is hypermature and the section may be made with the angular keratome. A period of waiting between the capsulotomy and extraction is required for the anterior chamber to reform completely, as there is usually sufficient loss of aqueous to render the eye soft and unsuitable for good section. This loss of time is really a gain in results, for even in four hours there is sufficient imbibition of aqueous to facilitate the separation between cortex and capsule and to make easier the delivery of the lens.

It will be noted that this is the first reference to an artificial maturation of the cataract by means of preliminary or rather primary capsulotomy, the other writers, as, in fact, Smith himself, having laid stress only on the more perfect capsulotomy thus made possible and on the information gained as to the consistency and, indirectly, the proportions of the lens as to the relative amount of nucleus and cortex. The advantages of this form of capsulotomy are presented by a better cutting instrument than the cystotome, the freedom of the section into the capsule from danger of entangling or wounding the iris, and the avoidance of dislocating the lens, as may easily be done when the cystotome is carried far toward the equator. These benefits are inherent in a method which finishes the opening of the capsule without emptying the anterior chamber or allowing the pupil to contract, rupturing the zonule or causing loss of vitreous. It will be noted that stress is laid on the superiority of this procedure as a means of opening the capsule and indirectly of removing cortical debris after extraction.

Recent advances in methods of dealing with the capsule, notably the procedure of tearing out a portion of the central area of the capsule with forceps, such as those devised by Fuchs and by Schweigger, and improved by Knapp, have made this less important if not entirely unnecessary. Short of an extraction in the intact capsule, there is no method which leaves so clear a pupil as that of capsulectomy. The crucial incision with the knife, or stop-needle, interferes with this procedure or renders it impracticable, as the tension of the capsule is reduced so that the forceps will not grasp or, at all events, if it does so, no central portion can be excised or torn off, the ends curling up at the crossing of vertical and horizontal incisions. The benefits of the complete removal of the capsule may, however, be gained without forfeiting preliminary capsulotomy if we make a peripheral semicircular incision as practiced by Drake-Brockman and originally advocated by Tynen, or make a number of straight, fairly peripheral cuts either horizontal at upper and lower pupillary margin, or vertical at the temporal and nasal edge of the pupil.

9. Alessandro: Arch. d. Ottalmol., 1901, vii, p. 201.

10. Page: Ann. d'Ocul., 1903, cxxix, 426.

11. New York Med. Jour., Sept. 20, 1900.

In a recent publication¹² Smith reviews this procedure, and now for the first time calls attention to its value as a rapid and safe method of causing operative maturity of senile cataract, by causing separation of the cortex from the posterior as well as anterior capsule, by entrance of aqueous under the capsule through the knife-needle incisions, this process being completed over night. Smith first made this observation by accident; the anterior chamber having been abolished while he was performing discission of the capsule in a case of immature cataract, and being obliged to defer extraction till the following day, he was agreeably surprised to find that the previously clear cortex had become opaque over night, and was able to deliver an operatively mature lens with little or no cortex, leaving a clear, black pupil, and gaining, eventually, 20/30 vision. The original idea of a more effective, complete, and safe capsulotomy, avoiding the dangers of the usual cystotome opening, was now replaced by the hope of causing a rapid maturation of cataract allowing extraction with a minimum of remnant cortex, with the incidental advantage of a more easily delivered lens; little or no necessity for prolonged anterior-chamber irrigation or mechanical expression for removal of retained cortical debris, and a posterior capsule left free from adherent lens-matter. Smith's first experience showed him that the knife-needle could be improved on. The blade was too long and not cutting sharp up to the point. He had constructed a "miniature scalpel" with a cutting-blade 2 mm. long and a slender shank just thick enough to stop the corneal puncture. Smith has not departed from his original crucial incision which is not allowed to penetrate deeply into the lens-substance. For this reason the shank is gradually withdrawn as the knife is carried along in making the incisions. "Were it not for this maneuver the blade would sink dangerously deep into the lens or possibly dislocate it." The only disadvantage of this preliminary capsulotomy, according to Smith, is that it requires more time and trouble as the technic of asepsis must twice be gone over.

We cannot, however, dismiss all objections in a single sentence unless we close our eyes to the fact that it is the danger of infection, even more than the time and trouble of disinfection in a second operation, to which we hesitate to expose our patient and which we would not risk unless there is something definite to be gained. The disadvantages of the ordinary capsulotomy are many, but the main point to be considered in weighing the pros and cons of the new procedure is the question whether we can expect decidedly better visual results and comparatively early operation in immature cataracts with little or no additional risk. The disadvantages of capsulotomy with mature lenses have become negligible quantities since the perfection of the capsulotomy method. The crucial incision rather complicates this and may have to be superseded by the peripheral curved or straight incisions in the capsule which still allow a central portion to be torn out with the forceps. The main advantage of preliminary capsulotomy is the rapid maturation, operatively speaking, of an immature but partly opaque lens by changing of sticky cortex into a homogeneous substance which no longer adheres to the capsule and either comes away with the nucleus or can easily be flushed out of the anterior chamber. As Smith well says: "It makes an immature cataract operable at once and saves the patient much weary waiting and loss

of usefulness." The procedure is safe, efficient, and easy of execution. It is adapted to all types of cortical cataracts, but it is particularly of value in the immature variety. It makes the capsulotomy the easiest step in the extraction operation and greatly facilitates the delivery of the lens. Finally, delivery is accomplished with little or no pressure, so that there is less danger of complicating prolapse or loss of vitreous, and a secondary operation is rarely necessary. This last point alone, if borne out by observations and experience of other surgeons, would be sufficient, in my opinion, to constitute this procedure a valuable and important innovation. For the danger of the preliminary capsulotomy would be balanced and wiped out by the fact that the extraction is the last operation. Comparing the two, one would infer, theoretically, that there was less risk in needling the capsule of an immature cataract than in performing discission of a secondary membrane, and this appears to be borne out by statistics and the consensus of opinion among eye surgeons.

Does the adoption of this procedure mean the passing of the immature cataract? If so, it is indeed a boon for patient and surgeon. The operations heretofore performed for maturing a partially opaque lens have been dangerous, ineffectual or unreliable, and all have required, at the shortest, three or four weeks to produce the required effect. Iridectomy, either simple or combined with massage of the lens, through the cornea or directly with the spatula introduced at the time of the iridectomy into the anterior chamber, have been tried and found of doubtful advantage.¹³ The dangers have been emphasized, particularly by Major Smith,¹⁴ who says:

Puncturing the lens capsule with a needle is liable to be a complete failure or to establish a traumatic cataract, which, thus established, may constitute a serious ophthalmic emergency. The formation may be so rapid and the lens may swell up to such a degree as to cause acute glaucoma and the lens-matter may escape into the aqueous chamber and cause acute iritis or iridocyclitis. The extraction of such a cataract admits of no delay. The conditions under which it has to be extracted are highly unfavorable and difficult, and the results are far from being as satisfactory as in the extraction of a cataract matured by Nature's process. It will thus be seen that when this procedure is efficient in maturing a cataractous lens, that is, when it causes a traumatic cataract, it is fraught with serious trouble and serious danger and is now, I think, relegated to the operations of the past.

Far from being relegated to the operations of the past, opening the lens capsule for the purpose of maturing cataract bids fair to be one of the type procedures of the future. The objections raised by Major Smith apply to the needling as formerly practiced, and involve the instrument and the lapse of time between the discission and the intended extraction. In the preliminary capsulotomy of Homer Smith of Norwich, a suitable cutting instrument is used and so little time elapses between its introduction into the eye and the extraction of the cataract that no danger need be feared. High tension might, it is true, develop over night, but the extraction would nip this process in the bud. Iritis could hardly develop if the pupil had been kept dilated, or at least would be in the stage of incipency and hence easily con-

13. Widmark, J.: Review of Methods, *Centralbl. f. Prakt. Augenheilk.*, March, 1897. The authors agree that massage methods (Foster, Bettmann) are generally effective only when there is a fairly large resistant opaque nucleus to serve as a base (Unterlage). In other cases capsulotomy is the better procedure. The latter procedure was reserved for patients under 40 and never used for the mature senile cataract proper.

14. *Tr. Am. Ophth. Soc.*, 1908, xl, 605.

12. Smith: *New York State Jour. Med.*, May, 1911; *Arch. Ophth.*, January, 1912.

trolled. The escape of lens-matter into the anterior chamber could hardly cause much trouble in the short time elapsing before the lens is completely removed.

My personal experience with Smith's method of preliminary, or, as I should prefer to style it, preparatory capsulotomy, is very limited, but so far at least, the results in my own cases as well as in those of my colleagues at the New York Eye and Ear Infirmary, who have given this procedure a trial, have been uniformly excellent. Some loss of aqueous or even complete draining off of this fluid sufficient to abolish the anterior chamber for a time does not seem to have any deleterious effect, and reminds us that the procedure of repeated paracentesis of the cornea and evacuation of the anterior chamber after dissection was recommended as long ago as 1845, by Werneck,¹⁵ in cases of soft cataract in which maturation was unduly slow. Aside from the ease and accuracy with which the corneal section and the cystotomy can be performed with and after the preliminary capsulotomy, respectively, stress should be laid on economic advantage to the patient of shortening the period of partial blindness and of incapacitation. This applies particularly to comparatively young cataract patients with lenticular opacities of sufficient density to materially interfere with their occupation, a condition found rather frequently in men of from 45 to 50 who work in front of fires, such as glass-blowers, foundrymen, engine drivers and stokers, workers in potteries, brick kilns, and so on. It seems to me that the advantages of the preparatory capsulotomy might be combined with those of excision of the capsule by a slight modification of the knife-needle incisions. If these are made at the periphery, above and below, or at the temporal and nasal margin of the dilated pupil, respectively, we produce the same ripening effect as with a crucial incision through the capsule, with the further advantage of not making it difficult or impossible to tear out a piece from the center of the anterior capsule. The latter maneuver undoubtedly facilitates irrigation of the anterior chamber and intracapsular washing as well and makes it possible to remove mechanically a maximum of cortex with a minimum of traumatism and consequent irritation. The purely optical effect of complete removal of capsule from the pupillary area must be considered as of decidedly beneficial influence on ultimate visual results.

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ABSTRACT OF DISCUSSION

DR. HOMER E. SMITH, Norwich, N. Y.: Dr. Fridenberg makes two parallel incisions in the capsule and afterward uses the capsulotomy forceps, and the capsule will retract along the line of the incisions and prevent the entrance of the aqueous between the capsule and the cortex which hastens the maturation of the lens. Therefore he will have a sticky cortex.

Every step in the extraction of cataract has undergone an evolutionary process, but while the section is practically agreed on, the capsulotomy is not, and this is, perhaps, the most important step in the operation. If the capsulotomy was an efficient instrument its shape would have been agreed on long ago; that it is not is proved by the many forms now

in use. If the elastic lens capsule be incised it will simply gape; if cross-incised it will open, the size of this opening depending on the length of the cross-cuts. A capsulectomy therefore insures no larger opening for the exit of the lens and the subsequent clarity of the mediums than does a crucial capsulotomy of equal size in the midpupillary space and, moreover, it is the less scientific surgical procedure as it means tearing and not cutting. That it is more difficult and dangerous only emphasizes this. A preparatory capsulotomy is certain, easy of execution, efficient, ample, of clean-cut margins, leaves no capsule in the pupillary space, minimizes the risk of loss of vitreous and, other things being equal, is superior to a capsulectomy. In addition to this a capsulectomy can be made only after the section and the advantage which one gains by a knowledge of the size of the nucleus and therefore of the proper size of the section is thereby lost. The point to the effect that high tension might develop overnight is well taken. Loss of aqueous during the capsulotomy is an embarrassment as it makes difficult what remains to be done of the crucial incision; following the withdrawal of the knife it is of no moment. The cut is so small that the anterior chamber reforms in a few minutes and with the new knife it rarely happens at all. I must differ from Major Smith of Amritsar in the matter of the operative maturation of the partially opaque lens. That these operations have been failures is due to the essential structure of the capsule and the mode of operating. Small punctures either close or at most produce small islands of opacity just beneath them. Small incisions allow none or but little lens matter to escape and if the lens swells it is most probably equatorially and we get occlusion of the filtration angle. If the incision is large and there is any swelling it is in the polar diameter.

DR. HOWARD F. HANSELL, Philadelphia: I feel that I am not entitled to speak very authoritatively on this operation because I have performed it only five times, but in those five operations I have been gratified beyond expectation in four, and I have come to consider that for the immature nuclear cataract, the kind that requires so many months and years of delay for its maturation, this operation can be done within twenty-four hours after the capsulotomy with perfect safety and assurance that the cortex of the lens will not be left behind. Since reading Dr. Smith's paper in the *Archives of Ophthalmology* for January I have thought rather deeply over the operation, and a week ago I had the opportunity of doing four of these operations together, and the week before one.

I was impressed with the fact that in none of these cases did the capsulotomy increase the opacity of the lens in the twenty-four hours, but only its maturation. In other words the clear cortex adheres to the nuclear as the lens is removed.

DR. G. C. SAVAGE, Nashville, Tenn.: Soon after I received the reprint sent me by Dr. Smith, feeling impressed by the work he had outlined, I proceeded to do it on the left eye of patients, and, by the way, I always leave the capsule in when I operate on the left eye. The ideal capsulotomy has been given us by Homer Smith. It is easy to do and he does it right. The crucial incision, the two lines crossing in the center, cannot be improved on by parallel lines running in any sort of direction. The points at the angle of the crucial incision, as has already been demonstrated, roll outward, but the thing that is accomplished by this device of my friend Smith is the ease with which the lens is expelled. During many years I have been transfixing the lens as it presents itself whether the capsule is left or taken out, so as to do away with continued external pressure on the eye, thus lessening the risk of escape of vitreous; but the lens is so loosened in its capsule when it has had a few hours to be loosened by the aqueous that it comes out before we have time to transfix it, like a bean out of its hull. It is a delight to see how easy it is by this procedure. I do not believe we ought to leave these patients over night. Do the capsulotomy at 8 a. m. and then about 2 p. m. you have all the loosening of the lens that is desirable, and it will come out at the end of six hours with such ease that you will be astonished, and

15. This procedure of Werneck is recommended by Arlt (*Graefes-Saemisch Handbuch*, 1874, III), who attributes its efficacy to mechanical stretching of the already torn or punctured capsule, widening and bursting the tears and deepening the fissures in the lens substance, due to the lens being forced forward. Resorption takes place more rapidly, then, possibly, he adds, because the aqueous, which had become saturated with lens-fiber matter, is emptied out and replaced by fresh fluid of greater absorptive capacity. Arlt considers this procedure less dangerous and accordingly more suitable for repeated application than a "formal" dissection.

then you can go to bed and sleep, because the pressure has not ruptured the hyaloid membrane and you have had no escape of vitreous. I honor my friend Smith for the gift which he has given us, but I am sorry his name is Smith, because it is going to lead to a little confusion. Hereafter we shall have to distinguish the two Smiths of cataract fame by calling the one "Indian Smith" and the other "American Smith." Of the two operations given us by these men, grant me the "American Smith's" operation.

DR. S. LEWIS ZIEGLER, Philadelphia: My attention was first called to this method of incising the capsule preliminary to cataract extraction soon after I presented my paper on V-shaped iridectomy and capsulotomy, at the Chicago meeting, in 1908. I received letters from several operators saying that they had used my knife-needle to make a preliminary cystotomy, at some period preceding the operation of cataract extraction. I tried a few of these operations with the V-shaped incision but was not favorably impressed with it and discarded it. I think, however, that we should give this procedure a thorough trial, because there are so very many cases in which we must have some method of maturing the lens, and the Foerster operation does not accomplish this satisfactorily.

In regard to the term to be applied to this procedure, we are apt to become a little confused because we are using the term "capsulotomy" in several different ways. The operation on secondary membranous cataract is properly called a capsulotomy, and it would seem more appropriate to call this procedure cystotomy, or preliminary cystotomy, because the capsule is still intact and is, therefore, a cyst holding the lens. In that way we would be able to make a slight differentiation between these operations. I think the procedure is worthy of our careful study and practice to see just how much we may develop from it.

DR. HENRY DEWITT WATSON, Binghamton, N. Y.: In one case in which I have operated with a capsulotomy preliminary to the extraction performed according to Dr. Homer E. Smith's method, the patient was a woman, 47 years old, who had been in ill health for six or seven years with a diagnosis by several internists of pernicious anemia. When she was referred to me last November, she gave a clinical picture of marked anemia with great emaciation. Her vision in the right eye was counting fingers readily at about 2 meters, and in the left eye the vision was 20/197. Her vision was sufficiently obscured to annoy her, and therefore to have a depressing influence on her mind. The eyes presented nothing out of the ordinary but because of the pronounced immaturity of the lenses and fear of an undesirable reaction I decided to do a preparatory iridectomy, with preliminary opening of the capsule. The right eye was chosen because of the slightly lesser vision. Six weeks after the iridectomy the lens was extracted. The capsule was opened as described by Smith at about 3 p. m., the eye bandaged and the patient placed in bed. She had no discomfort, and at 9 o'clock the following morning when the bandage was removed the eye showed very little reaction. The two incisions in the capsule were noticeably spread and presented an appearance as if the lens substance were slightly protruding. A section was made in the limbus about 2 mm. above the horizontal meridian of the cornea and the lens delivered in the ordinary way, but this required only very slight pressure. The pupil was clear and black, the toilet was made and the eye bandaged. The subsequent course was ordinary. In three weeks with an approximate correction the vision was 20/39. Three weeks later, because of some wrinkling and slight opacity of the capsule, I opened according to the method of Ziegler. With her correction she now has 20/16 vision.

Clean Milk.—The only reason why we do not have clean milk is that it costs more than dirty milk, though in the long run the cost of clean milk is less. If we could only impress the latter fact on the public the sanitation of our milk-supply would go forward rapidly.—*Dietetic and Hygienic Gazette*.

VISUAL RESULTS AFTER THE SMITH OPERATION FOR CATARACT

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So much has been said and written concerning the merits and demerits of this operation in the last few years that it may be assumed that the profession is generally well informed as to the indications for the operation, the operative technic, the accidents and complications which may follow it, so that little remains to be said along these lines. The phase of the operation to which we wish to call attention, aided by statistics, is the excellence of the visual results which can be secured by it in all stages of cataract, as this is not so generally appreciated as it deserves to be.

In order to present a summary of our visual results, we shall be obliged to depend on a comparison of statistics; the subject will not admit of treatment in any other way. We think it will be fair to the operation, and aid to a better understanding of our purpose, if we exclude from these visual tables cases complicated by unrecognized fundal disease, lacrimal disease and central opacities of the cornea and retention of ruptured capsule, unless it has been extracted, wholly or in part, as a step of the operation.

These statistics of unselected cases will show that taking large numbers of operations, all other things being equal, vision will average very much better one to two months after the intracapsular, than after the regular operation, and if the visual results are measured by the same standard; surely we are subjecting it to as severe a test as can be required of any cataract operation.

As the profession has a right to ask for the facts and figures on which the above claim of superior vision is based, the following recent visual statistics of the regular operation are offered for comparison.

Knapp, whose unequaled experience as a cataract operator has made him an authority, has given us the following standard for estimating vision, which by common consent is generally accepted. He said:

We should consider vision of 20/200 to 20/20 as constituting a first-class result, vision from 18/200 to 1/200 a moderate result and mere perception of light and blindness as failures.

In the same connection, he has said:

The average result of primary vision after extraction, simple as well as combined, computed from many hundreds of cases is 20/70, that of ultimate and permanent vision after discission 20/30.

No one will question the reliability of the statistics just given of ultimate vision in the skilful hands of Knapp, or operators of his class, but we believe, from a large experience, that this is too high a standard for the average operator. The statistics to follow will show that 20/40 is nearer the vision secured.

Under the standard just given the following statistics have been compiled by Theobald of Baltimore.¹

RESULTS OF TWO HUNDRED AND FIFTEEN CONSECUTIVE EXTRACTIONS OF CATARACTS

"Combined extraction was done in ninety-four cases, extraction after preliminary iridectomy in seventeen cases, simple extraction (unintentional) in one case, extraction in capsule without iridectomy (unintentional) in two cases, and suction extraction in one case of traumatic cataract."

1. Theobald: Summary of Results Obtained and Features of Interest in 215 Consecutive Cataract Extractions, *Tr. Am. Ophth. Soc.*, xii, 84.