Report and remarks on a third series of one hundred cases of cataract extraction by the peripheric-linear method / by H. Knapp.

REPORT AND REMARKS

ON A

THIRD SERIES OF ONE HUNDRED CASES

OF

CATARACT EXTRACTION

BY THE

PERIPHERIC-LINEAR METHOD,

BY

H. KNAPP, M.D.,

LATE PROFESSOR OF OPHTHALMOLOGY AND SURGEON TO THE OPHTHALMIC HOSPITAL AT HEIDELBERG; MEMBER OF THE N. Y. COUNTY MEDICAL SOCIETY, THE AMERICAN OPHTHALMOLOGICAL AND OTOLOGICAL SOCIETIES; SURGEON TO THE N. Y. OPHTHALMIC AND AURAL INSTITUTE, &C., &C., &C.

[REPRINTED FROM THE ARCHIVES OF OPHTHALMOLOGY AND OTOLOGY, EDITED BY DRS. KNAPP AND MOOS.]

NEW YORK;
WILLIAM WOOD AND COMPANY,

MDCCCLXIX.

REPORT AND REMARKS

ON A

THIRD SERIES OF ONE HUNDRED CASES

OF

CATARACT EXTRACTION

BY THE

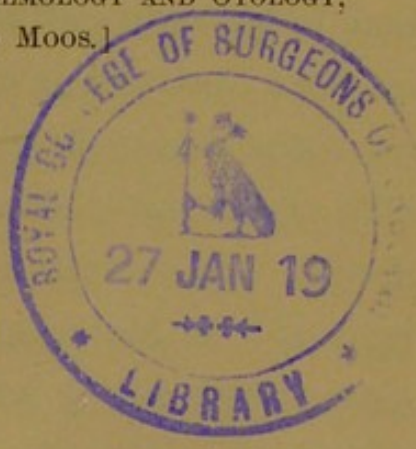
PERIPHERIC-LINEAR METHOD,

BY

H. KNAPP, M.D.,

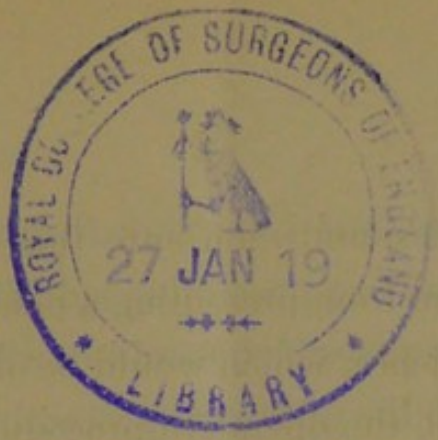
LATE PROFESSOR OF OPHTHALMOLOGY AND SURGEON TO THE OPHTHALMIC HOSPITAL AT HEIDELBERG; MEMBER OF THE N. Y. COUNTY MEDICAL SOCIETY, THE AMERICAN OPHTHALMOLOGICAL AND OTOLOGICAL SOCIETIES; SURGEON TO THE N. Y. OPHTHALMIC AND AURAL INSTITUTE, &C., &C., &C.

[REPRINTED FROM THE ARCHIVES OF OPHTHALMOLOGY AND OTOLOGY, EDITED BY DRS. KNAPP AND MOOS.]



NEW YORK;
WILLIAM WOOD AND COMPANY,

MDCCCLXIX.



REPORT AND REMARKS ON A THIRD SERIES OF ONE HUNDRED CASES OF CATARACT-EXTRACTION BY THE PERIPHERIC-LINEAR METHOD.

By H. KNAPP.

Von Graefe has given us a full account of the principles and details of his new method of extracting cataract, which he now very appropriately calls "peripheric-linear." Not so exhaustively has he published the accidents and disturbances which are liable to occur during the operative procedure and the healing process, nor has he fully acquainted us, in the way of detailed statistics, of the primary and final results, and the necessary or desirable and feasible after-operations. The general practitioner is certainly more inclined to read only a summary statement of the results than a minute description of the reverses of the method. But all who are engaged in ophthalmic surgery will be benefited by nothing more than an exact report of the unfavorable cases. If I were allowed to express myself figuratively, I should say: We are intimate friends of Graefe's operating room, but only casual visitors of his hospital wards. Certainly *Von Graefe* has not failed to give us a general out-

line of his statistics, and I am sure that only want of time has prevented him from presenting a detailed account of his unequaled experience, which would be of no less value than the description of the operative procedure ; for the knowledge of the adverse occurrences is the origin of improvement. The proverb says : "Necessity is the mother of invention."

Having been among the first who had and took the opportunity to learn the method from the originator's hands and to try it on a large scale, I have already reported twice on one hundred cases each time, and am now about to add a series of a third hundred, all operated on by me during the summer of 1868. One hundred extractions constitute a fair number of cases which, when carefully watched in their course, can not fail to teach useful knowledge. With regard to the exactness and reliability of the following and my former statements, I may mention that my hospital wards have been always open without restriction to medical visitors. Hardly one operation has been performed at which there were not some competent witnesses present. The nature of the cataract and the accidents of the operation were always recorded by the first assistant surgeon having charge of the medical book-keeping on all the in-door patients. During the regular daily visits through the rooms, I examined, treated, and bandaged every patient myself, and had the necessary observations noted in the diary. The last examination, at the discharge of the patient, was always made by the first assistant, its results, as to the conditions of the eye and its visual acuteness, entered in the journal, and

afterward controlled by myself. In this way I possess the fullest notes possible on my cases, and can at any time have resort to my clinical journals. Having no claims to the invention of the method of operating I may be credited for impartiality in my reports. I dare say that I made all the particulars of the operation an object of unwearying studies, both theoretical and practical. An extended practice having given me some skill in its performance, the following statements may be considered as faithful and objective as they possibly can be made.

QUALITY OF CATARACT.

The quality of the cataract with regard to consistence, size, maturity, and composition (simple opacity, or fatty, chalky, and other degeneration), is of the highest import concerning prognosis and indications. The following statement is the summary of the observations I have made in these one hundred cases:—

69 *eyes had mature cataract* of either hard or soft consistence; 66 of them were operated on with full, 1 with a half success, and 2 were failures. The operations in the latter cases were without any accident, but two were followed by iritis, of which the former ended with a pupillary membrane, the latter became purulent and destroyed the eye. In the third case primary corneal sloughing set in. In five cases out of these 69, the operation was complicated with slight accidents; three times an escape of some drops of vitreous during the attempt of removing the remainders, twice pro-

lapsus vitrei before the exit of the cataract. These five cases all healed well.

13 *cases had immature cataract*, that is the *cortical layers* were partly yet of *normal appearance*. 10 of the 13 cases proved perfect results, 1 a failure, and 2 imperfect results. The operations, with one exception, were without accidents, and only in two a quantity of lens matter remained in the eye. In the one exceptionable case escape of vitreous happened before the exit of the lens, the cortical layers of which remained, to a considerable amount, within the eye. The patient was 80 years of age and operated on during the warmest days. The concurrence of these unfavorable conditions with the accidents of the operation, occasioned purulent iritis and destruction of the globe. Of the 2 cases of half-success one had been operated on without accident, but was followed by plastic iritis with a dense pupillary membrane; in the other I was not able to remove the lens matter sufficiently.

In 8 cases the cataract was hypermature. In 3 of them there happened prolapsus corporis vitrei during the operation, one of which was followed by iritis and proved only a half-success ($S=\frac{1}{60}$), the others were perfectly good results.

In the remaining 10 *cases the cataract was cortical only;* 9 of them resulted well. In the tenth the operation was without accident, the lens came out clear and complete, but after-hæmorrhage ensued. This caused chronic hyperæmia of the iris, and pupillary opacity, $S = \frac{1}{20}$ only.

The experience of this latter group of cases, as well as of similar ones operated on formerly, has satisfied me that the

maturity of the corticalis is far more important than the maturity of the nucleus. The nucleus, being opaque or not, will always come out without difficulty, if only the corticalis can be clearly removed. This may be done if the stripes adjoining the capsule are sufficiently opaque. I have extracted many such cortical cataracts in which the nucleus had hardly begun to show any turbidity. Cases in which the posterior cortical layer is opaque, the nucleus transparent, and the anterior cortical layer but slightly, if any, affected, commonly show an extremely slow progress, causing for a long time considerable impairment of vision. In former years I used to puncture the anterior capsule of such cataracts, and extract the latter, after the anterior corticalis or the whole lens had become opaque. Of late I have extracted the whole lens at once, taking care to lacerate the anterior capsule very freely, and to extract as much of it as I could. In one of the latter cases there was a circumscribed, dense opacity in the centre of the posterior surface of the lens, having an apparent diameter of about 7 millimetres. I succeeded in extracting the lens completely, but this posterior opacity remained behind. I thought it was a thickening of the posterior capsule, and, therefore, did not at once interfere with it. The eye healed, the opacity remained unchanged just behind the pupil. Some weeks later I lacerated it with a needle.

OPERATIVE PROCEDURE.

The more cases I operated upon, the more closely I followed the method of *Von Graefe* in its details. I may add

that this was not done out of blind imitation, but my own experience gradually forced upon me the importance of the rules insisted on by the author of the method. I made a good many trials, going as far as the safety of the patient would allow, but my routes nearly always converged to the same point which *Von Graefe's* genius and his greater experience had already arrived at. I shall point out some of the particulars of the operative procedure, the good results of which were further confirmed by the experience of this new series of one hundred cases, and express my views on what remains doubtful and unsatisfactory.

As to the *form and size of the knife*, the discussions of the Heidelberg Congress proved that I had already come to the same opinion which *Von Graefe* expresses so stringently in his last article (Arch. f. Ophth., XIV., 3, p. 116). "The knife should be as narrow as solidity will permit." By being narrow its passage through the anterior chamber, from puncture to counter-puncture, prevents the increase of intraocular pressure to any considerable degree, which might cause escape of aqueous humor. The deeper the chamber, the easier the knife is guided in the exact way intended by the operator, and even a false direction may be instantly corrected by drawing the knife backward as much as is required.

Endeavoring always to make puncture and counter-puncture as peripheric as possible, I sometimes observed that *the point of the knife became engaged in the iris.* This never took place at the insertion of the iris, but on some point of its anterior surface, mostly at the annular elevation produced by the circulus arteriosus iridis minor. When this

accident occurred I drew the knife backward until its point was disengaged, lowered the handle a little, and proceeded with the operation as if nothing had happened.

Taking great care that my knives were very sharp, I often had them at the instrument-maker's. By the repeated grinding, the end of some of the knives became so much thinned, narrowed, and pointed, that I failed to place the counter-puncture as peripherically as I had intended, because I could not longer see or calculate the exact position of the point of the knife when it was hidden behind the non-transparent peripheral zone of the anterior chamber. So it occurred that, while I was still pressing the point of the knife backward in order to get a peripheral counter-puncture, the point had already entered the corneal tissue more in front than I liked. The end of the knife being very thin and flexible I felt the resistance no sooner than I saw the blade being markedly bent. Sometimes I have been much afraid of the point being broken in this way. In order to rectify the false position of the counter-puncture, I withdrew the point out of the corneal tissue and turned it behind the sclerotic margin. When the blade is narrow and of equal size throughout its whole length, this correction may be made without the slightest escape of aqueous humor or any perceptible change in the conformation of the anterior chamber. If the point of the knife is not elongated, it will last longer, break less, and not require so extensive a drawing back in case its position should need correction. Moreover, such a false direction is not so apt to occur because we see its end more distinctly than when it is threadlike. I think all these

advantages of a short point over an elongated one are appreciated enough in general surgery; but I found that, in the fabrication of Beer's cataract-knives, only the best instrument-makers in England paid due attention to them. The most appropriate shape of the knife for peripheral linear extraction I found at *Luër's*, in Paris. The blade is a trifle broader than 2 mm., begins to decrease in breadth 5 to 6 mm. before the point, but so slightly at first, that about 1 mm. before the end-point its breadth is still 1 mm. In this way a marked diminution of breadth for the purpose of forming the point is reserved to the last two millimetres. The back edge of the terminal portion of the blade is likewise sharpened as far as three millimetres backward. The surfaces of the blade are plain, and this I think more to the purpose than having them convex, the latter variety being less sharp, A somewhat hollow surface of the blades would increase the sharpness of the cutting edge, but soon find a limit by the danger of diminishing too much the durability and strength of the instrument already delicate enough.

About the section I have nothing new to suggest. I will only briefly repeat what I have said in my former report. On the surface of the globe, the whole section lies within the sclerotic. Its middle point is half a millimetre distant from the corneal margin, and, for large cataracts, extends so far laterally that perpendicular lines dropped from its extremities will touch the cornea as tangents. For smaller cataracts the middle of the cut remains the same, but its extremities do not reach so far laterally. I have expressed the reason for this rule in my former report (Arch. f. Ophth., XIV., 1, p.

291, &c.). Formerly I often placed the apex of the cut more toward the periphery. This, however, renders the expulsion of the lens difficult, and is apt to lead to prolapse of vitreous, without, as it now seems to me, preventing suppuration in a corresponding degree, so as to make amends for these drawbacks. Before the puncture, I determine with my eyes the location and size of the section, and try to hold the knife in such a way that its surface remains as much as possible in the same plane from the beginning to the end of its passage. By practising on the cadaver, I found that in this way the cut-surface becomes the most regular, whilst I sometimes was astonished to verify how irregular the section may be at its extremities, especially the outer, when the knife, in entering the anterior chamber, is held parallel to the plane of the iris. I have not a little improved in judgment on the means of obtaining a good section, and its qualities, by these experiments on the cadaver, affording a thorough inspection of all its irregularities.

Concerning the mode of excision of the iris, I have nothing to add to what *Von Graefe* says in his last article. I was acquainted with his views and practice on this subject by personal intercourse, and followed them in all the operations of this series. The iris is seized not in the middle of the wound, but somewhat nearer to its temporal extremity, gently drawn out and cut by three strokes of the scissors as close as possible to the borders of the wound. If then the sphincter edge of the coloboma does not spontaneously recede to its proper place, gently rubbing on the corneal edges of the wound with the hard india-rubber

curette is resorted to, until the pupillary edges of the iris are quite disengaged from the wound. The laceration of the anterior capsule, in all cases of mature and ordinary cataract, was done cautiously, but very freely, and in different directions. Whenever the capsule was thickened by deposits of any kind, I circumcised, with the cystitome, the part corresponding to the coloboma and extracted it. I succeeded in doing this, in some cases, with the cystitome itself, the point of which, after the circumcision of the thickened part of the capsule, was carried near the lower edge of the pupil, quite opposite to the apex of the cut, in order to catch the said portion of the capsule and drag it out. In other cases, when this procedure would not attain the desired effect, I extracted the loosened portion of the capsule by means of a pair of delicate forceps. I suppose that *Liebreich's* forceps,* with teeth at the convex side of its curve, will be very serviceable for extracting the anterior capsule.

In the art of *expulsion of the lens* I followed the procedure I advocated in my former report. While an assistant steadies the eye, the operator presses, by means of a flat spoon, the posterior lip of the wound backward, at the same time pushing with the india-rubber spoon, the lens through the opening. It seemed to me that the expulsion was the most facilitated in this way. In some cases of old, dislocated, or trembling cataracts I introduced a large, but rather flat, spoon behind the crystalline, and extracted it with the capsule. In the rare cases of prolapse of vitreous

* See his Article in the present number of these Archives, p. 22.

before the expulsion, I extracted the cataract with the same spoon, when the lens did not enter the wound readily by the pushing maneuver. I beg leave to say that I use a large spoon only for large lenses that fill it. They will then come out readily, with or without the capsule, even when adherent to the iris, in which case it mostly is unnecessary to break the synechiæ previously with a hook. Loose shrunken lenses or hard floating nuclei are best seized and extracted with suitable forceps.

ACCIDENTS OCCURRING DURING THE OPERATION.

Bad accidents during the performance of the operative procedure were less frequent than in the former two hundred cases, which I ascribe both to the improvements of the method, and to the acquirement of greater skill on my part.

Only twice there remained within the eye *considerable lens matter*, causing in one case purulent capsulitis, with $S = \frac{1}{20}$, but very good prospect for subsequent discision of the pupillary opacities ; in the other case no inflammatory reaction followed, and the patient was dismissed fifteen days after the operation with $S = \frac{1}{10}$. Six weeks later, I performed discision of the pupillary opacities, which operation, in the course of 5 days, raised S from $\frac{1}{10}$ to $\frac{1}{5}$.

Hæmorrhage into the anterior chamber during the operation was not infrequent, but the blood was almost always evacuated at once by pressing gently on the cornea with a soft sponge ; only in rare instances I was obliged to take the speculum away, lift the wound a little by means of a blunt spatula, and squeeze the blood out by rubbing with

the lower lid over the cornea. In all the cases I succeeded in getting the anterior chamber clear, so that I could dilacerate the capsule, while keeping constantly the point of the cystitome in view.

Prolapse of vitreous occurred nine times under the following circumstances:—

Twice it was only one drop coming out during the trials of getting the remainders clearly out. Both eyes healed without irritation, with S = $\frac{1}{6}$ and $\frac{1}{7}$ respectively.

Twice it occurred in eyes with shrunken cataracts. The first was calcareous and disciform in an old woman. Such cataracts are difficult to get out. In this case vitreous escaped during the pressure of the spoon on the cornea. I succeeded, nevertheless, in pushing the cataract out without being obliged to enter the eye with an instrument. Healing perfect; S=$\frac{1}{10}$ in an eye unhealthy apart from the cataract. The second case was a soft cataract, with many earthy and fatty deposits on the capsule. After the exit of the lens I tried to extract the anterior capsule, but in this attempt I ruptured the hyaloid fossa, and some vitreous escaped. This had the advantage to push the capsular opacities aside, and form a clear pupil. The patient had no trouble, and was very soon discharged with S = $\frac{1}{4}$. The *fifth* case was that of an excessively myopic eye, in which I presupposed the vitreous to be fluid and other changes present. I therefore extracted the lens with its capsule by means of a large spoon. The operation was done easily, and complicated with prolapsus vitrei only to a limited extent. The eye healed without trouble, but regained no higher

visual acuteness than $\frac{1}{40}$, on account of choroidal atrophy. In *two other* cases vitreous escaped before the exit of the lens by unusual pressing on the part of the patient. One eye healed well with S=$\frac{1}{10}$; the other, in which considerable portions of lens matter remained behind, was destroyed by suppuration. Both accidents, and the unfortunate termination of the latter case, might possibly have been avoided by using an anæsthetic.

The *two last* cases of prolapsus vitrei were brought about by slight dislocation of the lens with the cystitome. In former times I was more liable to incur this faulty step, of which other surgeons also are guilty even oftener than they are aware of, as I satisfied myself in seeing them operate. Although a slight dislocation of the crystalline is easily produced, when the section is peripheric and the zonula brittle, I think it may, with proper care, be reduced to exceptional instances. The two cases above mentioned did well, one obtaining S = $\frac{2}{7}$; the other, S = $\frac{1}{10}$.

Making a summary of all the operations in these one hundred cases, it ensues that there were eighty-nine operations executed without any accident whatever from the beginning to the end, and of the eleven operations accompanied with untoward accidents, four only can be laid to the charge of the operator. This is, I think, not an unfair percentage, but impresses, nevertheless, the writer of these lines very strongly with the conviction that further unremitting study, care, and practice is needed to perform every step of this admirable operation with the greatest possible neatness and safety.

COURSE OF HEALING.

The close observation of the healing process, after the operation, is instructive in the highest degree. Living in one wing of the Ophthalmic Institute, and not doing any out-door practice, I was particularly favored in watching my patients most carefully without losing much time by it. Twice a day I made the visit to the patients with the clinical assistants who were directed to take notes of every incident of any significance in the course of healing.

The diverse untoward circumstances which occurred after the operation were *after-hæmorrhage and inflammatory troubles.*

Six cases of the former are noticed. In the five first it occasioned no harm, and did not interfere with a speedy and favorable healing, the patients obtaining, respectively, S=$\frac{1}{4}$, =$\frac{1}{4}$, =$\frac{1}{8}$, =$\frac{1}{4}$, =$\frac{2}{5}$, after early discision of pupillary opacities in the latter. The sixth case, however, ultimately became the most distressing of the whole number.

Both eyes of a man, sixty-four years of age, and rather feeble in health, had cortical cataract. The left was first operated on without accident, and healed in the most pleasant way. Therefore the patient acceded gladly to my desire to operate also on the other eye, which I did without encountering any difficulty whatever. He felt well, and could see distinctly after the operation. During the night, however, he had considerable pain, and the next morning I found the anterior chamber filled with blood. The cornea looked clear, the wound was perfectly closed, and there existed but little redness of the conjunctiva. My expectation that the blood would

soon be absorbed was not realized. A moderate degree of irritation being kept up, and the blood becoming rather dark, I performed, the seventh day after the extraction, paracentesis of the anterior chamber, in order to let the blood out, which still filled two-thirds of the latter. As soon as the pupil was free, there was blood observed also in the vitreous. The healing went on slowly, and the patient was dismissed twenty days after the extraction of the cataract from his second eye. This was not yet clear in its interior, and showed $S = \frac{1}{20}$ with a perfect field of vision. The first eye was quite healed, and had $S = \frac{1}{4}$. A fortnight later the patient came back, having iritis of the eye last operated on, and again hæmorrhage into the anterior chamber. In a few days the blood disappeared, the eye beame white, and the patient went home again, hoping that now the eye was out of danger. Not a long time afterward he returned to me with a new attack of iritis, and this time in *both eyes*. He soon improved, and left the institution with tolerable sight in both eyes. At home the inflammation began anew, and I am informed that six months after the operation both pupils were closed, the eyes possessed good perception of light, but showed some slight diminution of tension. The patient refused, at this time, any further operation.

This most distressing case furnishes a proof that after-hæmorrhage, although having generally no bad consequences whatever, may in exceptional cases, lead to severe iritis, and even cause sympathetic trouble in the other eye. Whether the latter would have happened, if only one eye had been operated on, I am unable to tell, but this much is certain, that an eye recently operated on is more predisposed to respond to irritation from any cause than an entirely well-conditioned one. The greater safety of *Graefe's* operation for cataract gradually dispelled my fear of operating on

both eyes at the same time, or shortly after each other, and this just described case, is, out of 330, the only one I have to regret having operated on both eyes at so short an interval. But what operator would not feel justified in acting similarly under the same circumstances? The patient coming from abroad, with cataract in both eyes fit for operation, one eye operated on and healing without any irritation; should we not be allowed to operate on the other eye six days after the first, or should we wait, and how long? I do not think any rule can be laid down for such questions. There will always be some cases proving exceptional to every rule.

Now what is the cause of this after-hæmorrhage? In many cases I could positively ascribe it to some injury of the newly united wound. The patient had either hurt himself, or rubbed his eye forcibly, or done it some injury of a similar nature. Rubbing is certainly a most frequent occurrence with all freshly healed wounds, and it may be done during sleep quite unconsciously. While I am convinced that a large number of after-hæmorrhages are traumatic, I am just as satisfied that some cases, and certainly the worst of them, have another cause for the bleeding. Especially when the blood does not only fill the anterior chamber of the eye, but the vitreous also; moreover, when the effusions repeat periodically, then they certainly do not originate in the wound but in some portion of the uveal tract. How to foresee such a predisposition, how to prevent the ecchymosis, and which is the most effectual mode of its treatment, I am not prepared to indicate. The above

unhappy case is sufficient to cause me not to look any longer on after-hæmorrhage as a trifle, but to inquire after the patient's eye, constitution, and habits with regard to such a predisposition; moreover, to lead the after-treatment carefully, holding every excitement and restlessness as far from the patient as possible, nor dismiss him too soon from the circumspective control of an ophthalmic surgeon.

Among the different inflammatory processes following the extraction, iritis was the most common. It happened seven times in these one hundred cases. Since most of the failures and bad results are comprised in this series, I shall analyze them carefully as to the causes and consequences of the iritis.

Two out of the seven *healed* with perfectly good results, having, respectively, S = $\frac{2}{7}$ and $\frac{1}{5}$.

The first showed only slight iritic symptoms. Some drops of vitreous had escaped in the act of cleaning the eye from remnants. Patient left the hospital fifteen days after the operation. The second showed discolored, but dilatable pupil, and marked circumcorneal injection. Slight pupillary opacities with S = $\frac{1}{5}$. Discision nineteen days after extraction raised S to $\frac{1}{2}$.

Three healed with occlusion of the pupil.

The first was an old decrepit lady with gouty swellings of the limbs, and cataract in both eyes, which were operated on at the same time. One healed well, the other had severe acute iritis, terminating in closure of the pupil. In about six weeks the eye was free from irritation, of normal tension, with no protrusion of the iris. The pupil was clearing so that the fingers could be seen. The lady

was quite content with the one good eye, but the chances for instituting an artificial pupil were very promising.

The second was acute iritis in a woman seventy-four years of age ending with closure of the pupil, but good perception of light, and normal tension of the globe. Here, too, the chances of an artificial pupil were very great.

The third was the worst of the three. Acute purulent iritis healed with dense occlusion of the pupil and protrusion of the iris. Perception of light good. —T? In this state the patient was dismissed nineteen days after the operation. Four weeks later the inflammation had subsided, the pupil cleared up a little, and the anterior chamber deepened. She was able to count fingers near the eye. Three weeks later again, I instituted an artificial pupil by excising the central part of her pupillary membrane. She obtained a very beautiful central pupil, and left, nine days after this operation, with S = $\frac{1}{8}$, although the eye was still red. I do not doubt that her sight will be quite good when the inflammation, after the second operation, has disappeared.

Judging from this case, and others of my previous experience, I should do injustice to the results of this operative method, were I to insert the two previous cases among the failures. They will, therefore, appear among the imperfect results.

The two *failures* were destructions of the globe initiated by purulent iritis and so-called ring-abscess. The first was after a perfectly smooth operation, manifesting not the slightest reason to account for the fatal issue. Such cases will always puzzle the medical man very much. The second failure was a panophthalmitis too, brought about by the concurrence of several causes,—a frail woman, 80 years of age

—the hottest days of the exceptionally warm summer of 1868; and, above all, an impure operation—complicated with loss of vitreous and remaining of lens substance within the eye.

Four cases of capsulitis, out of these 100 of extraction, presented themselves and were quite remarkable.

The first was that of a whimsical old woman, who was operated on without accident, but some cortical matter was left. The eye got a little red, but the iris was fully dilated, the pupil rather opaque. In this state she could not be induced to stay any longer in the institute. She had no pain, and thought the eye might now take care of itself at home. So she left, ten days after the extraction, with S = $\frac{1}{20}$. At home she looked after her business which had been neglected so long. Six weeks later she came again, having one-third of the anterior chamber filled with pus. The pupil was still dilated with atropine which she had constantly instilled. I applied poultices on her eye. The hypopyon diminished immediately. The peripheral zone of the dilated pupil first cleared up, *while the centre was intensely yellow, like a circumscribed corneal pustule.* In five days the hypopyon had disappeared. Shortly afterward she left the institute with a hazy pupil, but with very good prospects for further improvement.

The second case was operated on without accidents, or remaining lens matter, in a woman of sixty-seven. She experienced pain in her eye the second night, had chemosis, hyperæmia of iris, the dilated pupil was filled by a yellowish gray, wrinkled membrane, in which there were some dark, free places. These symptoms went on slightly increasing, until eleven days after the operation hypopyon appeared, the iris became somewhat swollen, and there was one filiform synechia below. The hypopyon increased for a week, but was never higher than 2 mm. Then it diminished and disappeared, twenty-four days after the operation. At its place lay upon the iris

a small, reddish, convex mass, not unlike sprouting granulations. It shrunk gradually, and the patient was dismissed fifty days after the operation, with a dense pupillary membrane, being able to count fingers near the eye. Three months afterward Professor *Becker* performed iridectomy, which brought about a very clear pupil, and already, in the course of one week, $S = \frac{1}{8}$.

The third case was a good operation in a healthy woman. Under painless chemosis and dilated pupil, the latter grew hazy, and the patient left twenty days after the operation, free from irritation, with $S = \frac{1}{60}$, and the intention of having an after-operation performed in case the pupil should not sufficiently clear up of itself.

The fourth case was a stout man of forty-nine years of age. Operation was without accident, and seemingly with a clear pupil. This latter, however, showed itself filled the next day with a considerable quantity of swollen cortical fragments and pieces of capsule. The pupil was dilated, the iris discolored. Some synechiæ and hypopyon followed. These symptoms abated rapidly, the hypopyon disappeared, the pupil remained dim when the excitable patient got mental troubles, fits of mania, and hastened home, ten days after the operation, with S about $\frac{1}{15}$, but very good prospects of a satisfactory result

The latter case may be called *capsulo-iritis*, the inflammation of the capsule being decidedly the primary affection.

Diffuse inflammatory opacity of the vitreous was observed in three cases. In the one it occurred after the extraction of a hypermature cataract, with thickening of the anterior capsule by whitish-gray and yellow (connective tissue and chalk) deposits on its posterior surface. The operation was without accident. Wound closed rapidly, no abnormality of iris and pupil, anterior chamber a long time shallow, chemotic swelling of conjunctiva, and a gray, smoky appearance of the vitreous as in acute glaucoma. No pain or uneasiness of the eye. These symptoms began the third day, increased

slightly during the first week, then decreased; so that the patient was dismissed seventeen days after the operation. The redness and conjunctival swelling had nearly entirely disappeared, but the vitreous still looked misty, and S was only $\frac{1}{10}$. No doubt it will have become perfect in a short time.

The other two cases were in both eyes of an old lady with slowly progressing cortical cataracts. The anterior capsule looked somewhat thickened by irregular deposits of inorganic and organic substance. Both operations were very smooth, but there was a slow re-establishment of the anterior chamber, chemosis and smoky turbidity of the pupillary field and vitreous. No pain, no alterations of iris. Only very slowly the conjunctival redness and swelling disappeared, and meanwhile the pupil was traversed by a thin grayish film. Thirty-four days after the operation S was $\frac{1}{10}$ in either eye. Therefore discision was performed, and the patient dismissed five days later with S = $\frac{2}{4}$ in either eye.

The trouble in the former case may be called simple *hyalitis*, that in the latter *capsulo-hyalitis*.

One *eye was lost by primary suppurative keratitis*.

The patient was a decrepit, very anxious lady, eighty years of age, and operated on during the hottest time of July. The operation could not have been smoother and more regularly peripheral and linear. The apex of the wound was $\frac{1}{2}$ mm. distant from the transparent corneal margin. The day after the operation there was some mucous secretion on the lint covering the eye, slight œdematous swelling of the border of the upper lid, some redness of the conjunctiva and chemosis. The anterior chamber was filled and clear, pupil and iris entirely normal, and vision excellent. At the external corner of the wound, however, was a whitish swelling—infiltration of the lips of the wound, about one-fourth of its whole extent, the other three-fourths being perfectly smooth and well

united. The infiltration did not yet encroach upon the transparent cornea, but was entirely limited to the sclerotic at both sides of the cut. I mention expressly that no iris or any other perceptible foreign substance lay in the corner of the wound. The progress of the affection was simple. Without marked pain, the white infiltration extended gradually over the whole section, then upon the cornea, proceeding one definite step downward every day, showing a pretty sharp line of demarkation which, like in gangrene of the foot, advances a little every day. When it had reached the middle of the pupil, which was on the fifth day, the lower half of the pupil was still beautifully black and afforded the patient good sight. There was from the beginning only a very low degree of that peculiar form of striped parenchymatous keratitis which we witness as a rule after peripheral extraction. In the way just described the entire cornea was destroyed by suppurative softening, and the eye shrunk under the symptoms of panophthalmitis. The patient was dismissed twenty-four days after the operation.

If we now recapitulate the different disturbances of the healing process worth noting, as far as they have some influence on the results of the operation, we find the following:—

Six cases of *after-hæmorrhage*, five of which not interfering with a speedy and perfect healing; in one, however, aggravation took place after the patient had left the hospital, and was followed by irido-choroiditis of both eyes, in one eye most probably of a sympathetic nature.

Seven cases of *iritis*, two of them healed well and with good sight, three had occlusion of the pupil requiring a second operation for instituting an artificial pupil, and two were lost by suppurative irido-choroiditis.

Three cases of *capsulitis*, healing with imperfect sight easily improved by an after-operation.

One case of *capsulo-iritis*, with but moderately good sight, requiring an after-operation to obtain full success.

One case of *exudative hyalitis*, doing well.

Two cases of *capsulo-hyalitis*, doing well also.

One case of *primary suppurative keralitis*, eye being lost.

This statement gives a comprehensive survey of the reactive processes following this method of extraction. Let us inquire in what they differ from those of the corneal extraction, in order to find out which ought to be attributed as proper to the peripheral extraction.

First we see one instance of *true corneal sloughing*, as pure, complete, and terrible as ever it can happen after the ordinary flap-extraction. The old age and the excessive summer-heat may be alleged as having been productive of this bad result, but the example shows that pure corneal sloughing is not precluded by the peripheric ity of the section. Nevertheless it is a very rare occurrence after the peripheric operation. Since former observations are not so conclusive of establishing the point of origin of destructive suppuration of the globe, having not, as the present ones, been made so early after the operation, we must take all the cases of suppurative panophthalmia together. Of them there were three in this third hundred of cases, a higher percentage than in the two former hundreds. Still this is much more favorable than what I have experienced in previous years by flap extraction, especially in hot summer-time.

Next comes *the reaction of the iris*. Seven cases of iritis

out of a hundred operations is decidedly less than I have ever before experienced after any method of extraction; two cases out of the seven were only low degrees, so that only five cases of severe iritis remain, two destructive, and three requiring after-operations for restoring sight. This low percentage of iritis may be accounted for by the pure and broad iridectomy, especially by taking care that before the exit of the lens no part of the iris is left in the section.

After this we observe some *reactive processes which, I suppose, are more proper to this operation than to the corneal; I mean the capsulitis, capsulo-iritis, capsulo-hyalitis, and hyalitis proper.*

The clinical features of *capsulitis* have now come sufficiently often under my notice, to enable me to give a general picture of its symptoms after the notes in this and my former reports. As to its causes, I think the extensive tearing of the capsule, especially when the latter is changed in structure, acts in favor of the production of new cellular elements within the capsule. At the height of the process there is the greatest resemblance to corneal pustule or circumscribed abscess. This collection of pus was observed in the centre of the capsule, but I am not at all certain, whether those cases where the yellow discoloration appeared at the periphery of the coloboma, and which were registered as iritis, may not have had their starting point in inflammatory reaction of the capsule. The equatorial zone of the crystalline has a greater quantity of young cellular elements, is nearer to the nutritive channels, and may therefore be supposed more liable to reactive inflammation than the centre of the

capsule. I must again pronounce, as I have already done in my first report two years ago, what a benefit it would be to remove the anterior capsule by a fair procedure. Excision will be the only way, since tearing, which now is done most extensively, and, in some cases, has the effect that part of the capsule exudes together with the cataract, is a manipulation neither so appropriate nor so safe as excision would be. Clear cuts are easily borne, as we see in the iris, but tearing and bruising are detrimental hurts to any tissue or organ. Now, when we come to the practicability of excision of the capsule, there seems to be hardly any thing else conceivable than to cut or rend the capsule by a sharp, curved needle, cystitome, or hook, then seize it with delicate forceps (rather than with a peculiar modification of the needle or hook, as I have seen several contrivances for similar purposes), draw it out, and if necessary cut it off close to the wound.

That the inflammation of the capsule may extend towards the iris and towards the vitreous seems very natural, and is proven by direct observation.

Another group of consequences of this operation are deeper-seated affections; those of the ciliary processes, choroid, vitreous, and, secondarily, the retina. Hæmorrhage and *primary opacity in the vitreous* are rather frequent in this mode of operating, although I have noted, this time, but one case of hyalitis. This was, however, such a marked one, that it could not have been overlooked. Had I turned my attention more particularly to these deeper-seated changes, I should most probably have noted more of them. Their origin certainly lies in the proximity of the section to

the ciliary body and vitreous. The injury creates hyperæmia and its consequences, exudation and extravasation. These alone will pass away without damaging the eye, but when they are added to similar conditions in the membranes bordering the anterior chamber, they may make a total of inflammatory reaction, the consequences of which are commensurate with the number and dignity of the parts affected. That the involuntary or voluntary rupture of the hyaloid membrane, with protrusion of the vitreous into the anterior chamber or outside the eye, is another addition to the injuries inflicted on the eye by the operation for cataract, is self-evident. Not knowing beforehand what resistance each individual eye is capable of presenting to the unavoidable hurts of the operation, I do not feel justified to increase them voluntarily by another one (as *Hasner* does in his puncture of the hyaloid fossa); and, as everybody, I consider involuntary protrusion of vitreous to be an unfavorable complication.

Although these remarks have become somewhat lengthened, against my intention, I do not like to curtail them, since they are all based upon positive observation, and, as to me, may serve to others to understand more thoroughly the dangers and requirements connected with all the steps of this admirable, though complicated operation. The deeper our understanding is, the more to the purpose will be the different acts of the whole procedure; and I do not think it impossible that, by knowledge and practice, we may yet be able to perform extraction of cataract with the same degree of safety as the operations for artificial pupil.

TIME OF HEALING.

The average duration of the patients' stay in the institute was $14\frac{17}{100}$ days. They were dismissed as soon as the reaction from the operation had subsided, and he process of further clearing up of the eye and consolidation of the wound was judged unendangered by the usual external influences of light, locomotion, &c. The following data give a general insight into the time of healing. Out of the one hundred patients, fourteen were dismissed from the seventh to the ninth day (inclusively) after the operation, forty-six from the tenth to the fourteenth incl., twenty-nine from the fifteenth to the twenty-first incl., and ten from the twenty-second to the fiftieth.

The usual course of healing, therefore, did not even last a fortnight, whilst a protracted healing, from three to seven weeks, occurred in ten per cent., the greater part of which were dismissed during the fourth week.

RESULTS AS TO VISUAL ACUTENESS.

The visual acuteness of all the cases was determined the day before dismissal, that is, at the earliest possible date. This I beg the reader to take into consideration when judging of the results obtained. The given figures are primary results with a good chance of spontaneous improvement in all. In many cases I performed discision of pupillary opacities at an early period after the extraction, but never before the inflammatory reaction had subsided, the patient being in such a state in which he would have been dismissed

but for a secondary operation. Of this early discision I intend to speak at another time; I will only mention here, that none of the patients lost any thing by, or underwent a considerable degree of inflammation after it. Almost all cases healed quickly (commonly in five days), and gained very much by the operation, so, for instance, $S = \frac{1}{10}$ was nearly always raised to $S = \frac{1}{5}$ or $\frac{1}{4}$. The following statement of visual results is made *before a secondary operation*, and represents the visual power at a period when the patient's eye has not yet entirely recovered from the operation, but is only on a sure way to do so. The determination was made by looking at a distance in a moderately clear room in using Snellen's test type.

Number of Eyes.	Obtained Acuteness of Vision.
1	$\frac{3}{4}$
4	$\frac{1}{2}$
4	$\frac{2}{5}$
8	$\frac{1}{6}$
12	$\frac{2}{7}$
21	$\frac{1}{4}$
7	$\frac{1}{5}$
6	$\frac{1}{6}$
2	$\frac{1}{7}$
4	$\frac{1}{8}$
14	$\frac{1}{10}$
3	$\frac{1}{12}$
1	$\frac{1}{15}$
4	$\frac{1}{20}$
1	$\frac{1}{40}$
1	$\frac{1}{60}$
1	$\frac{1}{200}$
3	$\frac{1}{\infty}$*
3	0

* $\frac{1}{\infty}$ means curable blindness, or good perception of light in simple occlusion of the pupil. 0 means incurable blindness, with or without perception of light.

If we make larger groups, and consider all eyes, the sight of which is destroyed, as losses or failures, all those with S beneath $\frac{1}{10}$ as imperfect results, and those with S = $\frac{1}{10}$ or more as perfect results, we have losses, 3; imperfect results, 15; perfect results, 82.

Most of the imperfect results have been converted by after-operations into perfect ones, all (except two with deep-seated complications) were susceptible of becoming good results. Thus, I may *sum up the ultimate result*, that 3 *per cent. of loss*, 6 *per cent. of imperfect, and* 91 *per cent. of good success* were obtained.