ON THE TREATMENT WITH "GLAUCOSAN" OF CASES OF GLAUCOMA OPERATED UPON WITHOUT SUCCESS, AND OF COMPLICATED CATARACTS

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How are cases of glaucoma to be treated, in which an operation has either been unsuccessful, or resulted in only a temporary success in spite of regular application of eserine and of pilocarpine even subsequent to the surgical operation?

In 1923, Prof. W. Uhthoff, Chief of the University Clinic, Breslau, wrote in Deutsch. med. Wochenschr. ("On the treatment of glaucoma," p. 7): "Woe to the patient who loses courage too soon and refuses further operations!" This will be the opinion taken even at present by ophthalmologists. As soon as a suggestion is made to perform another operation in the near future, the patient will answer with the fearful cross-question: "But will this next operation lead to a successful result? Or will it possibly result in a change for the worse?" The decision is one of the most serious duties incumbent upon an ophthalmologist, because the operation will affect a seeing eye, and not an eye which has grown blind, as in the case of senile cataract.

The post-operative tension of the eye will often continue to be high, not only in simple glaucoma, but also in many cases of acute glaucoma after operation. The "attack," the steaminess of the cornea, the disturbance of vision, the pain, the nausea, are removed, but the tension will continue to amount to 40 or 50 millimetres; in such cases as, for instance, the case published by Dr. W. Rauh (Zeitschr. f. Augenheilk., Vol. LXXIII, 1930) and also the cases described in my own publications (e.g., Klin. Monatsbl. f. Augenheilk., Vol. LXXXIX, 1932, p. 366, and also in my book "Selbstheilung hoffnungsloser Krankheiten," [Spontaneous cure of hopeless diseases], G. Fischer, Jena, 1928, p. 37) simple glaucoma has already been present,—though unperceived,—a long time ago, and only the permanently high tension, in spite of the cornea being transparent, gave a clear insight into the character of the disease; in such cases there exists also an excavation of the optic nerves, whereas such an excavation is absent in an acute glaucoma affecting an hitherto healthy eye.

In my experience a second or another repeated operation for glaucoma ought not to be recommended prior to a preceding tentative treatment with glaucosan drops.
The operations concerned here are iridectomy and trephining. The glaucon drops* introduced by me in 1926, have become firmly established in ophthalmology. They are applied principally in severe iritis and in secondary glaucoma, i.e., annular adhesion between iris and lens. Prof. Stock of Tübingen writes as follows: "In such cases not infrequently the results have been simply splendid: The pupil dilates, adhesions separate, the glaucoma disappears." (Klin. Monatsbl. f. Augenheilk., Vol. LXXXI, p. 695, 1928.)

Though no doubts can exist any longer as to the value of the preparation in this type of glaucoma, two cases may be published here,—because of their typical character,—the first with due regard to the retarded effect, and the other, because the eye had been declared to be definitely lost by an experienced consulting ophthalmologist, unless it were operated upon forthwith.

Case One.—Hairdresser, aged 60 years. Had iritis repeatedly. On November 6, 1936, glaucomatous iritis, tension 50. Vision: Finger at 1 metre, i.e., practically blind. One day afterwards glaucon drops, ample dose, at first without any effect. Following day: "Repeated strong dose of glaucon." Another day later (on November 8) the eye suddenly cleared, the pupil became round, tension 22, vision 5/7. Last heard of almost one year later on: "Acute secondary glaucoma cured, visual acuity preserved."

Case Two.—Mrs. R. G., aged 46 years, cyclitis tuberculosa; Alpine cure unsuccessful; serious relapse in June, 1937, tension 40, vision 1/60, i.e., almost blind (prior to this relapse: 1/4). On July 20, 1937, consultation with famous specialist, who advised as his opinion: "Immediate operation" is the only way. The attending physician, Dr. F. Langendorff,† however, insisted on a previous glaucon treatment. Patient was treated for about three weeks with glaucon drops up to four times a day. Left clinic with same vision as before, 1/4 without any operation. Tension last measured 10 months later, when it was 20 mm., the splendid results thus being permanent.‡

* Source of supply: Chemische Fabrik of M. Woelm at Eschwege, near Cassel, Germany, "Glaucosan Drops" are identical with Laevorotatory Glaucosan.

† I am indebted to Dr. L., 838, Riverside Drive, New York, also for the information on Case 1. All the observations and opinions, as far as they have not been published in the literature, are contained in private letters remitted to me, I having been authorised to use them for publication.

‡ See Professor Wegner, Ophthalmic University Clinic, Freiberg, "Zeitfragen d. Augenheilkunde," Published by Enke, Stuttgart, p. 348, 1938. "All of you are aware of the fact that these increases in tension, obtaining in eye tuberculosis, offer almost insurmountable difficulties . . . A perfectly indispensable and unequalled preparation for such cases is offered by Hamburger's glaucosan, of which I stated already in 1926 that its principal field of use are cases of secondary glaucoma."
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What is remarkable in this case, is the application of glaucosan several times a day for some weeks; in the case of patients of higher age, from about 65 years upward, a much more cautious treatment would be necessary because of the possibility of necrosis, though I have at no time whatsoever observed such a case of necrosis.

As far as the most frequent type of glaucoma is concerned, i.e., simple glaucoma, most ophthalmologists gave up again glaucosan drops in view of the risk of an acute attack. Since the time when I commenced using a circumscribed massage with glaucosan (see below), in the place of a treatment by instillation, I have not observed any more even one single attack after the use of glaucosan. In excised and trephined eyes I did not even observe one single acute attack due to glaucosan at any time whatsoever; should such an attack occur at all, it must certainly be a rare accident, as has been confirmed to me by experienced clinical specialists. Prof. Fehr, for instance, who directed for a period of almost 30 years the large ophthalmological department of the Rudolf Virchow Hospital at Berlin, writes as follows:

"To-day, 12 years after its introduction by C. Hamburger, no one denies that thanks to its combined effect of dilatation of the pupil and decrease of tension glaucosan is the preferred therapeutic agent in all cases of iritis and uveitis accompanied by an increase in tension. It is also generally recognised as the therapeutic agent in iritis for adhesions which are not separated by atropine. In this field glaucosan has become an indispensable adjunct of all ophthalmological therapy.

"There are also other indications in which glaucosan is proving of great value, viz., in the frequent cases in which iridectomy or Elliot's trepanation had no or only temporary success and high tension persisted; as far as I know, this field of use of glaucosan has not yet been mentioned in the literature. In these cases acute attacks due to maximum pupil dilatation need not be apprehended as they occur in cases of primary glaucoma not yet operated upon, and have restricted the field of indications of glaucosan treatment. At least, I have never observed any, although I used glaucosan frequently in such cases. In most cases the tension dropped, frequently to the normal level, remaining often at normal even after discontinuing glaucosan and applying pilocarpine and eserine which previously had been ineffective,—thus avoiding the need for another operation. Glaucosan gives particular relief to patients in whom the continued use of miotics has led not only to gumming of the margin of the pupil, but also to pigmentation of the capsule in the contracted pupillary region, whereby vision was reduced. Dilatation of the pupil by glaucosan, even if only slight because of adhesions, improves vision at once, due to an improvement
of the optical conditions. One must not yield to the temptation of applying glauco-san for some considerable time without interruption, still less to let the patient use it without any control; we must always realise that glauco-san is a highly specialised therapeutic agent as has always been stressed by the author."

Particularly encouraging is the fact emphasized in this summarizing opinion that now frequently,—by the aid of the glauco-san drops—it has been possible to avoid the need for another operation. In order to corroborate further the statement, two graphs and two histories of patients may be cited, one after a ten months' period of observation, the other having been observed for more than ten years.

**Curve 1.** The curve is that of a merchant, 59 years of age, who underwent iridectomy on both eyes—technically perfect—nine months ago, on account of simple glaucoma, but without any success. Tension 36 in either eye in spite of regular application of miotics. A new operation on both sides was proposed, *i.e.*, a third and fourth, but declined by the patient.

One eye sees only eccentrically and is practically blind, the other having almost half normal vision.

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**Graphic Record One.**—Pupil of an iridectomised eye, concentrically dilated by instillation of glauco-san. For details see essay. The configuration taken by the eye in case of massage with glauco-san, can be seen from Curve 3.
By glucosan with subsequent application of eserine the tension was kept normal. At the first instillation only the worse eye was treated and given only one drop as a precaution. At the second treatment two drops were given. Tension dropped to 21 from 36, and to 18. After this favourable experience the better eye was also treated with this extremely cautious dosage. An acute attack did not occur at any time whatsoever.

Curve 2.—Miss R. J., Berlin, a former teacher, now 64 years of age, and 52 years upon the commencement of the treatment in 1927, underwent ambilateral iridectomy twenty years ago for simple glaucoma, technique excellent (operation performed by Prof. Silex). Tension 50 on either side. Vision 5/7 and 5/15, but visual fields already greatly damaged. Lately has been suffering from sudden blacking out and iridisation in spite of eserine. Thus operation was in fact unsuccessful. My observations commenced in January, 1927, i.e., almost 11 years ago. In view of the long period of observation the graph only shows typical tests. It shows that occasional rises (for instance in January, 1929) are...
always mastered by glaucosan. Patient has for many years been instilling the drops herself one to two times per week, as she can usually tell when the tension is too high. Acuity of vision, and also field of vision have been impaired, as they are bound to suffer in all cases of this chronic disease. Operation cannot prevent it either; cf. enormous tension in January 1927 at the commencement in spite of previous operation: 50 mm. Hg.

Ophthalmologists intending to be particularly cautious, because they are afraid of an acute attack, may avail themselves of the method of massage with glaucosan (Gl. = M.) in the place of instillations. Thereby the dilatation ad maximum of the pupil is prevented, which according to experience creates an inclination to attacks. Gl. = M. aims at an eccentric dilatation of the pupil.

The details of the glaucosan massage are as follows:

1. Apply in the forenoon, to leave plenty of time for observation.
2. Instruct the patient to come with his pupil at maximum contraction; last eserine dose about thirty minutes before the glaucosan massage.
3. One drop of pantocaine or larocaine as anaesthetic.
4. Apply glaucosan massage, taking care to prevent the liquid from running into the conjunctival sac.
5. Repeat the glaucosan massage on the same spot, if the pupil does not react sufficiently after 20 to 30 minutes.
6. One to 1½ to 2 hours after the glaucosan massage instil eserine or physostol drops in accordance with the diameter of the pupil. If any scruples are felt, massage with amino-glaucosan (2 per cent. or 7 per cent. histamine), as the irritation is much less than upon instillation.
7. The patient should not be allowed to go until the pupil begins to contract.
8. Never treat both eyes at one sitting.
9. Always treat the more affected eye first.
10. The massage can be repeated on the following day.

A treatment by glaucosan massage is also particularly well suited to the purpose of examining the optic nerve in the case of such eyes where there exists a suspicion of glaucoma, in view of the eccentric dilatation of the pupil brought about, and also for the purpose of removing adhesions of the iris to the capsule of the lens after a cataract operation. Many post-cataractous discisions have in such cases been rendered dispensable by a massage with glaucosan. It is furthermore advisable in order to form an opinion as to whether an optical iridectomy—in a case of a corneal leucoma, etc.—will be successful. “In the most
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satisfactory manner I have been able to bring about the local, eccentric dilatation of the pupil by means of laevorotatory glaucosan." (Franz Gnad, Elschnig Clinic at Prague, "On the manner in which pupillo-motoric agents display their effect, if applied upon local restriction of the area treated," Klin. Monatsbl. f. Augenheilk., Vol. LXXXIV, p. 512, and Dr. M. Vannas: "Eccentric Mydriasis upon ascertaining the indication of an optical iridectomy," ibid., Vol. LXXX, p. 482.)

Curve 3 may be mentioned as a proof of the effect attained also in the case of glaucomatous eyes (simple glaucoma) not having been operated upon.

Curve of a business man of 64 years of age, bilateral glaucoma simplex, so far untreated. One eye sees only eccentrically, and

**Graphic Record Three.**—Man of 64 years who refused to be operated on for simple glaucoma. Massage with glaucosan on January 20, 1937. Attention is drawn to the "sympathetic effect," i.e., the effect conveyed to the other eye (after massage). In January, 1937, treatment of the worse eye, the better eye having been treated later on, i.e., in March. Attention is drawn to the eccentric dilatation of the pupil.
is practically blind. The better eye has about half normal vision. Tension bilaterally 40 in spite of eserine, etc. Patient refused operation. On January 20, 1937, glaucosan massage of bad eye. Tension fell to 18 bilaterally. (Sympathetic conveyance of the stimulus thus also obtains in the case of glaucosan massage.) The curve indicates the intensity and duration of the effect. After about a fortnight (February 9) the massage was repeated on the same eye with the same effect. Contraction after 2 hours. The better eye was then similarly treated. Energetic massage on March 3, 1/3 of peripheral cornea for 10 seconds. This time there was no sympathetic softening. Contraction of the pupil was this time brought about by massage with amino-glaucosan—Wölfl, * 2 per cent., because the better eye was concerned. Treatment later on repeated from time to time. Tension continued to be normal in the better eye. (Measured for the last time on May 6, 1938.)

The patient who refused to be operated on the eye (tension 40) would without glaucosan have suffered serious damage, or even have become blind. When using glaucosan in this cautious manner, I emphasize once more: massage with glaucosan, and at the beginning only on the worse eye, even a sole eye can without any hesitation be treated with glaucosan. Or would it be considered preferable to leave the patient untreated to himself, i.e., to inevitable privation of sight,—a patient whose eye tension continues to be high in spite of miotics,—because, deterred by the fate of the other eye, operation was declined by him?

Dr. Haitz of Mayence (Klin. Monatsbl. f. Augenheilk, p. 937, 1939, writes: "A patient has refused operation, under glaucosan his better eye has kept invariably well for two years and a quarter, whereas the other, operated on before, has been getting slowly worse (enlargement of scotoma)."

It would, moreover, be wrong to desist from further treatment with glaucosan, if the tension does not immediately fall to a sufficiently low level. Even after several weeks or even months I observed a reduction in tension down to 13 or 12 mm. Schötz, even in cases where at the beginning the tension had only been reduced from 32 to 25.

In this regard I would, however, like to emphasize as much as possible that, as far as patients are concerned who have already

been operated on without a successful result, a second operation ought not be to performed without a previous tentative treatment with glaucon, either as drops, or by the even more cautious method of massage with glaucon. I repeatedly state that acute attacks are certainly very rare in iridectomised or trephined eyes, such attacks at any rate not having become known to me. I cannot desist from quoting below the observations made by some particularly experienced ophthalmologists:

1. Dr. W. Rauh (Zeitschr. f. Augenheilk., Vol. LXXIII, 1930: Acute bilateral glaucoma. Attack cured, but tension soon rose again to 60 (!). Glaucon drops. Author writes: Apparently both eyes inclined to acute attacks, i.e., such eyes where attacks already obtained and were for the time being improved by pilocarpine-eserine or by a surgical operation, can be treated with glaucon without any serious risk. . . For this reason we also treated as out-patients without any scruples three uniocular patients.” (University Clinic at Giessen.)

2. Dr. Bender, former Assistant to the University Clinic at Berne, Switzerland), now Hospital Director at Breslau: R. W., who already lost his sight in the left eye in consequence of tuberculous iritis, in the right eye operated on for glaucoma three times in the course of 13 years. (Iridectomy, sclerotomy, cyclodialysis). Tension, nevertheless, frequently higher than 30, at one occasion having risen up to 55 (!), not reduced to normal by miotics. “The glaucon treatment carried through at intervals of several months and only once every time caused the tension to drop immediately, though it has risen temporarily up to 55 mm. Hg, wherefore the tension could thereupon again be kept at a normal level for several months by a treatment with pilocarpine-eserine. No symptoms of any acute attack.”

Professor C. A. Hegner, Director of the Cantonal Ophthalmological Clinic at Lucerne, Switzerland, reports: Mrs. H., aged 50 years, hysterical subject, trephined bilaterally 5 years ago for glaucoma, one eye blind. Tension 50 in both eyes in spite of miotics being applied. Glaucon drops do not produce any attack. Glaucon again and again reduced the tension to normal and made miotics effective, without any attack. “In such a desperate case this result must be considered excellent. Again and again the tension was reduced by glaucon to an almost normal level and miotics were again rendered effective.”

4. Dr. Iwan Enfedjeff, Ophthalmologist in Bulgaria (at Stara-Zagora), trained in Berlin (at the Charité Hospital), writes as follows: “After glaucoma operations which had no success or only a temporary one, I used glaucon drops and never observed any attack.”
I am not at all opposed to any surgical operation for glaucoma simplex, though I am considered to be such an antagonist on principle. There are certainly cases where the eye can only be saved by an operation; and now and then there are cases where an operation has a perfectly rescuing effect. In view of the reports printed above I, however, am convinced that I am right in recommending and stating as my opinion that, as far as patients already operated on without success, a tentative treatment with glaucosan ought to be carried through prior to any new surgical operation.

Even for operations in cases of complicated cataracts glaucosan drops are advisable. This indication results from the incomparably intense effect exercised by glaucosan in the following regards:

1. To dilate the pupil;
2. To contract the vessels of the iris and of the ciliary body and thus to prevent haemorrhage, and even secondary haemorrhage.

1. Glaucosan brings about such a considerable dilatation of the pupil that the enlargement will continue to exist even upon the aqueous humour of the eye being discharged. Therefore glaucosan was used by Jess for the extraction of a lens dislocated into the vitreous body by a contusion of the eye (this extraction having been carried out with the high-frequency pin described by him, which is sunk into the cataract. "Normal course of healing." (Ophth. Ges., Kongresbericht, 1934, p. 181).

2. Upon operations on complicated cataracts and secondary cataracts the success can be perfectly obviated by haemorrhage; (and there are even cases where the operation must be discontinued, because the anterior chamber will be filled with blood). This bleeding amounts to such a danger that a special method has been described by Meller of Vienna in order to prevent it: After the incision has been made, "an appropriate pressure is to be exercised on the eye by means of the finger and a compression bandage to be applied. This procedure has the greatest influence upon the result. By the pressure the haemorrhage (from the cut vessels of the iris and of the membrane) is checked. By a haemorrhage the success of the operation would be jeopardized and in the great majority of cases would even be perfectly annihilated. It is a well-known fact that a haematoma effused in the anterior chamber of eyes affected by chronic iridocyclitis, is not liable to be easily absorbed. And even in case of the blood slowly disappearing after some weeks, the slot produced by the incision will generally be found to have again been closed by a thick membrane formed from the haematoma." ("Augenärztliche Eingriffe" [Ophthalmological operations], 2nd edition, 1921, p. 290.)
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The instillation of glaucosan is a much easier method, as shown by H. Elschnig's example. (Clinic, Znaim, Czechoslovakia.) He avails himself of glaucosan just for cataracts associated with cyclitis and showing large adhesions of the iris to the lens, wherefore these operations offer great difficulties, because the adhesions by their readiness to discharge blood, render any operation difficult and dangerous. "In one of the last cases operated upon—iridectomy having been performed as a preparatory measure (an extensive agglutination of the entire iris with the mature cataract and a dense occlusive membrane nevertheless being present), I was able to prevent even the slightest trace of haemorrhage prior to and in the course of the intracapsular extraction by means of an instillation of laevorotatory glaucosan." (Klin. Monatsbl. f. Augenheilk., Vol. XXXVIII., p. 194, 1937.) I received a letter from Mr. Elschnig in which he was so kind as to inform me of the favourable course taken by the three other "most serious cyclitic cataracts offering large synechiae, where laevorotatory glaucosan was instilled prior to the operation." (April 6, 1938.)*

A similar and most instructive case has been placed at my disposal by Dr. K. Lebuscher, New York.

Female patient, aged 60 years. Subsequent to the operation for cataract: iridocyclitis. Two operations made in order to extract the thick membrane of the secondary cataract proved to be unsuccessful in consequence of haemorrhage. (Both discission and lance-incision.) I advised him to instil glaucosan prior to the next operation, three times in the course of three-quarters of an hour, according to the example given by Elschnig.

Dr. L's report on the third operation:

"After incision a very minute drop of blood appeared, which, however, did not cause any difficulties whatsoever. No blood whatsoever discharged afterwards. The membrane could be removed easily and thoroughly. I am convinced that this operation would have been just as unsuccessful as the former operations, if glaucosan had not been used." (June 2, 1938.)

Recovery (sole eye) resulting in almost perfect acuity of vision: 2/3.

There is apparently no danger of any secondary haemorrhage, as the blocking of the vessels caused by glaucosan will continue to exist for a period of 1 1/2 to 2 hours, and because after this period the small vessels have long been closed by thrombotic action.

* * * About 30 minutes before the operation I have the first instillation made, and then a second and a third time at intervals of 10 minutes. In this manner an excellent anaemia is brought about, making dispensable any cleansing by mopping. The patient mentioned in the publication enjoys excellent vision, the satisfactory success in my opinion being exclusively due to glaucosan."