OPERATING ROOM GONIOSCOPY IN ANGLE CLOSURE GLAUCOMA SURGERY

BY *Robert N. Shaffer,* M.D.*

It is now generally accepted that iridectomy is the most logical, the most effective, and the safest operation for the control of angle closure glaucoma. Unfortunately, it is ineffective if the anterior chamber angles are occluded by permanent peripheral anterior synechias. The purpose of this paper is to present a technique for determining the presence or absence of synechias at the time of surgery.

When tension can be restored to normal by medical means within twelve hours in angle closure glaucoma, conventional presurgical diagnostic methods can be employed. If gonioscopy shows that the angle has opened, one can be confident that iridectomy will be curative. If the angle still seems to be blocked, it is probable that the synechias are permanent and that the low tension is on the basis of suppression of aqueous production. This assumption can be proved or disproved by tonography. If the coefficient of aqueous outflow is high, the outflow channels must be patent, and it is probable that iridectomy will be successful.

When tension does not drop to normal, however, it is impossible to know if the iris is permanently attached to the trabeculum, or if it is only pressed against it. It is quite possible for permanent peripheral anterior synechias to form in an eye which has never had an attack of angle closure glaucoma. Conversely, it is also possible for an eye to lose most of its vision from a chronic narrow angle glaucoma, yet to have the angle open almost completely following a simple iridectomy. Therefore, it is impossible dogmatically to assume the presence or absence of peripheral anterior synechias by the duration of the angle closure.

In the past a filtering procedure has been advised if the tension in an acute attack has been elevated over thirty-six hours, or if there has been any history of previous tension elevations. Such advice may be correct in the majority of cases. Unfortunately, the possibility of com-

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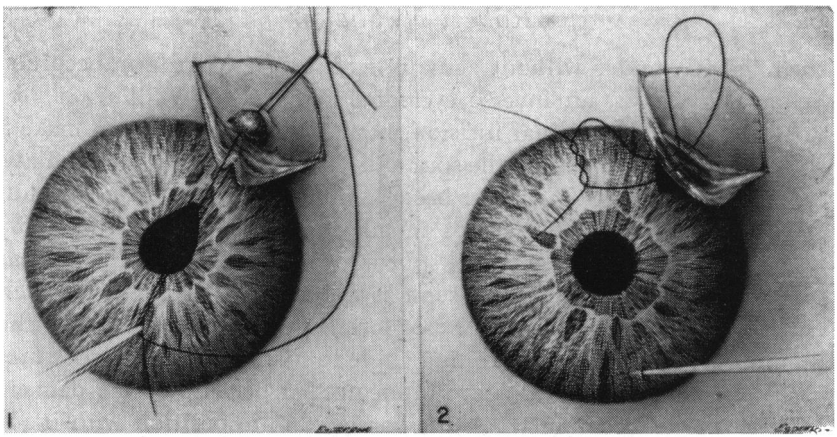
plications and the probability of decrease in vision are considerably increased by any of the external fistulizing operations. It is far better to employ iridectomy and the normal outflow channels if at all possible. This is the problem which has led to the adoption of gonioscopy in the operating room to enable the surgeon to make a logical decision.

In the Glaucoma Clinic at the University of California Medical School, the following procedure is being followed in all cases of angle closure glaucoma. First, a determined effort is made to bring down the tension by miotics, Diamox, retrobulbar injections of procaine, and the like. If the tension is falling rapidly after four hours, medical regime is continued. If pressure is normalized, surgery may be delayed one to two days to permit the eye to quiet down and to allow gonioscopy and tonography. If tension is not normalized, surgery is done within twelve hours.

At the time of surgery a beveled corneal paracentesis is made in the lower third of the cornea with a Wheeler or Greishaber knife-needle so that the anterior chamber can certainly be reformed postoperatively. A routine *ab externo* peripheral iridectomy is performed, following the technique of Haas and Scheie (1). After repositing the iris with a stream of saline from an anterior chamber irrigator, the first half of a surgeon's knot is tied in the McLean suture and tightened. Usually the anterior chamber will have been filled by the irrigation. If the chamber has not formed, saline is injected through the corneal paracentesis.

A sterile glass Koeppe diagnostic contact lens is then placed over the eye and filled with saline. The surgeon now drops out of the sterile setup to examine the eye gonioscopically with a Barkan hand illuminator and a corneal microscope. The latter is best supported on a stand, but may be hand-held if equipment is not available (2). The surgeon can now see the angles of the anterior chamber and tell at once whether or not peripheral anterior synechias are present. If the iris has dropped free of the trabeculum, the assistant completes the tie of the McLean suture, closes the conjunctiva and dresses the eye. The patient is almost surely cured.

If the surgeon sees that extensive anterior synechias are present, several courses are open. A synechialysis, as suggested by Dr. Paul Chandler (3), may be effective. A spatula is passed into the chamber through the original incision and the synechias are dialysed. This is useful if the synechias are in the upper half of the eye. It is difficult to reach the lower angle without possible damage to the iris and the lens. After reforming the anterior chamber, the gonioscopy is repeated. Sometimes the synechias are still present, as the spatula may merely



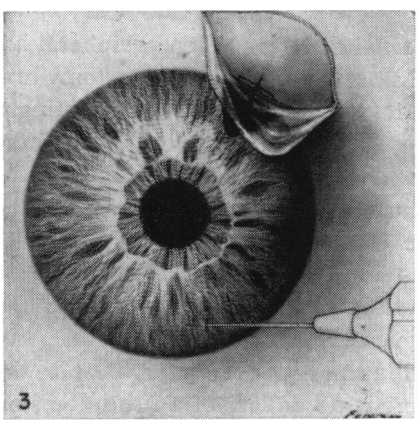


FIGURE 1. PERIPHERAL IRIDECTOMY PERFORMED

FIGURE 2. MCLEAN SUTURE WITH THE FIRST LOOP OF A SURGEON'S KNOT
Beveled corneal incision for reforming chamber previously prepared

FIGURE 3. INCISION CLOSED. CHAMBER REFORMED IF NECESSARY

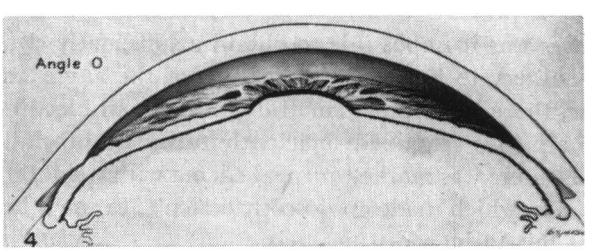


FIGURE 4. GONIOSCOPY SHOWING CUT-AWAY DRAWING OF CLOSED ANGLE

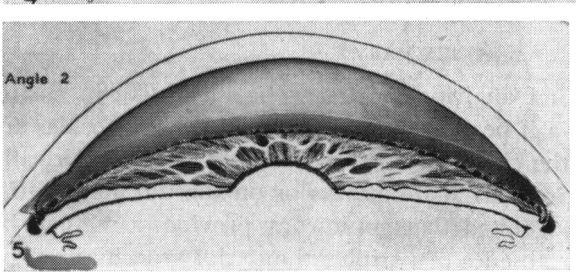


FIGURE 5. GONIOSCOPY SHOWING DEGREE OF OPENING OF ANGLE AFTER IRIDECTOMY IF NO ANTERIOR SYNECHIAS ARE PRESENT

turn the iris under without actually freeing it from the trabeculum. When this occurs, an inverse cyclodialysis is indicated. This can be done through the original incision, but the author prefers to make a second incision just behind the spur and do a routine inverse cyclodialysis so that the spatula can be brought into a formed chamber, thus avoiding damage to Descemet's membrane. Bleeding is avoided by keeping the spatula close to the spur and by restoring the intraocular pressure by saline injection as soon as the dialysis is completed. Even though a suprachoroidal cleft is not formed, the stripping away of the iris may give sufficient functioning angle to maintain normal pressures in the future. Miotic drops are often needed because of the damage done to the trabeculum when iris has been in apposition with it for any length of time.

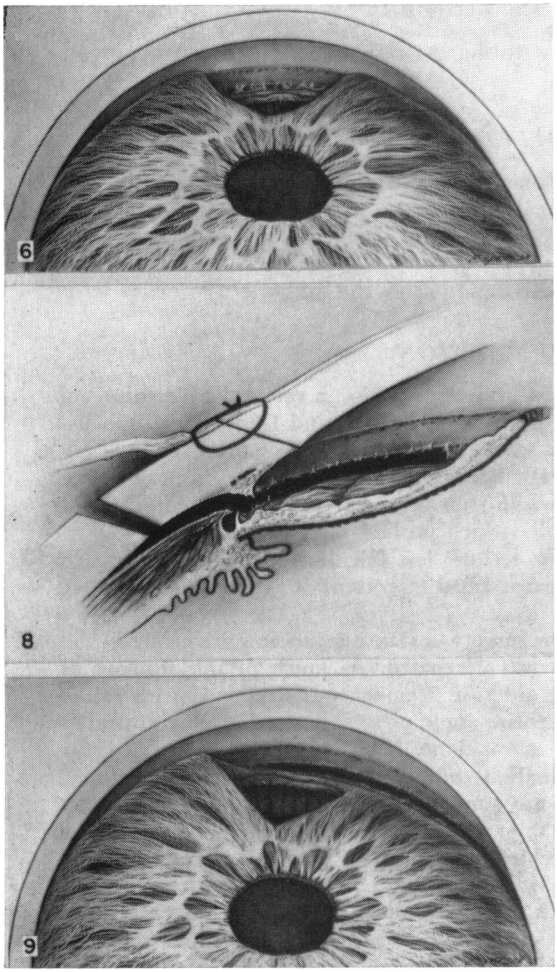
For the surgeon who prefers external filtration when peripheral anterior synechias are present, it is possible to convert the iridectomy into an iridencleisis by removing the McLean suture and incarcerating a pillar of iris after cutting the sphincter. If this is contemplated, a large conjunctival flap should be prepared before starting the iridectomy. The author prefers to reserve iridencleisis for those cases in which the procedures mentioned before have failed.

Postoperatively there is a strong tendency for posterior synechias to form. It is most important to dilate the pupil once a day for the first week or two. Neo-Synephrine, 10 percent, should be tried first, but atropine should not be delayed if dilation is not achieved. Despite the fears of some ophthalmologists, there is no danger of a rise in tension if a patent iridectomy is present.

In only two instances was it impossible to obtain a sufficiently clear view at the time of surgery to be sure whether or not the angle was open. In one of those, there had been a small hyphema from bleeding of the iris root. The aqueous remained sufficiently turbid to preclude gonioscopy. In another there was marked corneal edema with wrinkling of Descemet's membrane, which made gonioscopy difficult. In the other cases, gonioscopy was felt to be a distinct help.

SUMMARY

It is well known that an iridectomy may be ineffective in curing angle closure glaucoma if permanent peripheral anterior synechias are present. In the past, the choice of surgery has been based empirically upon the history of previous acute attacks or on the duration of the present attack. It is suggested that gonioscopy provides a method by which the presence or absence of peripheral anterior synechias can be



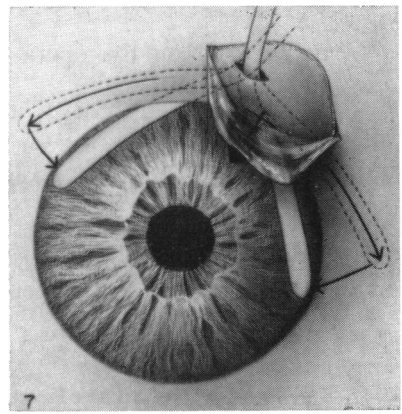


FIGURE 6. GONIOSCOPY AFTER IRIDECTOMY SHOWING PERMANENT ANTERIOR SYNECHIAS

FIGURE 7. CYCLODIALYSIS DONE NEAR SPUR TO FREE ANGLE OF SYNECHIAS

FIGURE 8. RELATION OF CYCLODIALYSIS INCISION TO IRIDECTOMY INCISION

FIGURE 9. GONIOSCOPY AFTER SINGLE-SWEEP CYCLODIALYSIS
Peripheral anterior synechias still present on opposite side

determined on the operating table. A logical choice of surgery can then be made.

REFERENCES

1. Haas, J., and H. Scheie, Peripheral iridectomy in narrow angle glaucoma, Tr. Am. Acad. Ophth., 56:589, 1952.
2. Shaffer, R., and R. Tour, A comparative study of gonioscopic methods, Am. J. Ophth., 41:2:256, 1956.
3. Chandler, P., personal communication with the author.

DISCUSSION

DR. PAUL A. CHANDLER. I consider this presentation a very valuable contribution to the management of angle closure glaucoma, and I hope it will not be neglected for a long period, as is so often the case with new things in ophthalmology. For instance, although Dr. Barkan gave us a fine classification of the glaucomas many years ago, it was fifteen or more years later before we got around to applying the principles which he laid down.

Dr. Shaffer told me about this technic last fall, but I did not attempt to use it until early this spring. Because I had forgotten his exact procedure, I set to work as follows:

After the patient was ready for surgery, a slanting incision was made in the lower cornea and the aqueous was evacuated. As much of the aqueous as possible was let out. Then the anterior chamber was deepened with saline and the angle inspected. If the entire angle or a large portion of it appeared to be closed, a filtering operation was done. If only a quarter or a third was closed, I usually chose a synechialysis combined with peripheral iridectomy. If it was entirely open, then I was sure that a simple peripheral iridectomy would be effective.

I have found that with the technic I have used it is very important to draw off all the aqueous possible before deepening the chamber. Otherwise, due to certain hydrodynamics, which I don't understand, if one puts in saline without drawing off the aqueous the angle may appear entirely closed when it really should be open. This does not occur if one first draws off as much of the aqueous as possible.

I have wondered whether putting a blast of saline into the anterior chamber in such eyes might actually tear off some peripheral anterior synechias. It appears in some cases that this has occurred, for one sees strands and tabs hanging onto the meshwork and onto the peripheral iris. I have found it helpful to look before the operation is actually started, because if I am going to free peripheral anterior synechias I know where to make the incision. For instance, I usually make the incision up and out for peripheral iridectomy. If I find that the synechias are more on the nasal side, then the incision can be made there instead. If, as I said a moment ago, I find, before starting the operation, that a large portion of the angle is closed by peripheral synechias, I can choose an iridencleisis or a combined peripheral iridectomy and cyclodialysis according to what I have seen with the gonioscope.

As Dr. Shaffer pointed out, in acute glaucoma—even in patients where

medical treatment brings the tension to a low level—we still cannot be sure that the angle is entirely open, because if we see patients in whom the tension comes to 14 with medical treatment, we may say, "Surely this angle is open." A peripheral iridectomy is done, and in the postoperative period we are surprised on gonioscopic examination to find numerous peripheral anterior synechias.

I should like to congratulate Dr. Shaffer on originating this technic, and I recommend it to all of you.

DR. HERMANN M. BURIAN. Today again I find myself in agreement with everything that Dr. Shaffer has had to say. He has given us a very useful and practical paper. I believe that his suggestion of applying gonioscopy in the operating room has much to recommend it.

I was glad to hear about the routine which Dr. Shaffer follows in his glaucoma clinic with regard to angle closure glaucoma, and particularly interested in the fact that he advocates surgery within twelve hours or at the most within thirty-six to forty-eight hours, even if he has been able to reduce or to normalize the intraocular pressure with miotics, notably with Diamox. There is today a regrettable tendency to delay or even to avoid surgery in such cases, especially since the advent of Diamox. Dr. Chandler has recently and very ably called attention to this danger. Also, Dr. Becker has published an editorial in the *American Journal of Ophthalmology*, in which he calls attention to this.

I have only a few questions to ask Dr. Shaffer. I understood him to say that he makes a beveled paracentesis prior to his *ab externo* incision for the iridectomy. To what extent does the lowering of the pressure due to the paracentesis increase the difficulty in making the initial external incision for the iridectomy?

The synechialysis or, if necessary, the inverse cyclodialysis recommended by Dr. Shaffer if gonioscopy shows that the iris has not fallen back from the trabecular zone following iridectomy, would seem to be very logical procedures. Dr. Shaffer uses a spatula for the synechialysis. He does not mention the possible use of a goniotomy knife. I should like to ask him whether, in his opinion, the goniotomy knife could be employed advantageously for this procedure.

Is it the iridectomy or the reduction in intraocular pressure when the anterior chamber is opened which makes the iris initially fall back from the trabecular zone? Of course, we realize that the iris is kept away from the trabecular zone by the iridectomy. But if it could be shown by operating room gonioscopy that the anterior chamber itself allows the iris to fall back when there are no anterior synechias, then this might prove helpful in the choice of surgery. If the iris fell back after the opening of the chamber, one would proceed with the iridectomy; if not, one would either plan to add a synechialysis, or to do an inverse cyclodialysis or an iridencleisis.

DR. WENDELL L. HUGHES. I think this is a most interesting technic. I wonder whether Dr. Shaffer has tried using air instead of saline in the anterior chamber to deepen it—and to help break up some of the peripheral anterior synechias. In that way one could avoid having to use a contact glass on the

cornea, as the anterior chamber angle can very frequently be visualized without the contact glass if air is used.

DR. WILLIAM J. HOLMES. Dr. Shaffer has carefully, thoroughly, and scientifically proved by gonioscopic observations a fact which has been suspected but not confirmed by Italian ophthalmologists for many years. In 1950, at the time of my visit to the largest surgical eye clinic in Rome, I was amazed to see that the routine operation for glaucoma consisted of three procedures. These included iridectomy, cyclodialysis, and Lagrange sclerectomy.

In discussing this approach with the surgeons in Rome, I asked whether so much surgery at one sitting did not seem too mutilating to them. They said no; from a practical standpoint they found that multiple procedures in their hands at that time were the most efficient means of permanently reducing increased intraocular pressure.

Mind you, all of this without the use of the gonioscope, and without knowing much about the chamber angle, but on the basis of practical observations alone.

DR. ROBERT N. SHAFFER. In regard to Dr. Burian's questions: First, in the paracentesis which we use only the tip of the knife is brought into the anterior chamber. We try very hard not to lose any aqueous at that time. If aqueous is lost the incision has not been beveled sufficiently. Actually, in our experience paracentesis has seldom been needed. Almost always it is easy to reform the anterior chamber once the iridectomy has been performed. I think that is the important thing, and it is probably the reason Dr. Chandler has noted that the angle may not be opened by paracentesis when the iridectomy has not been performed. That would be entirely dependent on whether complete evacuation of the aqueous from behind the iris has occurred. If it has, the angle will open up. If not, it will be impossible to tell whether or not synechias have formed.

As to the use of a goniotomy knife for the synechialysis: Dr. Otto Barkan, as you know, has been using a goniotomy-like technic to perform a cyclodialysis. However, he restricts its use to a deep-chambered eye. I think it would be very difficult to use a goniotomy approach in these shallow-chambered eyes, and it would be quite dangerous. In addition, the freeing of synechias is more traumatic if one attempts to approach from the anterior chamber side. That is why one sometimes fails with synechialysis. One is going with the grain of the synechias, so to speak, when coming from the suprachoroidal space into the chamber.

Going back to the third question of Dr. Burian: It is not the reduction of the pressure of the anterior chamber which allows the iris to drop free, but the breaking of the pupillary block, which permits the aqueous to come forward into the anterior chamber.

With regard to Dr. Hughes's question about air: That goes back to the technic of doing goniotomy with the use of air. We personally feel that when using air you just cannot do the accurate gonioscopy necessary to tell whether or not synechias are present. There are too many reflections; there is too much of a film of aqueous caught in the narrowness of these angles to enable one to see well. A wide open angle presents no problem, but a narrow angle is hard to examine. I don't believe air is a good enough medium.