THE EFFECT OF MYDRIATICS UPON THE INTRA-OCULAR PRESSURE IN SO-CALLED PRIMARY WIDE-ANGLE GLAUCOMA

PETER C. KRONFELD, M.D.
Chicago, Ill.

AND

(By invitation)

H. ISABELLE McGARRY, M.D.
Chicago, Ill.

AND

(By invitation)

HOMER E. SMITH, M.D., U.S.N.R., M.C.
Chicago, Ill.

The effects of mydriatics or cycloplegics upon the intra-ocular pressure of human eyes have been discussed repeatedly before this Society. A great deal of attention has been given to the so-called dilation glaucoma, that is, to cases of unexpected marked rise of the intra-ocular pressure following the local administration of mydriatics for the purpose of obtaining cycloplegia or for examination of the fundus. Such cases have been reported by H. Derby in 1867; J. Green in 1880; H. W. Ring in 1903; T. Y. Sutphen in 1916; H. Woods in 1923; and finally by S. Judd Beach and E. E. Holt, Jr., in 1940. The last two authors, as well as Verhoeff, in the discussion of Gradle's paper in 1935, stressed as "the most significant feature of this group the recurring mention of shallowness of the anterior chamber." Recent gonioscopic work[1] has shown that it is highly probable that the mechanism of the dilation glaucomas is that of an acute obstruction of the entrance to the chamber angle by the ruffled iris, combined, in some instances, with other angle-crowding factors. Also through gonioscopic evidence it now appears reasonably well established that such an obstruction is possible only in eyes

with a pre-existing narrowness of the angle, which is usually, but not always, associated with shallowness of the entire anterior chamber.[2] By means of gonioscopy or, more accurately, by goniometry,[3] it is possible to predict with reasonable certainty whether the intra-ocular pressure of a given eye will be disturbed by mydriatics and what degree of mydriasis will bring about this disturbance.

The present study concerns itself not with dilation glaucoma, but with the effects of mydriatics upon the intra-ocular pressure of eyes with apparently primary glaucoma in which the mydriatics could not and did not produce any obstruction of the entrance to the angle, or, more specifically, did not alter the area of the corneoscleral trabeculum which was gonioscopically visible and therefore presumably accessible to the aqueous. The fulfillment of this requirement was verified by repeated gonioscopic examination during the action of the respective mydriatic. Border-line cases, in which the size of the gonioscopically visible area of the corneoscleral trabeculum may have been altered while the eye was under the influence of the mydriatic, were not included in this report. The fact that the intra-ocular pressure was elevated in the absence of any obstruction of the entrance to the angle places the eyes upon which this report is based in the group of so-called "wide-angle glaucoma" (O. Barkan). Strictly speaking, none of the work done in the pregonioscopic era can be considered as having any bearing on the problem of the effect of mydriatics upon wide-angle glaucoma. It is, however, reasonably certain that observations made on glaucomatous eyes with deep anterior chambers are comparable to our findings, even though the possibility of angle obstruction was not definitely ruled out by gonioscopic examination. Motivated by the "widely accepted concept that the width of the pupil *generally* exerts a decisive effect upon the intra-ocular pressure," H. Koellner[4] made the first systematic study of the relationship between width of the pupil and intra-ocular pressure in cases of chronic simple

glaucoma with deep anterior chambers. In 12 out of 13 such eyes Koellner could not detect any influence of single or repeated instillations of homatropine, scopolamine, or atropine upon the intra-ocular pressure. In the thirteenth case, which was characterized by extensive spreading of pigment in the anterior chamber, a slight rise of tension (10 mm.) occurred five hours after the instillation of homatropine. In his "mydriatic-negative" cases it appears that the tonometric measurements were made only two or three times daily, so that slight transient increases might have escaped recording. It also appears that no special attention was paid to the period during which the mydriasis and the cycloplegia are most pronounced, namely, during the first four hours following the instillation. Nevertheless, Koellner is entitled to the credit of having first shown that mydriasis and cycloplegia of varying degree do not dramatically alter the intra-ocular pressure in chronic simple glaucoma with deep anterior chamber.

No further reports on the effect of the parasympatholytic mydriatics upon the intra-ocular pressure in glaucoma appeared until Streiff[5] published his experiences with syntropan. In a few cases of glaucoma simplex this writer observed, after the instillation of syntropan, an increase in the intra-ocular pressure which could be overcome promptly by the instillation of a miotic. The type of glaucoma that was present in these cases, whether of the narrow or of the wide-angle type, was, unfortunately, not stated.

After Hamburger recommended epinephrine and its congeners for the treatment of certain forms of glaucoma, the effects of the sympathomimetic drugs upon the intra-ocular pressure in so-called primary glaucoma have received a great deal of attention in the international literature as well as at the meetings of this Society. Here again it was our belief that gonioscopy had much to offer toward a more accurate definition of the type of glaucomatous eye, the response of which to the sympathomimetic drugs is being studied.

The present study was undertaken to fill in some of the gaps in this work; namely, gonioscopic observations and more frequent tonometric measurements during the first few hours following the instillation of the mydriatic. We were also interested in determining whether a positive or a negative response of the intra-ocular pressure to the instillation of a mydriatic was of any diagnostic value in cases of suspected primary wide-angle glaucoma.

PROCEDURE

The 15 eyes with apparently primary wide-angle glaucoma which were chosen for this study could, on the basis of the gonioscopic findings, be divided into three groups:

1. Eyes with wide angles and trabecular or scleral adhesions (Nos. 1 through 5). In all these eyes the glaucoma was far advanced, as was evidenced by the extensive if not complete loss of the visual function.

2. Eyes with wide and entirely open angles but moderate to marked trabecular pigment infiltration (Nos. 6 through 12). The loss of visual function which had occurred in these eyes as the result of glaucoma varied from no demonstrable defect in one case (No. 12) to amaurosis in one case (No. 8).

3. Eyes with entirely open angles and without any visible abnormality of the trabecular area (Nos. 13 through 15). In the eyes of this group the loss of visual function attributable to the glaucoma was slight.

In none of the 15 eyes had any surgical procedure been instituted. The use of miotics was discontinued at least twenty-four hours before the beginning of our study, which consisted of the observation of the variations in the tonometric reading as they occurred during control periods and under the influence of two instillations, ten minutes apart, of the following three mydriatics:

5 per cent. homatropine hydrobromide.

2 per cent paredrine hydrobromide.

5 per cent. homatropine hydrobromide dissolved in 2 per cent. paredrine hydrobromide.

The early afternoon hours were chosen for our study because of the greater stability of the intra-ocular pressure during this part of the day. In most cases we confined ourselves to making tonometric measurements every three hours following the administration of the mydriatic. If the last one of these readings was definitely higher than the preceding one, the period of observation was extended. In most cases a further reading was made the following morning.

In an attempt to estimate the factor of ocular rigidity the tonometric readings were taken at first with two different weights. The results indicated that, under conditions of our studies, no significant variations in ocular rigidity occurred. We therefore adopted as a routine measure the taking of the tonometric measurements with one weight only, and transposed the reading into millimeters of intra-ocular pressure using Schiötz's nomogram of 1924.

To be able to compare the possible diagnostic value of the response to mydriatics to that of well-established provocative tests, in the patients of our series, the drinking test of Marx and Schmidt was carried out. After the regular breakfast before 8.30 A. M., the patients received nothing by mouth until 1 P.M., when they drank, within three to five minutes, 1,000 c.c. of water. Tonometric readings were taken immediately before and every twenty minutes after the drinking until the initial tonometric level was reached again. (For a recent review of the value of the drinking test the reader is referred to the article by G. Ohm.[6])

While this work was in progress we felt the need for a control series. We therefore subjected 36 control eyes with minor refractive errors, of individuals over forty-five years of age, to the homatropine-paredrine test, that is, we determined the fluctuations of the tonometric readings as they occurred during the three hours following two instillations of 5 per cent. homatropine dissolved in 2 per cent. paredrine. (For a comprehensive review on the effect of mydriatics upon the intra-ocular pressure of non-glaucomatous eyes, the reader is referred to a recent doctor's dissertation by I. Gilde.[7])

RESULTS

In the patients in our series the greatest increase in tension which was observed while under the influence of mydriatics was 13 mm. Since the intra-ocular pressure at the end of the observation period was usually on the down-grade or had leveled off, it is unlikely that any great increase of intra-ocular pressure occurred during the night following the in-

TABLE 1.—THE FLUCTUATIONS OF THE INTRA-OCULAR PRESSURE WHICH OCCURRED IN THE GLAUCOMATOUS EYES DURING THE CONTROL PERIOD

No.	T_0	T_1-T_0	T_2-T_0	T_3-T_0	T_n-T_0
1.	29	0	+2	+2	+2
	27	+2	+2	+2	+4
2.	27	0	+2	+4	+4
	23	+2	+2	+2	+6
3.	52	−7	0	0	−3
	49	−4	−4	−4	+3
4.	45	−6	−3	−3	0
	42	0	0	0	0
5.	31	0	−2	−2	+2
6.	33	0	0	0	..
7.	27	0	−4	0	+15
	31	−2	−2	−2	+14
	33	−4	0	−6	0
8.	29	−2	−2	−4	..
	27	0	−2	−2	+6
9.	33	−2	−4	−2	+3
	29	−4	−2	−2	+4
10.	27	−2	0	0	..
	27	0	0	0	..
11.	23	0	−2	−2	..
	20	0	0	0	..
12.	19	+4	+4	+1	..
13.	23	0	−2	−2	..
14.	29	0	0	0	..
15.	31	−4	−4	−4	−2
Averages	..	−1.2	−1.0	−1.2	..

The following abbreviations have been used in the tables:

T_0 signifies the tonometric reading obtained at the beginning of each observation period.

T_1, T_2, and T_3 designate the tonometric readings obtained one, two, and three hours respectively after the last instillation or after the first reading.

T_n designates the tonometric reading obtained at about 8.30 A.M. the following day.

F_p designates the greatest fluctuation of the width of the pupil observed during the three-hour periods.

stillations. The next morning the eyes which were under the influence of homatropine or homatropine plus paredrine showed tonometric readings not essentially different from those obtained on the control days. If paredrine alone had been instilled the day before, the morning readings were consistently lower than on control days, a finding mentioned also by other authors.

TABLE 2.—THE FLUCTUATIONS OF THE INTRA-OCULAR PRESSURE AND OF THE WIDTH OF THE PUPIL WHICH OCCURRED IN THE GLAUCOMATOUS EYES WHILE UNDER THE INFLUENCE OF HOMATROPINE

No.	T_0	T_1-T_0	T_2-T_0	T_3-T_0	F_p
1.	36	+3	+6	0	−0.5
2.	36	+3	0	−5	+0.5
3.	45	0	+11	+4	+1.5
4.	42	+3	+3	0	+2.0
5.	31	+8	+11	0	+4.0
	31	+11	+5	+2	+2.0
6.	31	+10	+5	+2	+3.5
	29	0	+4	+7	+2.5
7.	36	+3	+13	0	+1.0
8.	27	+9	+9	+12	+2.5
9.	25	0	+4	+2	+1.5
	27	+4	+2	+4	+0.5
10.	23	+4	+6	+8	+3.5
	25	+6	+6	+6	+2.0
	25	+6	+6	+6	−0.5
11.	21	+4	+6	+4	+3.0
12.	23	−4	−3	0	+1.5
	17	+4	−1	0	+1.0
13.	21	+6	+6	+4	+4.5
14.	27	+4	0	−2	+1.5
	29	+2	−4	+2	+1.5
15.	25	0	+4	+6	+2.0
Averages	..	+3.9	+4.5	+2.8	+1.9

Many of the fluctuations of the tonometric readings observed on the control days, as well as while the eyes were under the influence of mydriatics, were less than 5 mm., and these may have been partly or entirely due to technical errors. Such "pseudofluctuations," if due entirely to experimental errors, would be expected to occur in both plus and minus directions, whereas consistent plus or minus fluctuations, however small, probably indicated a corresponding

change in intra-ocular pressure. Thus the fundamental question appeared to be that of consistency or inconsistency of the data.

TABLE 3.—THE FLUCTUATIONS OF THE INTRA-OCULAR PRESSURE AND OF THE WIDTH OF THE PUPIL WHICH OCCURRED IN THE GLAUCOMATOUS EYES WHILE UNDER THE INFLUENCE OF PAREDRINE

No.	T_0	T_1-T_0	T_2-T_0	T_3-T_0	F_p
1.	36	+3	+6	−5	+3.0
2.	42	−6	0	−11	+2.5
3.	42	−3	+3	+7	+2.0
4.	39	−3	+3	0	+2.0
5.	31	0	+2	+2	+3.0
	29	−2	−2	−2	+1.5
	36	+10	+6	−3	+2.0
6.	29	0	+2	+7	+4.0
	33	+3	+3	+3	+3.0
7.	31	+2	+2	+2	+2.5
	36	0	+3	0	+4.5
8.	29	+2	+4	+7	+2.0
9.	23	+4	+6	+6	+2.5
	25	+2	+4	+2	+3.0
10.	27	0	+2	+2	+3.5
	20	+3	+3	+3	+2.5
11.	21	+4	+4	+4	+2.5
12.	19	0	+4	+4	+2.0
13.	21	+4	+2	0	+2.0
14.	23	+4	+8	+6	+2.5
	27	0	+2	+2	+3.0
15.	31	−6	−2	−4	+2.0
Averages	..	+1.0	+3.0	+1.5	+2.6

A study of the tables shows a fair degree of consistency from No. 5 on, whereas the eyes of Nos. 1 to 4 acted rather erratically. The fact that the vision of these eyes was very poor and the fixation uncertain made the tonometric readings on these eyes less accurate than in the eyes of Nos. 5 to 15. However, even considering the gross inaccuracy of the readings in the first four eyes, it is reasonably certain that no gross alteration of the intra-ocular pressure occurred while these eyes were under the effect of mydriatics. The data obtained on eyes Nos. 5 through 15 possessed the quality of consistency to a high degree.

During the control period the tonometric readings usually

TABLE 4.—THE FLUCTUATIONS OF THE INTRA-OCULAR PRESSURE AND OF THE WIDTH OF THE PUPIL WHICH OCCURRED IN THE GLAUCOMATOUS EYES WHILE UNDER THE INFLUENCE OF HOMATROPINE PLUS PAREDRINE

No.	T_0	T_1-T_0	T_2-T_0	T_3-T_0	F_p
1.	33	0	−2	−2	+1.0
2.	31	0	0	−4	+1.0
3.	67	−6	+4	+4	+3.0
4.	56	0	+11	0	+3.0
5.	31	+5	+11	+11	+2.0
	33	0	+3	−2	+3.0
6.	36	+3	0	+6	+5.5
	36	+6	+6	+13	+2.0
7.	27	+6	+9	+12	+5.0
8.	20	+3	+7	+9	+1.0
9.	23	+4	+10	+6	+2.5
	27	+2	+4	+7	+1.0
10.	23	+4	+6	+4	+3.0
11.	17	+6	+6	+10	+3.0
12.	20	+5	+9	+9	+2.5
13.	21	+9	+6	+4	+1.0
14.	23	+4	+10	+8	+2.0
15.	25	+6	+7	+6	+1.5
Averages	..	+3.2	+5.4	+5.6	+2.4

TABLE 5.—THE FLUCTUATIONS OF THE INTRA-OCULAR PRESSURE WHICH OCCURRED IN THE GLAUCOMATOUS EYES DURING THE DRINKING TEST

No.	T_0	*Readings Twenty Minutes Apart*			
1.	33	+6	+16	+16	..
2.	31	+2	+14	+14	..
3.	61	+6	+6	+10	+6
	49	+12	+7	+3	0
4.	61	+6	0	+16	+6
	45	+11	+7	+4	+4
5.	31	+5	+5	+8	..
6.	31	+5	+11	+7	..
7.	33	+6	+9	+6	−2
8.	29	+2	+10	+10	+7
9.	29	+2	+4	+7	..
10.	23	+10	+13	+13	+8
11.	20	+9	+7	+9	+7
12.	20	+5	+7	+1	0
	17	+10	+10	+10	+10
13.	20	+3	+7	+7	+9
14.	20	+3	+3	+3	0
	23	+2	+2	+2	0
15.	31	+5	+5	+8	+5
Averages	..	+5.8	+7.5	+8.1	+4.3

remained fairly stationary at a level slightly below the initial reading.

Under all three mydriatics the tonometric readings tended to be higher than the initial reading. This increase was most pronounced under homatropine plus paredrine and least marked under paredrine alone. In the case of homatropine

TABLE 6.—COMPARISON BETWEEN GLAUCOMATOUS AND CONTROL EYES WHILE UNDER HOMATROPINE PLUS PAREDRINE

Averages and Greatest Fluctuations Observed

	T_1-T_0		T_2-T_0		T_3-T_0	
Controls	+1.3	+5 −2	+1.2	+4 −2	+0.7	+3 −2
Glaucomatous eyes	+3.2	+9 −6	+5.4	+11 −2	+5.6	+13 −4

alone the increase in pressure seemed to occur a little earlier than after the use of paredrine alone or when combined with paredrine. Three hours after the instillations a trend toward return to the initial reading became noticeable.

The foregoing fluctuations of the tonometric readings occurred with a consistency sufficient to warrant the interpretation that they represented actual increases in intra-ocular pressure.

Plotting of the increase in pupillary size against the increase in intra-ocular pressure revealed no relationship be-

TABLE 7.—SUMMARY

Averages of Fluctuations Observed in the Glaucomatous Eyes

Medication	T_1-T_0	T_2-T_0	T_3-T_0
Control	−1.2	−1.0	−1.2
Homatropine	+3.9	+4.5	+2.8
Paredrine	+1.0	+3.0	+1.5
Homatropine plus paredrine	+3.2	+5.4	+5.6
Drinking test*	+5.8, +7.5, +8.1	+4.3	..

* These figures represent the averages of the tonometric readings obtained at intervals of twenty minutes.

tween the two factors. A study of the relationship between the increase in intra-ocular pressure and the degree of cycloplegia was attempted, but proved impractical because of the advanced presbyopic condition of the great majority of the patients.

As was stated in the beginning of this article, the area of the corneoscleral trabeculum that was gonioscopically visible displayed no variation throughout this study.

Conclusions

Although no claim is made that in our series of 15 eyes all varieties or forms of so-called primary wide-angle glaucoma are represented, the group seems to be comprehensive so far as the gonioscopic picture and the stages of glaucoma are concerned. It appears certain that in primary wide-angle glaucoma the intra-ocular pressure is not grossly influenced by the administration of mydriatics. On the other hand, we believe we have shown that a slight increase of the intra-ocular pressure does occur. Such increase, while of no practical importance, is greatest under homatropine plus paredrine and smallest under paredrine alone. Since paredrine usually exhibited the strongest mydriatic and the weakest pressure-elevating effect, it seemed to be the ideal mydriatic for cases of wide-angle glaucoma.

The increases in the tonometric reading were not associated with significant changes in ocular rigidity, and therefore probably represented true elevations of the intra-ocular pressure. The mechanism of these elevations can at this time be only a matter of speculation.

The response to mydriatics of early so-called primary wide-angle glaucomas is, as a rule, less constant and less pronounced than is the response to the drinking test of Marx and Schmidt. The latter test is, therefore, of greater practical diagnostic value than the former. By the same token a negative response to mydriatics of an eye suspected of

wide-angle glaucoma is of considerably less diagnostic value than is a negative response to the drinking test.

CASE REPORTS

No. 1 (Right) AND No. 2 (Left).—M. P., colored, female, aged sixty years. G–42–1227.

Right: Amaurosis. Left: Light perception. Anterior chambers moderately deep. Both angles are wide and show slight scleral adhesions and marked trabecular pigmentation. Complete glaucomatous excavations. Retinal arteriosclerosis.

No. 3 (Right) AND No. 4 (Left).—N. C., white, male, aged fifty-one years. G–42–1218.

Right vision = left vision = eccentric finger counting at one foot. Healed trachoma. Small pterygia. Anterior chambers deep. Wide angles; moderate trabecular pigmentation; scleral synechiae. Complete glaucomatous excavations. Fields: Only temporal islands.

No. 5 (Right).—W. B., colored, male, aged forty-four years. G–42–1211.

Right: Amaurosis. Left vision = 20/40 + 3. Anterior chambers deep. Right: Wide angle, extensive trabecular adhesions, partial trabecular pigment ring. Left: Wide angle; scattered trabecular adhesions. No trabecular pigment ring. One small posterior synechia in each eye. Right: Total glaucomatous excavation. Left: Partial glaucomatous excavation.

No. 6 (Left).—T. F., colored, male, aged fifty-six years. G–40–592.

Right vision = 20/15; left vision = 20/200. Anterior chambers moderately deep. Wide-open angles. Right: No trabecular pigmentation. Left: Moderate trabecular pigmentation. Right disc normal. Left disc partial excavation. Left field constricted to within five degrees.

No. 7 (Right).—L. A., colored, female, aged forty-three years. G–42–1199.

Right vision = 20/20−2. Left vision = 20/20−2. Anterior chambers deep. Wide-open angles. Right: Marked trabecular pigment ring. Left: Slight trabecular pigmentation. Right: Complete glaucomatous excavation. Left: Physiologic (type 2 Elschnig) excavation. Right field: Large arcuate scotoma above. Left: Normal.

No. 8 (Left).—A. F., colored, female, aged seventy-three years. G–39–513.

Right vision = 20/20. Left: Amaurosis. Anterior chambers moderately deep. Wide-open angles; heavy trabecular pigmentation in both eyes. Right disc normal, left shallow, complete excavation. Right field: Upper nasal step.

No. 9 (Right).—W. E., colored, male, aged fifty-five years. G–42–1206.

Right vision = 20/20−. Left vision: Counting fingers at two feet. Right: Anterior chamber of moderate depth. Left: Shallow (after trephine operation). Right: Wide-open angle; partial trabecular pigment ring. Left: Multiple postoperative, peripheral anterior synechiae; prolapse of ciliary processes into the trephine hole. Complete glaucomatous excavation of both discs. Fields: Right, constriction above and nasally; left, only temporal island.

No. 10 (Right) AND No. 11 (Left).—M. K., white, female, aged seventy years. G–42–1190.

Right vision = 20/200. Left vision = 20/100. Anterior chambers moderately deep. Wide-open angles; heavy trabecular pigmentation in both eyes. Partial glaucomatous excavations; senile macular degeneration. Fields: Upper nasal step in both eyes.

No. 12 (Left).—M. M., white, female, aged sixty-six years. G–39–477.

Right vision = 20/30. Left vision = 20/30. Anterior chambers of moderate depth. Wide-open angles; trabecular pigment ring in both eyes. Discs and fields normal. Spontaneous tensions of 37.

No. 13 (Right).—J. D., white, female, aged sixty-eight years. G–42–534.

Right vision = 20/30. Left vision = 20/30. Right anterior chamber slightly shallow. Left anterior chamber deep. Right: Open angle; no trabecular pigmentation. Left: Angle open except for postoperative adhesions from 4.30 to 6.00 o'clock. Right: Incipient cataract. Left: Surgical aphakia. Right: Partial glaucomatous excavation. Left disc normal. Right field: Rönne scotoma. Left field: Normal. Many spontaneous tensions between 28 and 32 (right).

No. 14 (Left).—R. E., white, female, aged fifty-three years. G–40–572.

Right vision = 20/70+2. Left vision = 20/200+2. Anterior chambers moderately deep. Wide-open angles; no trabecular pig-

mentation. Incipient cataract in both eyes. Right: Physiologic (type 1 Elschnig) excavation. Left: Glaucomatous excavation. Fields: Right, normal; left, nasal step. Spontaneous tensions of 35.

No. 15 (Left).—C. D., white, female, aged sixty years. G–42–1226.

Right vision = 20/50. Left vision = 20/70. Anterior chambers moderately deep. Wide-open angles; no trabecular pigmentation. Right: Physiologic (type 2 Elschnig) excavation. Left: Partial glaucomatous excavation. Fields: Right, no glaucomatous defects; left, constriction above and nasally for 2/1000. Left, spontaneous tensions of 37.

BIBLIOGRAPHY

1. Sugar, H. S.: Am. J. Ophth. **24**: 851, 1941.
2. Gradle, H. S., and Sugar, H. S.: Am. J. Ophth. **23**: 1138, 1940.
3. Gradle, H. S., and Sugar, H. S.: Am. J. Ophth. **23**: 1135, 1940.
4. Koellner, H.: Arch. f. Augenh. **88**: 58, 1921.
5. Streiff, E. B.: Klin. Monatsbl. f. Augenh. **98**: 504, 1937.
6. Ohm, G.: Arch. f. Ophth. **135**: 537, 1936.
7. Gilde, I.: Doctor's Dissertation, Koenigsberg, 1937.

DISCUSSION

DR. S. JUDD BEACH, Portland, Me.: Dr. Kronfeld mentioned the report by Holt and myself on dilation glaucoma at last year's meeting. His paper represents another step in running down the subversive elements in this disturbance. Besides the narrow chamber angle, usually indicated by shallowness of the chamber remarked by us, it will be recalled that endocrines are implicated, as shown by the overwhelming predominance of female victims. Some other factor is still unknown. Hans Barkan suggested the menstrual cycle. That something of this kind exists is indicated by the observation of Magitot on the erratic behavior of provocative tests. He said, in reporting a series of cases, that in the same case an agent that will precipitate an exacerbation on one afternoon may have no effect whatever the following morning. Dr. Kronfeld's observations are of especial interest in supporting the preference of Scandinavian observers for the drinking test rather than mydriatics in uncovering latent glaucoma.