

Unilateral glaucoma

R. ÉTIENNE

Lyon, France

Unilateral glaucoma is usually secondary, and a careful systematic ocular examination may help to detect the reason for the hypertension. Much more interesting is the problem of possible unilateral primary glaucomas, which it is the purpose of this paper to examine. A review of previous works does not give much information about chronic simple glaucoma (Étienne, 1969a). The earlier publications are unhelpful because of the lack of differentiation between angle-closure and chronic simple glaucoma. Duke-Elder (1969c) reached the conclusion that "adequate series of cases to explore this question are sadly lacking". Only a single communication from Drance, Wheeler, and Pattullo (1968) breaks the bibliographical silence. This lack of information is justified by the rarity of the phenomenon (2.4 per cent. of cases, if a distinction is clearly drawn between unilateral and asymmetric chronic simple glaucoma, as it will be seen later). The diagnosis of unilateral glaucoma is nearly always confusing, as was observed by Leydhecker (1960). It is an invitation to examine the fellow eye very closely; the more precise and complete the examination, the greater the chances of finding a sign of glaucoma.

On the question of unilateral angle-closure glaucoma, we have nothing to add to the observations of Winter (1955), Bain (1957), and Lowe (1962).

Frequency

We have reviewed 1,373 observations of glaucomatous in-patients at the Lyon University Eye Clinic, and have found that 289 cases (28 per cent.) were unilateral. Primary open-angle glaucoma (cases with exfoliation or pigmentation included) was present in only 2.4 per cent. (chronic simple glaucoma: 33 cases; exfoliation and glaucoma: 12 cases; pigmentary glaucoma: 1 case). The other unilateral cases involved either secondary (12.8 per cent.) or angle-closure glaucoma. It must be remembered that:

- (i) The out-patients did not include the most serious cases which required hospitalization.
- (ii) We systematically perform a routine prophylactic iridectomy in cases of acute glaucoma: so that the number of fellow eyes not operated on is very small.
- (iii) The present work includes only patients seen during this last year.

I. UNILATERAL ANGLE-CLOSURE GLAUCOMA

This is, in its acute form, a typical unilateral disease, although the fellow eye may subsequently become glaucomatous in 50 per cent. of cases (Bain, 1957; Lowe, 1962). The disease may start with an acute crisis in 34 per cent. of cases during the first year. After 10 years, 40 per cent. of the second eyes are glaucomatous (Lowe, 1962). The second eye may be involved after an average interval of 4 to 25 years (Bain, 1957); an interval of 32 years has been recorded only once.

Is it possible to predict the future of the fellow eye?

(i) Recent biometric studies are generally useless on this point. If the eye with angle closure differs biometrically from normal eyes or those with chronic simple glaucoma, the spared eyes do not differ from the diseased (Grieten and Weekers, 1962). The depth of both anterior chambers is always the same if one takes into account the effect of miotic treatment. A shallow anterior chamber is usually associated with a narrow angle but not necessarily with a closed angle. All shallow anterior chambers do not lead necessarily to angle-closure glaucoma: the disease may remain unilateral as it was clinically observed in 50 per cent. of our cases. It may be asked whether there is a crucial lower level of anterior chamber flattening below which the risk of angle closure is certain. All that may be said is that angle-closure glaucoma is very uncommon if the anterior chamber depth is 2.4 mm. or more (except in the case of "iris plateau") and that the risk is higher when the anterior chamber depth is 1.8 or 1.7 mm. (Lowe, 1970b). Drug dilatation of the pupils may be dangerous at the 2.25 mm. level and below (Delmarcelle, personal communication).

Measurements of the anterior segment are illustrated in Fig. 1.

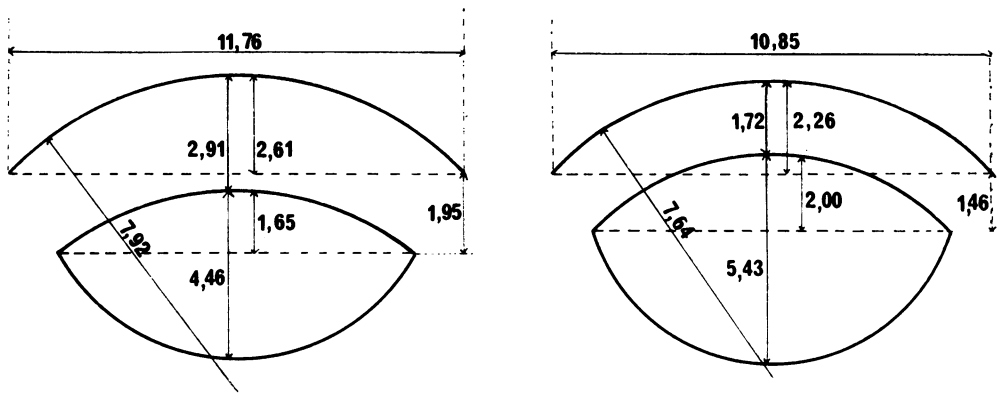


FIG. 1 Measurements of the anterior segment (Courtesy of Delmarcelle, Luyckx-Bacus, and Weekers, 1969; Delmarcelle, Collignon-Brach, and Luyckx-Bacus, 1971)

(ii) The conventional provocative tests (dark adaptation, mydriasis) have the same value as in the past, but I have no information on the proportion which give positive results in the fellow eye.

(iii) There are only two uncommon conditions in which unilateral disease is certain:

- (a) If the spared eye is very myopic;
- (b) If the diseased eye has a microcornea and the fellow eye is biometrically normal.

In conclusion, since it is impossible to know the future, to live under the sword of Damocles is a serious risk and it is well proved that an iridectomy is less dangerous than "crossing a street in London to-day".

The other clinical types of angle-closure glaucoma (subacute or chronic hypertensive) are almost always bilateral.

II. CHRONIC SIMPLE GLAUCOMA

Is chronic simple glaucoma always bilateral?

If it is, one must diagnose a secondary glaucoma in unilateral cases. It is well known

that nearly 98 per cent. of cases of chronic simple glaucoma are bilateral but it is not common to find markedly *asymmetrical involvement of the two eyes*.

There are two possibilities:

(i) The most common form of asymmetry is typical glaucoma on one side and ocular hypertension on the other. Only very careful perimetric investigations by the most precise methods may reveal defects of the visual field (generally isolated scotomata in the Bjerrum area) (Drance and others, 1968).

(ii) The most uncommon form is that in which the spared eye is normotensive with no field defect. We have specially studied a small group of nineteen eyes of this type seen during the last year.

In a series of 31 eyes of the first group, Drance and others (1968) found hypertension of the fellow eye in 79 per cent. (intraocular pressure between 24 and 43 mm. Hg). The intraocular pressure was below 22 mm.Hg in only 21 per cent. of these cases. In the 31 spared eyes careful perimetric studies had shown visual field disturbance in fourteen. This asymmetrical involvement may be explained by: a large difference in intraocular pressure between the two eyes, a reduction in the arterial ophthalmic pressure on one side, a localized circulatory disturbance, or a past history of ocular trauma.

In our nineteen cases, in which one eye was obviously diseased and the fellow eye was normotensive all day long, the mean intraocular pressure of the glaucomatous eyes was 34 mm. Hg (range 14 to 53) and that of the fellow eyes was 17 mm.Hg (range 13 to 23). In only two cases was the intraocular pressure normal and symmetrical (14 and 18 mm.Hg). These spared eyes had normal discs without big cups and the visual fields were quite normal even by the most meticulous methods of examination.

(i) *Diseased eyes:*

In eight cases a close examination showed why this eye was more diseased than the other:

In two cases a history of trauma in childhood accounted for the tearing of the choroid. The gonioscopic appearance was normal without angle recession.

In one case exfoliation of the peripheral lens was found only after a very wide mydriasis.

In two cases only the gonioscope could show an abnormality of the chamber angle (in one there was a benign naevus of the peripheral iris, and in the other a marked unilateral enlargement of the iris process).

In two cases there were colobomatous pits of the discs.

In the eleven other cases there was no possible explanation, even after an ophthalmodynamometric examination.

(ii) *Fellow eyes*

They were all normotensive, but tonographic studies showed a glaucomatous value of C in nearly all of them. A diagnosis of "potential" glaucoma may be accepted on a C value of less than 0.12 : but a diagnosis of clinical glaucoma cannot be made by tonography only. Two tests were made when possible:

(a) A genetic test with dexamethasone as described by Armaly (1967e).

(b) A new tonographic test as follows:

After a 4 minute conventional tonography, two drops of cyclopentolate 1 per cent. are put on the eye and a tonometry and tonography are performed again 1 hour later (Lipsich, 1968; Harris, 1968; Harris and Galin, 1969a; Lazenby, Reed, and Grant, 1970).

In normal eyes, we have observed that drops of cyclopentolate 1 per cent. do not change either the intraocular pressure or the value of C. On the contrary, in eyes with chronic simple glaucoma, the intraocular pressure may be either the same or higher, but in nearly all cases the value of C is much reduced, though the chamber angle remains open. This test is not time consuming and is very well accepted by the patients.

The interest of the cycloplegic tonographic test is shown by the following example. In a case of unilateral glaucoma of the right eye with exfoliation, which was discovered only after maximal mydriasis:

<i>Right</i>	IOP = 21 mm.Hg	C = 0.08
<i>Left</i>	12	0.23

One hour later, after cyclopentolate 1 per cent.:

<i>Right</i>	35	C = 0
<i>Left</i>	14	0.08

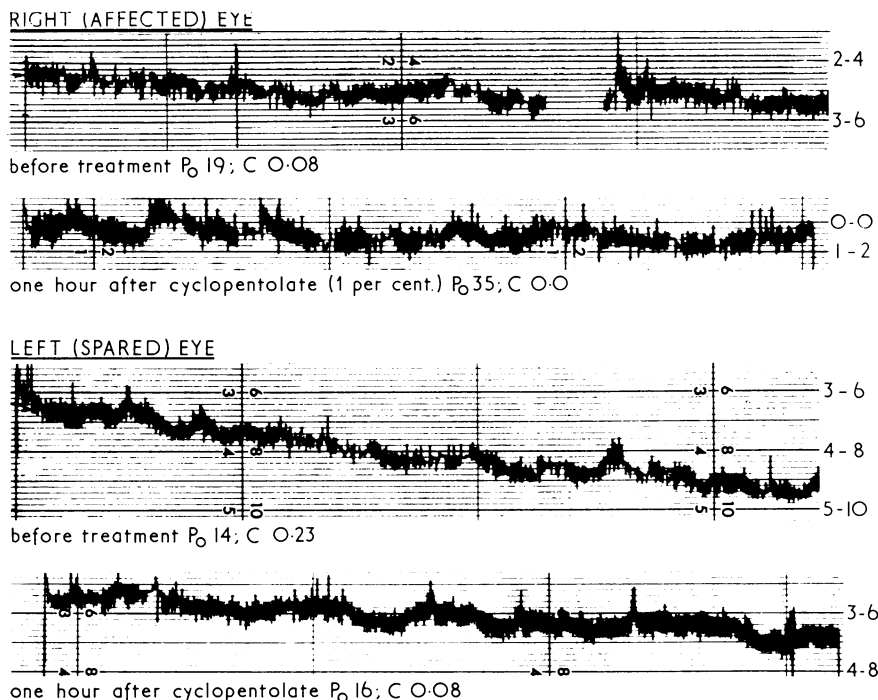


FIG. 2 Tonography of the right (glaucomatous) eye and the left (spared) eye, without treatment and 1 hr after cyclopentolate 1 per cent.

When these two tests can be done it is possible to show that the “spared” eyes respond like obviously glaucomatous eyes. We did not use these tests on all of our little group of patients because some refused the dexamethasone test. In all cases in which the two tests were done, both were positive.

Circulatory disturbances

None was found in any of our cases. To explain why an eye remains normotensive, we selected another group of 42 patients with unilateral stenosis of the carotid artery (proved by radiology and surgery) and checked the intraocular pressure in both eyes. On the stenosed side the mean intraocular pressure was 16 mm.Hg, and on the normal side it was 16.6 mm.Hg, which shows that stenosis of the carotid artery does not lower the ocular pressure and does not cause unilateral hypotony.

What may be the future of these spared eyes?

Without a long period of observation, it is impossible to say. One of our cases has been observed from the age of 45 to 62 years, and the spared eye was quite normal 14 years after the diagnosis of glaucoma on the other side (intraocular pressure : 15 mm.Hg; C = 0.31; visual fields normal).

Treatment

We emphasize only one point: if the diseased eye, with poor vision, is controlled only by the maximum medical therapy, and if sulphonamides by mouth have disagreeable side-effects, the patient prefers to have an operation on the glaucomatous eye and to have no treatment to the good eye.

We have never seen unilateral cortisone-induced glaucoma as observed by Chandler and Grant (1965).

Conclusions

(1) Angle-closure glaucoma may remain unilateral in 50 per cent. of acute cases. It is impossible to predict future structural changes in the anterior segment. Provocative tests are always valuable and prophylactic conventional iridectomy should be carried out on the fellow eye.

(2) Chronic simple glaucoma may be markedly asymmetrical, but the asymmetry is rarely so important that the glaucoma appears to be unilateral. If the spared eyes are studied by tonography, the dexamethasone test, and cyclopentolate tonography, they nearly all react like glaucomatous eyes.

So, if one accepts a hydrodynamic definition of glaucoma, unilateral glaucoma does not exist: there are only asymmetrical glaucomatous eyes. But if one does not accept this hypothetical concept unilateral glaucoma must exist.

(3) To explain why only one eye is diseased is another story.

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Glaucoma associated with spontaneous displacement of the lens

BARRIE JAY

From the Genetic Clinic, Moorfields Eye Hospital

There are a number of disorders which may be associated with spontaneous displacement of the lens and it is instructive to study the mechanism of the glaucoma which may occur in certain of these conditions (Table I).

Simple ectopia lentis is a genetically determined condition with an autosomal dominant mode of inheritance. Glaucoma eventually develops in about one-quarter of patients