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REFERENCES


A suggested anatomic classification to define the pupillary block glaucomas.

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The term, pupillary block glaucoma, has been used to define any of the various mechanisms which interfere with the forward flow of aqueous humor through the pupil. Yet it is well known that resistance to anterior flow can occur at any point from the ciliary body to the pupil itself. A clear understanding of the anatomic position at which the block occurs should aid the doctor in choosing appropriate therapy.

The idea for this anatomic classification was developed in cooperation with Dr. Daniel Weiss during the course of our studies on ciliary block or malignant glaucoma.1 The need for such a classification is repeatedly demonstrated as one sees good ophthalmologists confused by the fail-
ure of certain phakic and aphakic eyes to respond to an iridectomy when the presence of a shallow chamber, closed angle, and increased pressure indicates "pupillary block."

There are only four portions of the eye which are able to interfere with the forward flow of aqueous humor. These are the iris, the lens, the ciliary body, and the vitreous. Resistance developed by apposition of these tissues in various combinations produces all the manifestations with which we are familiar. The following classification is suggested:

A. Phakic eyes: 1. Irido-lenticular pupillary block or iris bombe (Fig. 1). Fig. 1 shows the posterior synchias binding the iris to the lens at the pupillary border causing iris bombe. It is the only true "pupillary block." 2. Irido-lenticular block (relative pupillary block) (Fig. 2). This represents the relative block to aqueous flow occurring in shallow-chambered eyes predisposed to angle-closure glaucoma. If iritis binds the iris to the lens throughout their zone of continuity, an absolute block would exist, but could still be broken by iridectomy. 3. Ciliary block (Fig. 3). This type of block is far more rare and therefore less well understood. The block involves the interface between the ciliary body, the vitreous body, and the edge of the lens. The exact contribution of each to the syndrome can not be assessed, but there results an entrapment of part of the aqueous flow which is forced backward into the vitreous body itself. In such cases iridectomy is seldom curative.

a. Cilio-vitreo-lenticular block (Fig. 3, A). In most instances all three of these structures, the ciliary body, the vitreous humor, and the lens, contribute to the ciliary body apposition which forces some part of the aqueous humor flow backward into the vitreous humor. This is the usual cause of "malignant glaucoma" which is an unfortunate, nonspecific term, confusing to the ophthalmologist and frightening to the patient. Daniel Weiss and I have suggested the term, ciliary-block glaucoma. In most instances all three of these structures, the ciliary body, the vitreous humor, and the lens, contribute to the ciliary body apposition which forces some part of the aqueous humor flow backward into the vitreous humor. This is the usual cause of "malignant glaucoma" which is an unfortunate, nonspecific term, confusing to the ophthalmologist and frightening to the patient. Daniel Weiss and I have suggested the term, ciliary-block glaucoma. 1-3 b. Cilio-lenticular block (Fig. 3, B). A pure apposition between the lens equator and the ciliary body is a rare occurrence, but it accounts for the occasional case reported in which a seeming "malignant" or ciliary-block glaucoma is precipitated in an unoperated shallow-chambered eye. It is usually initiated by the use of strong miotics which loosen the zonules, permitting the lens to drop forward. Medical control of the glaucoma is achieved only by the use of cycloplegics to pull the lens backward and flatten the ciliary body, thus freeing the cilio-lenticular apposition. This mechanism has been documented by watching the opening and closing of the opening between the lens and ciliary body through a previously performed iridectomy.

B. Aphakic eyes: 1. Aphakic irido-vitreal block. a. With a normal hyaloid face (Fig. 4, A). This is the usual type of pupillary block in an aphakic eye caused by adherence of iris to vitreous humor. b. With a weak hyaloid membrane (Fig. 4, B). Rarely, the hyaloid membrane and anterior vitreous will be forced forward filling the entire anterior...
Fig. 4. Aphakic irido-vitreal block. A. Normal hyaloid membrane. B. Weak hyaloid membrane.

Fig. 5. Aphakic cilio-vitreal block.

chamber. This causes an aphakic glaucoma with a deep anterior chamber. Too often the irido-vitreal adhesion (or pupillary block) etiology is overlooked by the ophthalmologist.

2. Aphakic cilio-vitreal block (Fig. 5). When phakic ciliary-block (malignant) glaucoma has been present for some time, the adhesion between vitreous and ciliary body becomes difficult and often impossible to break. After removal of the lens, the flow of aqueous humor is still directed posteriorly into the vitreous body, continuing the ciliary-block glaucoma. Another iridectomy is usually attempted but cannot be expected to improve the condition. An incision of the hyaloid, or a deeper incision into the vitreous humor, or an actual vitrectomy will be needed to restore unobstructed flow of the aqueous humor.

An anatomic classification has been designed to identify the site of obstruction to forward flow of aqueous humor in pupillary block glaucoma and in ciliary-block (malignant) glaucoma in both phakic and aphakic eyes.

A. Phakic eyes:
1. Irido-lenticular pupillary block (iris bombe).
2. Irido-lenticular block (relative pupillary block).
3. Ciliary block (malignant glaucoma)
   a. Cilio-vitreo-lenticular block
   b. Cilio-lenticular block

B. Aphakic eyes:
1. Aphakic irido-vitreal block.
   a. With a normal hyaloid face.
   b. With a weak hyaloid membrane.
2. Cilio-vitreal block (continuing malignant glaucoma).

It is hoped that the use of this anatomic classification will aid ophthalmologists in the diagnosis and therapy of this interesting type of glaucoma.

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REFERENCES

Eye closure and effect of atropinic drugs.
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The present study was made in an attempt to explain the finding of a previous study of fifth nerve injury in the rat, namely, that the combination of lid closure and atropine (topical or systemic) largely protected the eye from the effects of nerve injury, while neither lid closure alone nor atropine alone had such protective effect.

Normal human volunteer subjects were the experimental subjects. The upper face was photographed while the subject fixated the camera lens. Pupil diameters were measured on projections of the photograph negatives at an enlargement of 4 to 5 diameters. Photographs were taken before medication or manipulation of the eyes and at numerous stages of the experiments. Results are given as the ratio experimental eye pupil diameter/control eye pupil diameter. No special control of light or fixation was employed.

Experiment 1. The effect of lid closure on pupil response to topical eucatropine.

After initial photography, one eye was bandaged for a period of time. The bandage was removed and after various intervals 5 µl of 5 per cent