Hypopyon and iris necrosis in angle-closure glaucoma

Report of two cases

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A mild anterior chamber aqueous flare and cellular response are common findings in acute angle-closure glaucoma. Chandler and Grant (1965) have noted that "discovery of a great many cells in the aqueous is perfectly consistent with the diagnosis of acute angle-closure glaucoma". We have recently seen two patients who had developed hypopyon during the course of their attacks of acute angle-closure glaucoma. Medical therapy for glaucoma brought the tension under control and the hypopyon disappeared after iridectomy. In one case the iridectomy specimen was retained for histopathological study and showed iris necrosis.

Case reports

Case 1, a 56-year-old Caucasian woman, was seen in February, 1971, because of a pain in her left eye of 36 hours' duration associated with blurred vision, nausea, and vomiting. She denied previous ocular disease or symptoms.

Ocular examination

The uncorrected visual acuity was 20/30 in the right eye and counting fingers at 2 ft in the left. The applanation tensions were 20 mm. Hg right and 66 mm. Hg left. The left eye showed marked conjunctival hyperaemia, a diffuse corneal haze, 2+ aqueous flare and cells, and a fixed 4 mm. pupil through which only a red reflex could be seen on ophthalmoscopy. On gonioscopy, the filtration angle of the left eye was found to be entirely closed and in the right eye the angle was slit-like, but open throughout.

Physical examination

This was unrevealing, and the blood count, urine analysis, electrolytes, blood sugar, and blood urea nitrogen were within normal laboratory range.

Treatment

The diagnosis of acute angle-closure glaucoma in the left eye was made, and treatment was begun with oral and intravenous acetazolamide, oral glycerol, and topical pilocarpine 4 per cent. After 6 hours the ocular hypertension had not significantly decreased and intravenous mannitol was administered. Several hours later the intraocular pressure was 37 mm. Hg and the pupil unchanged. Therapy with the same agents was continued and 24 hours after treatment had been begun the pressure was 17 mm. Hg; the angle was visible gonioscopically and the pupil was unchanged.

Progress

The patient was maintained on pilocarpine 4 per cent., but 2 days later again complained of ocular pain. The intraocular pressure was 37 mm. Hg and an hypopyon occupied the inferior quarter of the anterior chamber. The pupil was mid-dilated, the filtration angle was visibly open, and there was posterior synechiae formation. Topical therapy was then changed to pilocarpine 1 per cent. and dexamethasone 0.1 per cent. Oral glycerol and acetazolamide were administered and within 1 hour the intraocular pressure fell to 21 mm. Hg.

Surgery

The following day the patient underwent a sector iridectomy. Immediately upon excision of the sector of iris the anterior chamber filled with blood. On the first postoperative day the hyphaema cleared sufficiently to reveal a well-formed anterior chamber with no hypopyon. During the next 5 days the blood resorbed completely, and the intraocular pressure ranged from 15 to 30 mm. Hg.

Follow-up

After 2 months the corrected visual acuity was 20/50, with normal ocular tension, minimal iris atrophy as manifested by increased light transillumination, and extensive posterior synechiae.

Case 2, a 49-year-old Caucasian female, presented in March, 1971, with a complaint of pain in the left eye, associated with blurred vision for 8 days. A history was elicited of intermittent episodes of ocular pain associated with haloes around lights for the past 4 years.

Ocular examination

The corrected visual acuity was 20/20 in the right eye and 5/200 in the left. Applanation tensions were 8 mm. Hg right and 48 mm. Hg left. The left eye showed moderate conjunctival hyperaemia, a hazy cornea, moderate aqueous flare and cells, and a 5 mm. nonreactive pupil. Gonioscopy showed the filtration angle of the right eye to be open but very narrow, while in the left eye it was closed throughout.

Physical examination

A chest x-ray and electrocardiogram were unrevealing and the blood count, urine analysis, blood sugar, blood urea nitrogen, and electrolytes were within the normal range.

Treatment

The patient was treated with intramuscular acetazolamide, oral glycerol, and pilocarpine 4 per cent., and within 2 hours the intraocular pressure had fallen to 10 mm. Hg in the left eye. The regimen was then changed to pilocarpine 2 per cent. solution every 6 hours. On the following day, the intraocular pressure had risen again to 20 mm. Hg and an hypopyon was noted to occupy the lower fifth of the anterior chamber. The pupil was fixed and the filtration angle remained closed throughout. Topical prednisolone 1/8 per cent. solution every 4 hours was added to the regimen, but the next day, the patient again complained of pain in the left eye. The tension was 40 mm. Hg but other findings were unchanged.

Surgery

A decision was made to operate and after pretreatment with intravenous mannitol, a sector iridectomy was performed. The iris specimen was retained for histopathological examination. After surgery the anterior chamber filled with blood but this resorbed over the ensuing week.

Result

The intraocular pressure has since remained in the 12–14 mm. Hg range and the corrected visual acuity is 20/25. A wide sector iridectomy is present with the pupil bound down by extensive posterior synechiae. Scattered areas of minimal iris atrophy as manifested by increased transillumination of light are present.

Pathological examination

The sections are of a portion of iris (Figs 1 and 2). In one area there is a focus of acute ischaemic necrosis. Marked pigment dispersion is present with loss of cellular detail. A second area shows an acute inflammatory infiltrate.

FIG. 1 Section of iris, showing acute necrosis. Haematoxylin and eosin. $\times 82$

FIG. 2 Higher-power view of Fig. 1, showing marked pigment dispersal in the stroma with an eosinophilic exudate on the anterior surface. Haematoxylin and eosin. $\times 218$

Discussion

The clinical features of acute angle-closure glaucoma are well known (Chandler and Grant, 1965; Kolker and Hetherington, 1970). The appearance of an hypopyon as part of the clinical picture has not to our knowledge been commented upon previously. Comprehensive treatises (Chandler and Grant, 1965; Kolker and Hetherington, 1970; Duke-Elder and Jay, 1969; Elliot, 1922; Fuchs, 1923; Axenfeld, 1923; Sugar, 1951) make no

mention of the finding, but many authors have noted turbidity and cells in the anterior chamber. Presumably, the aetiology of the hypopyon is related to the necrosis of the iris as observed in the iridectomy specimen. Friedenwald (1930), Samuels (1929), and others have noted partial or sector iris necrosis as a characteristic sequela of angle-closure glaucoma; the area of iris chiefly involved lay in the pupillary zone and was probably related to compression of the blood supply in the root of the iris.

The radial arteries in the iris originate in the major circle of the iris located in the anterior portion of the ciliary body near the iris root (Hogan, Alvarado, and Weddell, 1971). They travel within the iris stroma near the anterior border layer with rare branchings toward the pupillary zone. A few anastomoses take place in the collarette, forming an incomplete arterial ring, but the radials are more like end-arteries in function. At the pupillary border a profuse capillary network exists in the region of the sphincter muscle. The venous channels generally follow a similar path to the arterial; the larger channels lie in the anterior stroma while the smaller ones lie near the dilator muscle. Castenholz (1966) examined the iris circulation in albino rats and observed changes in blood flow with experimental increases in intraocular pressure. With pressures in the 30 to 60 mm. Hg range, the circulation was retarded, while pressures greater than 60 mm. Hg blocked the circulation completely. Small increments in pressure produced a slowing of flow in the vessels.

Vannas (1969) has studied fluorescein angiograms of the iris in the normal eye and in angle-closure glaucoma. His findings in the latter included fluorescein extravasation from the radial arteries, from the capillary network near the pupillary border, and from the vascular whorls that appeared near the ciliary portion of the iris.

Summary

Two patients developed an hypopyon during an attack of acute angle-closure glaucoma. One iridectomy specimen showed iris necrosis on histopathological examination. Hypopyon formation has not previously been reported in angle-closure glaucoma.

We are indebted to Mrs. Irene Begleiter for typing the manuscript, to Mr. Henrick Malpica for the photography, and to Miss Judith Braham for the preparation of the histological material.

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