COMMUNICATIONS

IRIDENCELEISIS IN CONGESTIVE GLAUCOMA *

BY

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IN 1945–46 one of us (EGM) became aware that approximately 20 years in ophthalmology had not taught how or why the classical von Graefe iridectomy deserved its pride of place in the surgical treatment of acute (congestive) glaucoma; nor did any authority pretend to this knowledge. The operative results were not outstandingly commendable and congestive glaucoma remained a condition of serious prognosis for vision. On the contrary a considerable experience of Holth iridencleisis in “chronic” glaucoma had shown far better results which might be due either to the character of the operation or, more probably, to the state of the eye at the time of surgical intervention.

Numerous attempts to systematize various types of glaucoma from the surgical point of view and to draw logical conclusions as to the rational operative procedure in each particular case did not seem to yield unequivocal directives for the surgeon confronted with his patient. The surgical approach to glaucoma was first suggested by von Graefe (1859) as an empirical measure, and it is on this empirical basis that we still stand to-day. The “theoretical” objections to the mere idea of an operation on a congested eye were very strong, and more than 40 years after von Graefe’s publication de Wecker (1901) thought it important to devote a great part of his lecture on iridectomy in glaucoma to opposing the prejudice against it.

When the mechanism of the rise in ocular tension is clinically obvious, the choice of treatment is also obvious: iridectomy in secondary glaucoma with seclusio pupillae, Barkan’s goniotomy in congenital malformations of the angle of the anterior chamber, and so on. In cases of primary idiopathic glaucoma—be it narrow or wide angle or of the over-secretive or impeded-drainage type—the choice of procedure is usually determined by the surgeon’s experience with various techniques or his operative routine.

In congestive glaucoma it is less possible than in any other form to decide the choice of operation from the clinical picture, and in most clinics a routine operation is performed unless contraindicated.

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RATIONALE OF OPERATION FOR CONGESTIVE GLAUCOMA

Before 1946 it had become abundantly clear that some advantage to chronic cases was gained in iridencleisis by early closure of the scar with quick re-formation of the anterior chamber. This reduces the incidence of haemorrhages from sudden decompression and loss of external support to arteries in a state of relative vasodilation or vasomotor laxity. It seemed that if this decreased incidence of haemorrhage occurred in the "quiet" eye of the chronic glaucoma case, it might be found even more useful in the eye in a state of active congestion.

The recommended technique for the von Graefe operation involves a broad iridectomy with tearing away of the iris root. To von Graefe the breadth of the iridectomy meant a diminution of the surface capable of producing aqueous. "Opening up of the angle" and some dramatic interruption of disordered vasomotor reflexes were suggested by others as possible mechanisms.

These same purposes might be achieved equally well in the course of the iridencleisis operation if this were used for congestive cases, and this would leave the eye with an incarcerated iris and the mechanical basis for a permanent filtering scar if the post-operative tension of the eye should require it. In such a concept the element of self-regulation in the Holth operation is a valuable factor—the intra-ocular pressure itself determining the amount of filtering or fluid shift along the iris wick into the subconjunctival tissues.

The technique would require a small modification of the simple Holth operation, in that, after the section of the iris sphincter and down to the iris root, the pillar left in the grasp of the forceps should be pulled sideways so as to tear a little of the iris root. It is only then incarcerated—hence the keratome incision should be enlarged slightly in its total width to allow this manoeuvre.

A certain reserve was felt on the possible effects of opening up subconjunctival channels in the congested eye, but in practice no difficulty was found.

The routine use of this operation was established and favourable experience led to its continuation.

At a later stage one of us (KR) adopted the *ab externo* approach to the original Holth technique (Schlösser, 1922) as a measure of safety which is undoubtedly promoted by this cautious method. In theory, the creation of a conjunctival flap with a wide area of subsequent scar tissue might be thought inimical to the spread and absorption of aqueous. In practice no appreciable disadvantage of this kind was noted. The slight extension of recovery time by comparison with that experienced with the simple Holth approach is a small price to pay for security.

The material now justifies a review of the results and the statistics provoke certain reflections.

Historical Survey

The literature contains little material on the surgical treatment of congestive glaucoma, and many accounts of glaucoma surgery do not single out the results obtained in congestive cases. Table I (opposite) is collected from various reports in the literature. The percentages of success in most of these reports are based on such small numbers of operated cases as to have no real meaning. By grouping these reports according to the type of operation performed and summing up the results,

TABLE I
SURGICAL TREATMENT OF CONGESTIVE GLAUCOMA

Author	Date	No. of Cases	Operation	Percentage Success	Remarks
Sulzer	1901	113	Iridectomy	full 21 part 34	16 total blindness
Koster Gzn	1906	222	Iridectomy	full 45 part 27	
Vettiger	1901	?	Iridectomy	full 74 part 4	
Meller	1914	47	Lagrange	95	Two failures in 178 chronics
		19	Elliott	100	
Gunnufsen	1916	9	Iridectomy	11	amongst 130 chronics
Sattler	1921	?	Elliott	83	amongst 429 chronics
Whitehead	1927	38	Iridectomy	full 57·9 part 26·3	
Holth	1927	3	Iridenceleisis	100	
Spaeth	1928	16	Iridectomy		
Pillat	1928	11	Iridenceleisis	90	
Holth	1930	6	Iridenceleisis	100	
Gjessing	1931	1	Iridenceleisis	100	amongst 122 chronics
Löfgren	1932	11	Elliott	73	amongst 247 chronics
		47	Iridectomy	81	
		2	Iridenceleisis	100	
Butler	1932	12	Iridenceleisis	83	
		26	Elliott	54	
Ploman and Granström	1932		Iridectomy	60	
Clapp	1934	6	Iridenceleisis	100	
Lloyd	1948	19	Iridectomy	full 42 part 15	
		4	Iridenceleisis	100	

a more reliable picture may be obtained. This is done in Table II (overleaf), which shows that iridectomy, which is—we believe—performed by most surgeons as the operation of choice in congestive glaucoma, yields results that are far from satisfactory; Duke-Elder (1940) writes that . . . “a good average for successes in acute

glaucoma is 60 per cent.”. Sclerectomy operations—Lagrange and Elliott’s types—proved to be dangerous in congestive cases, and are not practised nowadays, although it is not quite clear why the Lagrange operation was discarded. It may have dropped out of use for this condition because it had a relatively limited vogue, tending to be overshadowed by the corneo-scleral trephining of Elliott. The number of iridencleisis operations performed in congestive cases must considerably exceed the figures cited above. Holth (1933) stated that since 1916 all his acute cases had been treated with iridencleisis; Lindner (1939) stated that in his clinic in Vienna iridencleisis had been performed as a routine for all glaucomas since 1921 unless contra-indicated; but detailed reports are lacking.

TABLE II
SURGICAL TREATMENT OF CONGESTIVE GLAUCOMA

Operation	No. of Cases	Percentage Success	Remarks
Iridectomy	264	49	Plus 21 “partial” (sum 70) Meller’s material only
Lagrange	47	95	
Elliott	68	77	
Iridencleisis	43	96	

Selection and Management of Cases now Reported

In the years 1946–1954, 110 consecutive cases of congestive glaucoma (65 females and 45 males) were operated upon (Table III). The patients were admitted to hospital as emergencies and medical treatment was started at once. This consisted of “intensive Eserine” (1 drop of 0·5 per cent. solution every 5 min. for 30 min., followed by 1 drop every 30 min. until the tension was reduced and the pupil contracted), $\frac{1}{4}$ to $\frac{1}{2}$ gr. morphine by hypodermic, and two leeches applied to the temple. Next day (*i.e.* within 12 to 24 hours) iridencleisis was performed. Cases which fully responded to medication are not included in this report. We are unable to state in exactly how many cases the tension was reduced to normal or nearly normal by medical means, but all eyes in this series were in a state of congestion at the time of operation. The ordinary Holth approach was used in 34 cases, the *ab externo* approach in 76. The eyes were treated with gutt. homatropine 1 per cent. three times a day for 3 days after operation, and the patients were discharged as a rule after 5 days on gutt. pilocarpine 1 per cent. three times a day with instructions to massage the eye.

TABLE III
DISTRIBUTION OF CASES

Year	1946	1947	1948	1949	1950	1951	1952	1953	1954
No. of Cases	1	8	22	22	16	20	8	15	1

FIG. 1.—Rate of hospitalization of congestive glaucoma cases. In ten cases the information was considered unreliable and they are not included.

Duration of Attack.—Our findings here agree with those of Lloyd (1948): an attack of congestive glaucoma is not always considered by the patient to be an emergency. The range of duration of attack before seeking medical advice in this series was between 6 hours and 8 weeks, but 70 per cent. of the cases entered hospital within the first week (Fig. 1).

Observation Time after Operation.—No case in this report was operated upon less than 4 months ago, seven cases only were operated upon within the past 12 months. Sixteen cases were operated upon 3 to 5 years ago, but ceased attending the glaucoma clinic after a few months, considering themselves cured; these are included under the short observation time group (Table IV).

TABLE IV
OBSERVATION TIME (YEARS)

Observation Time	Less than 1	1-2	2-4	4-6	6-8
No. of Cases	23	22	29	22	12

Results

To establish the efficiency of an antiglaucoma operation it is clearly necessary to estimate three factors: influence on visual field, influence on visual acuity, and control of intra-ocular pressure. In cases of congestive glaucoma this would be unobtainable. Visual field plotting is not practicable during the attack and the visual acuity is reduced by raised tension and a steamy cornea, as well as by the general state of the patient who cannot be made to co-operate. Only the intra-ocular pressure can be estimated and compared with the post-operative state.

Visual Acuity.—The dramatic post-operative improvement of visual acuity should be considered the rule rather than the exception in congestive cases. The results obtained by us are set out in Fig. 2 (overleaf) for the purpose of completeness of this report but are not considered an achievement.

A history of previous congestive attacks was given by 27 patients whose visual prognosis is worse than that of those suffering from first attacks (Fig. 2B), undoubtedly because of gradual deterioration of vision during the glaucomatous state before attendance.

First attacks in a previously good eye were suffered by sixty patients (uncomplicated, primary cases only are included here). Fig. 3 (overleaf) records an attempt to ascertain the influence of the delay in relieving the

FIG. 2.—Comparison of pre- and post-operative visual acuity in 110 cases of congestive glaucoma.

A: whole series;
B: 27 cases who had had "previous attacks";
C: Sixty cases of "primary attack".

FIG. 3.—Final visual acuity in relation to duration of congestive attack.

A: "primary attack" only (sixty cases), amblyopia, thrombosis, retinopathy and lens sclerosis are excluded;
B: whole series.

intra-ocular pressure (delayed attendance) on final visual acuity. Good visual results do not go hand-in-hand with immediate operation, and raised intra-ocular pressure does not affect central visual acuity for a considerable time.

Control of Intra-Ocular Pressure.—Excluding nine thrombotic cases and one case of vitreous haemorrhage on entering the anterior chamber, which was very likely thrombotic as well, the intra-ocular pressure remained raised post-operatively in four cases (4 per cent.).

(1) This patient had a subluxated lens—noted post-operatively—which was subsequently removed without influence on the raised tension.

(2) This patient gave a history of previous attacks in both eyes, was admitted with bilateral congestive glaucoma, and did not respond to medication at all; final visual acuity in this case is perception of light in each eye.

(3) This patient gave a history of recurrent attacks for the previous 2 years, cataracts were present in both eyes, and the other eye was affected by absolute glaucoma; subsequent cataract extraction was followed by uveitis, and the final visual acuity was perception of light.

(4) This patient attended after 2 weeks after the onset of pain, and medication had no effect on the tension; there was a history of many previous attacks, and the optic discs were cupped. His visual acuity of 6/18 has remained unchanged for the past 12 months, his visual field is small (20°), and the tension is 35 mm. Hg Schiötz in a white eye. It has been decided to perform a cyclodialysis on this eye in the near future.

In two further cases (2 per cent.) the tension remained full (about 30 mm. Hg Schiötz). One was operated upon 14 months ago, the other 4 years ago. Their visual acuity is 6/9 and 6/12 respectively since operation with full visual fields and no complaint, and we do not propose to interfere with these eyes.

The lowering of tension was delayed in six cases (6 per cent.), in five of which the tension was raised after operation for 2 to 8 weeks before becoming normal. The visual acuity and visual fields of these cases did not deteriorate during this time.

One eye developed post-operative hypotension which lasted for 4 weeks. Visual acuity in this case deteriorated from a post-operative 6/18 to hand movements. There were no keratic precipitates or cloudiness of the media or any other signs of uveitis.

Pre-Operative Complications

Thrombotic Glaucoma.—There were five cases of central vein occlusion and four of occlusion of one of the two main branches.

The visual results in the first group are: two hand movements, one perception of light, and two enucleated; in one case only did the intra-ocular pressure eventually come down to normal.

In the four incomplete occlusions, the visual results were 6/36, 4/60, hand movements, and perception of light. In three of these cases the tension was controlled by the operation, in one it remained full (30 mm. Hg Schiötz).

As would be expected, iridencleisis—like the other filtering operations—is of little avail in thrombotic glaucoma. These nine cases were operated upon only because of diagnostic difficulties in the acute stage.

Hypertensive Retinopathy.—In three cases hypertensive retinopathy was diagnosed post-operatively; they finished with a visual acuity 6/6, 6/18, and 6/24 respectively, and controlled tension.

Central Artery Occlusion.—In one case an old occlusion of the central artery was diagnosed post-operatively. The tension was controlled and the visual acuity in the remaining field was hand movements.

Diabetes.—There were four diabetics in these series.

Two of them belong to the thrombotic group and developed vitreous haemorrhage, the eyes being subsequently enucleated.

Of the other two, one had an orbital haemorrhage when retrobulbar novocaine was being injected before operation, and iridencleisis had to be preceded by posterior sclerotomy; the final visual acuity in this case is 6/9. The second patient was admitted with intumescent cataract; iridencleisis resulted in a quiet eye with normal tension, but subsequent cataract extraction revealed post-uveitic dystrophy of the fundus and secondary optic atrophy; the visual acuity is now perception of light.

State of the Other Eye.—In thirty cases the other eye was already affected by glaucoma. In eight of these it was in a state of absolute glaucoma on admission; in two cases chronic glaucoma was confirmed by typical visual field changes; in twenty cases the following antiglaucoma operations had been performed on the other eye before the present attack:

Iridencleisis	...	...	...	...	...	15
Iridectomy	...	...	...	...	...	2
Elliott's trephine	...	...	...	...	...	2
Cyclodialysis	...	...	...	...	...	1

Five patients were admitted with bilateral congestive attacks and both eyes were operated on at the same session. Three further cases were bilateral, but the attack affected each eye on different occasions.

These figures are worth noting in view of recent attempts to differentiate between patients whose eyes are affected by simple glaucoma, and those who (it is suggested) never develop a congestive episode and *vice versa* (Lloyd, 1948). Our material does not support this view.

Operative and Post-Operative Complications

Iris Rigidity.—The iris proved rigid and the inclusion of a pillar impossible in two cases of congestive glaucoma. Basal iridectomy was performed instead of iridencleisis and these cases are not included in the present study. A rigid and fibrous iris was met more often in chronic cases; in congestive cases it does not seem to present a problem.

Hyphaema.—Occurrence of hyphaema is common at the moment of cutting through the sphincter, but we are unable to give exact figures for its incidence. In no case did it fail to resorb without trace and without any influence on the final result.

Vitreous Haemorrhage.—In four cases, vitreous haemorrhage occurred on entering the anterior chamber.

Two were diabetic cases and they lost their eyes (*vide supra*).

The third was a case of central vein occlusion, in which the intra-ocular pressure settled down to normal and the visual acuity to hand movements.

The fourth was a case of glaucoma in an aphakic eye with no perception of light.

Late Infection.—One eye became purulent 3 months after operation, went into phthisis bulbi, and was enucleated 3 years later.

Uveitis.—Two cases fall into this group.

The first eye developed keratic precipitates after operation, the tension persisted high, the cornea did not recover from bullous degeneration with which the patient was admitted, and the visual acuity was perception of light. The other eye was not affected. This patient had very bad dental sepsis which he refused to have treated.

The second patient was admitted with fine keratic precipitates in the eye affected by congestive glaucoma but with a wide pupil. It was decided to operate, but the eye did not settle down, and 2 months after operation keratic precipitates were present in both eyes. Eventually the eyes became quiet and secondary cataract was extracted from one of them, giving the patient a visual acuity of 6/9 with correction.

Luxation of Lens.—Two cases fall into this group.

In one the lens was found subluxated after operation, and was successfully extracted, but the tension persists elevated in a quiet eye.

In the second case, the lens was found lodged in the vitreous when the patient attended the department 1 year after operation complaining of sudden onset of blurred vision. No attempt was made at extraction; the visual acuity in this eye is 6/6 with correction (since 1948), and the tension remains normal.

Sympathetic Ophthalmia

Two female patients developed sympathetic ophthalmia, presenting a classical clinical picture including poliosis in one case. In both the condition was diagnosed 9 weeks after operation which was uneventful and resulted at first in a quiet eye with normal tension and visual acuities of 6/6 and 6/60 respectively. In spite of vigorous treatment, which included arsenicals, cortisone, protein shock therapy, and anti-

TABLE V
INCIDENCE OF SYMPATHETIC OPHTHALMIA IN IRIDENCELEISIS

Author	Year	No. of Cases	Percentage of Symptoms	Remarks
Gunnufsen	1916	127	none	36 cases only followed
Galetski-Olin	1922	20	none	
Gjessing	1927	113	none	92 cases only followed
Gjessing	1931	122	none	
Hagen	1932	175	none	
Holth	1933	221	none	
Holst	1934	534	1	
Gjessing	1939	198	none	
Goar and Schultz	1939	?	none	All chronics
Reid	1940	100	none	
Butler	1940	100	none	All chronics
Iliff	1943	47	1	
Mackie	1948	100	none	Negro patients only
Lloyd	1948	6	none	

biotics, these cases fared badly. Final visual acuity in the first case became 6/36 in the better eye and in the second case no perception of light and phthisis bulbi were the result (This is the only case of complete blindness in this series).

Because sympathetic ophthalmia is the mainstay of all criticism of iridencleisis, it seems essential to attempt to ascertain its incidence. The reports of various authors practising iridencleisis are set out in Table V. The percentages and numbers of cases apply to all iridencleisis operations, that is, in chronic as well as in acute cases as it proved impossible to select the figures relating to congestive cases only.

These reports are very good but they are rather surprising. Sympathetic ophthalmia may occur after any intra-ocular operation, including iridencleisis, and Table VI shows its incidence in various conditions.

TABLE VI
INCIDENCE OF SYMPATHETIC OPHTHALMIA

Author	Date	Place	Total No. of Cases	Condition in which Sympathetic Ophthalmia arose						
				Penetrating Wounds	Cataract Operation	Other Intra-ocular Operation	Subconjunctival Scleral Rupture	Perforating Corneal Ulcer	Phthisis Bulbi	Intra-ocular Tumour
Fuchs	1905	Vienna	35	19	4	4	2	3	—	3
Grósz	1926	Budapest	156	141	11	4				
Theobald	1930	Illinois Eye Infirmary	11	8	2	1				
Joy	1935	New York State Survey	151	26	5	3	4	1	1	1
Verhoeff	1936	Massachusetts Eye Infirmary	35	20	7	7	—	1	—	—
Woods	1936	Wilmer Institute	28	23	2	1	1	1	—	—
Samuels	1936	New York State Survey	112	—	—	13	—	—	—	—
Irvine	1940	Massachusetts Eye Infirmary	63	—	11	11	—	—	—	—
McPherson	1949	Wilmer Institute	61	36	10	10	3	1	—	—
Total	...	...	652	273	52	54	10	7	1	4

The figures obtained for “other intra-ocular operations” are of special interest; not all authors specify what are the “other operations”, but the available particulars (Table VII) show that all or nearly all “other operations” mean various antiglaucoma procedures. This connection is so well established that Samuels (1936) attempted a possible direct link between glaucoma itself and sympathetic ophthalmia.

TABLE VII
SYMPATHETIC OPHTHALMIA AFTER OPERATIONS OTHER THAN CATARACT EXTRACTION

Operation	Grósz (1926)	Verhoeff (1936)	Samuels (1936)	Irvine (1940)
Iridotaxis		4		5
Iridectomy	3	2	4	5
Trephine	1	1	1	1
Cyclodialysis and posterior sclerotomy			1	

The fact that in all reviewed reports on iridencleisis—with two exceptions (Holst, 1934; Iliff, 1943)—sympathetic ophthalmia is not listed amongst complications may be explained only by erroneous diagnosis or by reasons more personal than surgical. The pathological reports show that sympathetic ophthalmia is rather over- than under-diagnosed clinically. Theobald (1930) could confirm the diagnosis histologically in only eleven out of 23 eyes enucleated because of the full clinical picture of “sympathetic”; McPherson (1949) confirmed only 25 out of 61 cases; Irvine (1940) only 37 out of 63 cases.

Regarding the deep-rooted abhorrence of calling a case of bilateral uveitis “sympathetic ophthalmia”, certain relatively recent American surveys may be significant:

(1) Joy (1935) circularized 471 ophthalmologists in the state of New York asking about their experience with sympathetic ophthalmia. Only 212 of them replied; 112 of those denied having seen a case, eighteen admitted having seen some cases but were unable to supply any records, and the remaining 82 (19·5 per cent.) reported 151 cases.

(2) Haik, Waugh, and Lyda (1952) circularized 58 ophthalmologists seeking information on sympathetic ophthalmia and experience with cortisone in this condition; 29 replies denied having seen any cases, but the other 29 ophthalmologists supplied data of 69 patients in whom cortisone was used for sympathetic ophthalmia.

With due respect to these reports, we believe—and our experience bears it out—that sympathetic ophthalmia is a rare but classical complication of any intra-ocular operation, that it will continue to occur until its aetiology is elucidated and prevention made possible, and that it is only a matter of time before any surgeon encounters a case or cases. We had two cases of sympathetic ophthalmia in this series but taking our results as a whole we are not alarmed by this incidence.

Comment

The iridencleisis operation in congestive glaucoma has the following advantages:

(a) It is a one-stage operation assuring permanent drainage and normal intra-ocular tension.

Classical iridectomy in these cases aims only at termination of the attack; it is not supposed to and it does not effect a permanent surgical cure. Table II demonstrates that it yields a very modest percentage of success, and Table VII that it is not free from dangers.

(b) It is a safe operation, and the complications are few.

(c) It controls the tension. Of our four cases in which it failed to do so, the dislocated lens was probably produced by faulty technique; this leaves only 3 per cent. of failures, all in very advanced cases affected by repeated attacks. Hypotony on the other hand occurred in one case only.

(d) It is a quick and easy operation. Surgical emergencies—such as congestive glaucoma—have often to be operated on by intermediate grade staff, and possibly even by juniors; even in cases of very shallow anterior chamber the *ab externo* approach ensures safety.

(e) Recovery time after operation is shorter than after any other filtering operation because the trauma to the eye is slight.

The only point that might be advanced against iridencleisis seems to be the occasional occurrence of sympathetic ophthalmia. Our two cases (1.9 per cent.) could be fitted into previously quoted reports (Table V). The danger then seems to be very small, but even taking our statistics alone, it is open to discussion whether this experience—only one case of blindness amongst 110 patients affected by and operated on for congestive glaucoma—in any way outweighs all the other advantages of the operation.

Summary

110 cases of congestive glaucoma treated by a slightly modified Holth iridencleisis are described. The results appear to show a significant advantage over those obtained in this condition by the classical iridectomy.

We wish to thank Miss. E. Hatherley for kind permission to include her private and hospital patients in this report.

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