Enlargement of laser iridotomies over time

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SUMMARY We reviewed the photographs of our patients who have undergone laser iridotomies since 1975. We were able to examine photographs of 21 eyes of 13 patients to determine whether their iridotomies had enlarged over time. We detected an appreciable increase in the size of the iridotomy in seven of the 21. We attempted to determine whether there was any relation between an increase in iridotomy size and several ocular as well as systemic factors, but no such relations could be identified.

Since 1956, when Meyer-Schwickerath¹ first used the xenon arc photocoagulator to produce openings in the human iris, reports have appeared of iridotomies produced by photocoagulation.²⁻¹¹ Most clinicians now use a continuous-wave argon laser to produce an iridotomy. Although several investigators have observed a decrease in iridotomy size^{8,9} over time, so far there have been no documented reports of iridotomy enlargements. In this article we report our observations on iridotomy enlargements and our attempt to correlate them with several ocular and systemic factors.

Subjects and methods

We reviewed the photographs of patients from the New England Medical Center's Department of Ophthalmology who had undergone laser iridotomy since 1975. All of the eyes included in this analysis had been photographed with a Zeiss slit-lamp camera. We compared at least two photographs for each patient. We excluded patients if they lacked photographic documentation or if non-comparable photographic techniques had been used for documentation.

The ocular diagnoses of the patients were acute angle-closure glaucoma, subacute angle-closure glaucoma, secondary angle-closure glaucoma, fellow eye of patients with acute angle-closure glaucoma, and patients with extremely narrow angles with

positive provocative tests. For all patients a continuous wave argon laser was used to produce the iridotomy. In those patients with acute angle closure, laser iridotomy was performed after breaking the acute attack medically. An appropriate site on the iris was selected—ideally an iris crypt in the superonasal periphery. The first six spots (200 μ m, 0.2 s, 500 mW) were placed in a circular fashion around the area to be penetrated. Penetration was obtained with smaller spots of higher intensity (50 μ m, 0.1 s, 1000-1500 mW). The iridotomy was considered complete when the lens was seen in the opening. In a number of patients full penetration was not achieved after the initial laser iridotomy procedure. Several further attempts were required, resulting in a final laser iridotomy procedure. The patients were given pilocarpine drops before the iridotomy procedure and for a variable period following it. Unless contraindicated, 650 mg of aspirin was given to each patient for at least 30 minutes prior to treatment and continued four times a day for two days. In addition, each patient was asked to apply Decadron (dexamethasone) ointment (0.1%) twice daily for two days after the laser procedure.

In an attempt to quantitate changes in iridotomy size we projected iris photographs on to a screen and then traced them on to paper. We used a planimeter to determine the size of the iris, the pupil, and the iridotomy. We compared photographs taken soon after the iridotomy procedures with our most recent photographs. We made attempts to control for variations in photographic magnification and pupil size, but these variables, compounded by differences in photographic technique, made measurement of changes in large iridotomies difficult and accurate

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measurement of changes in small iridotomies impossible.

One of us (S.W.S.) reviewed the photographs and medical records of 21 eyes of 13 patients and classified the eyes into one of two groups according to the presence or absence of iridotomy enlargement following laser treatment. Then both of us verified that enlargements had occurred. We determined the composition of the two groups of eyes with respect to age, sex, ocular diagnosis, iris colour, interval between photographs taken soonest after the iridotomy procedure and our most recent photographs, duration of pilocarpine usage after the iridotomy procedure, presence of systemic disease such as hypertension or diabetes mellitus, and use of drugs. We also determined the intervals between laser iridotomy (or initial laser treatment, for those patients who needed more than one laser iridotomy procedure to attain perforation) and final photograph, as well as the number of laser iridotomy procedures for both the group showing enlargement and the group without enlargement.

We used non-parametric statistical methods to compare eyes showing an enlargement after the iridotomy.¹² To compare the distributions of age, interval between photographs, interval between laser iridotomy and final photograph, and duration of pilocarpine use between the two groups, we employed the Mann-Whitney U test. We assessed differences in the frequency distribution of sex, iris colour, diagnosis, and presence of systemic disease by the χ^2 test.

Results

Photographs of 13 patients were evaluated in this study. Of the 21 eyes for which we had sufficient photographic documentation seven eyes of four patients (three females and one male) had an increase in iridotomy size that we could appreciate visually (Figs. 1–3). Fourteen eyes of nine patients (seven females and two males) showed no enlargement of the iridotomy. Although we noted stromal burns around the perforation site in most instances, the iridotomy enlargement extended beyond the area of stromal burns, as can be seen in Fig. 2. The ages of these patients ranged from 31 to 77 years, with a mean of 56.7 years. Of patients showing no enlargement of their iridotomies seven had brown irides and seven had blue. The ages of patients showing enlargements ranged from 45 to 70 years with a mean of 56.2 years. Three patients with enlargements had brown irides and four had blue. Patients without iridotomy enlargement took pilocarpine after the iridotomy procedure for periods of from one to 35 months with a mean of 8.9 months. For those who showed enlargement the periods ranged from two weeks to 15 months with a mean of 7.6 months. The intervals between the date of the first iridotomy and the date of the last photograph after the iridotomy procedure were from five to 45.5 months with a mean of 27.2 months for those without enlargements, and from 16.5 months to 70 months with a mean of 40.1 months for patients who showed enlargements of their iridotomies. The intervals between the earliest and most recent photo-

Fig. 1 Left: Right eye one week after final laser iridotomy performed 17 May 1980 (initial laser iridotomy was approximately two months earlier). Right: Right eye of same patient 15 months after final laser iridotomy.

Fig. 2 Left: Right eye of a patient immediately after final laser iridotomy performed on 12 April 1977 (initial laser iridotomy was on 7 April 1977). Right: Right eye of same patient approximately three years after laser iridotomy procedures.

graphs after the iridotomy procedure were from 14 months to 65 months with a mean of 37.7 months for the group who showed enlargements, and from two to 44 months with a mean of 20.1 for those without enlargements.

The Mann-Whitney U tests showed no significant differences in age, interval between photographs, interval between laser iridotomy and final photograph, or duration of treatment with pilocarpine between the two groups. Similarly, χ^2 testing revealed no significant differences between the two groups with respect to sex, iris colour, type of ocular diagnosis, and the presence of systemic disease. We also compared the number of laser iridotomy treatments for each eye that both groups received. It

appeared not to be different for the two groups, with slightly more iridotomy procedures done for the group without enlargement.

We noted that two of the eyes showing marked iridotomy enlargement were in a patient who had undergone bilateral surgical iridectomies after laser iridotomy (Fig. 3). On slit-lamp gonioscopy the angles had not opened after laser iridotomy but did so after peripheral iridectomy.

Discussion

Closure or decrease in size of the iridotomy opening, generally by proliferation of pigment, has usually been noted following laser iridotomy. Pollack⁸

Fig. 3 Left: Right eye of a patient five months after final laser iridotomy performed on 18 February 1976 (initial laser iridotomy was on 7 January 1976). Right: Right eye of same patient approximately four and one-half months after peripheral iridectomy performed 27 June 1977. Note surgical iridectomy is in upper left quadrant.

observed that of 77 eyes, 26 (34%) closed at least 50% during the first six weeks following laser iridotomy. Podos *et al.*⁹ also noted that 10 of 42 eyes (24%) showed occlusion of the previously patent iridotomy site with pigment which occurred within a few weeks. However, we observed enlargement of the iridotomy opening with time rather than closure. Of the 21 eyes that had photographic documentation of the iridotomies seven, or one-third, became enlarged over a mean follow-up period of 40.1 months. We could not identify any ocular or systemic factors that were associated with enlargement or non-enlargement. In two eyes (one patient) in which we noted iridotomy enlargement surgical iridectomies had been performed after laser treatment before we observed an increase in iridotomy size. However, because the surgical iridectomies were created in the superior quadrant opposite the iridotomy site, we do not consider that the surgical iridectomies were implicated in the enlargement of the iridotomies.

One of the factors contributing to iridotomy enlargement may be the stromal burns around the iridotomy site. However, we noted that the enlargement generally extended beyond the area of stromal burn damage. Furthermore, the burns were superficial: they did not penetrate all the layers of iris tissue. We believe the fact that enlargement occurs is significant.

We cannot explain the observation of iridotomy enlargement at the present time. We are unaware of any literature referring either to surgical iridectomy or laser iridotomy enlargement over time, except for

the reference by Quigley to laser iridotomy enlargements.¹¹ Therefore we believe it is possible that iridotomy enlargement may be peculiar to the laser technique.

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