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# ORIGINAL COMMUNICATIONS

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## A REVIEW OF SURGICAL ALTERNATIVES TO MEDICAL THERAPY FOR GLAUCOMA

Douglas E. Gaasterland, MD  
Washington, DC

**Results of four uncontrolled studies, with short-term follow-up, of argon laser trabeculoplasty (ALT) as initial treatment for various open-angle glaucomas indicate short-term success varies from 65 to 90 percent. The success rates are less impressive when the definition of success, usually intraocular pressure 22 mmHg or less, and the short follow-up, usually limited to months, are considered. The ongoing, multicenter, random-assignment, controlled Glaucoma Laser Trial in the United States will provide additional information about short- and long-term follow-up of primary ALT that will clarify the accuracy of the results of these preliminary trials.**

**Results of another study suggest that initial filtering surgery is as effective at controlling intraocular pressure and preserving visual function as medical treatment for newly diagnosed glaucoma. All these clinical studies are difficult to interpret and suffer from the lack of data analysis using the life-table method. The comparatively low rate of long-term success of ALT for open-angle glaucoma performed after failure of medical management, particularly in blacks, cautions that ALT may not be a good substitute for medications or filtering surgery in newly diagnosed glaucoma.**

This paper is a review of available information related to the management of recently diagnosed, open-angle glaucoma and poses the following questions: Can argon laser trabeculoplasty (ALT) replace medications for newly diagnosed open-angle glaucoma? Does ALT reduce the need for medications in newly diagnosed open-angle glaucoma? In what early open-angle glaucoma situations is laser or filtering surgery superior to medical treatment? These questions are important for all glaucoma patients, but they have particular relevance to patients in the parts of the world where medications are not readily available or are prohibitively expensive.

Glaucoma is a complex, chronic disease, and its successful management is poorly defined. Most ophthalmologists believe that the important outcome of the disease is damage to visual function, and that this is the result of sustained, excessive intraocular pressure (IOP) that damages axons in the optic nerve head. Therefore, it is the aim of most medical or surgical management schemes to seek to reduce IOP in eyes with glaucoma. It is useful to review available information about the effectiveness of laser and filtering surgical intervention applied soon after glaucoma is diagnosed.

### REVIEW

Four series<sup>1-4</sup> have been reported of patients who underwent ALT in one or both eyes for previously untreated glaucoma. Rosenthal and coworkers<sup>1</sup> treated one eye each of 33 consecutive, phakic patients with medically untreated, chronic open-angle glau-

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From the Glaucoma and Laser Service, Center for Sight, Georgetown University School of Medicine, Washington, DC. Requests for reprints should be addressed to Dr. D. E. Gaasterland, Georgetown University Medical Center, 3800 Reservoir Rd, NW, Washington, DC 20007.

coma. Circumferential laser treatment was carried out in one or more sessions. If, at four to six weeks, IOP in the treated eye was reduced to 21 mmHg or less, the treatment was called successful, and the second eye was eligible for treatment. Medical treatment was introduced if the pressure was not 21 or less at six weeks after laser treatment, and the laser treatment was considered a failure. Successfully treated eyes were followed for 6 to 18½ months. Of the 33 eyes of 33 patients initially treated, 18 (55 percent) had successful lowering of IOP while 15 (45 percent) required start of medical treatment by the end of six weeks. Of the 18 patients with successful treatment in one eye, 10 underwent laser treatment of the second eye. All 10 of these second eyes had successful IOP reduction at six weeks after laser treatment. Eyes that achieved IOP of 21 mmHg or less without medical treatment at six weeks after laser treatment continued to have pressure within this range throughout the longer-term follow-up.

Thomas and coworkers<sup>2</sup> reported the effects of circumferential ALT in 30 eyes of 20 patients with newly diagnosed open-angle glaucoma and no previous medical or surgical therapy. Various types of open-angle glaucoma were included in this study, but 26 of the 30 eyes had primary open-angle glaucoma. In addition, two had glaucoma secondary to angle recession, and two had pseudoexfoliation glaucoma. Success was regarded as reduction of IOP to 22 mmHg or less, without further damage to the optic nerve or visual field and without medical or further surgical therapy. If these criteria were not met, initial ALT was considered a failure. The length of follow-up varied, with an average of 7½ months and a range from 3 to 10 months. During the follow-up, failure occurred in 5 of 30 eyes. The report fails to clarify whether the eyes that experienced failure of management with primary laser treatment were those with secondary open-angle glaucoma or primary open-angle glaucoma.

Migdal and Hitchings<sup>3</sup> presented observations concerning 15 eyes of 15 patients with primary open-angle glaucoma that received a two-step ALT, with each step consisting of 50 burns over 180° of the anterior trabecular meshwork. The treated eye was either the worse eye or, in cases of symmetric disease, a randomly chosen eye. The opposite eye received medical management. Minimum follow-up was six months. Treatment was considered successful if the pressure was 22 mmHg or less three months later, and if visual field loss was comparatively stable. At

the six-month examination, failure was identified in 4 of 15 eyes (27 percent).

Tuulonen<sup>4</sup> studied the outcome of initial ALT in 63 eyes of 54 patients.<sup>4</sup> Of these, 37 had pseudoexfoliation and the remainder had chronic primary open-angle glaucoma. Follow-up varied from 12 to 18 months. Failure in this study was defined as "uncontrolled" glaucoma, worsening of visual field defect, or worsening of optic disk cupping. If these occurred, the patient was started on medication. In the follow-up period, 6 of 63 eyes (10 percent) experienced failure.

Smith has reported a prospective trial at Moorfield's Eye Hospital comparing initial filtering surgery to medical treatment for primary open-angle glaucoma.<sup>5</sup> The trial began in the early 1960s, and the preliminary results were presented in the early 1970s. One eye per patient was randomly assigned to either a thermal sclerostomy or to medical management. The thermal sclerostomy (Scheie procedure) was performed in 25 eyes; another 27 patients received medicines. Of interest is the observation that by the fourth year 40 percent of the patients with medication-treated eyes had required surgery, and that this increased to 75 percent by the sixth year. During the first three years, the patients who had surgery had a significantly lower IOP than those receiving medications. The number of patients available for longer-term assessment of results (four to six years) was smaller in each group. In the short term, IOP was significantly lower in the patients who had surgical intervention, but in the longer term there was no difference between successful medical treatment and surgical intervention. Visual acuity was the same, having fallen off slightly in both groups. Similarly, visual field defects had worsened slightly in both groups, but there was no difference between groups.

## DISCUSSION

The comments made by Smith<sup>5</sup> 15 years ago remain pertinent.

. . . the matter [how to spare an eye from glaucoma damage] is amazingly complicated. If one knew that at a certain pressure a particular eye would go blind from glaucoma in a certain time, and if one could confidently predict an improvement in this prognosis by successful surgery, one would be in a powerful position. . . . We cannot relate prognosis at all reliably to pressure; we cannot predict whether our operation will succeed. In fact, we know that sometimes the operation will be disastrous and, even if it

does succeed pressure-wise, we do not know in any individual patient what improvement, if any, we have brought to the prognosis. There are so many variable factors.

These comments emphasize the importance of a statistical approach to the discovery of better management for glaucoma. Most ophthalmologists believe that the important outcome of glaucoma is damage to visual function, and that this is the result of sustained levels of IOP sufficient to damage axons in the optic nerve head. There is a tendency, in reports of the effectiveness of interventions, to define success as reduction of IOP below an arbitrary level at some point in time, usually based upon a follow-up measured in months. Often 21 or 22 mmHg is used as a dividing line between "successful" and "unsuccessful" IOP control. Such an approach omits clarification of the preservation of visual function.

Recently, ophthalmologists have started to use the life-table method of analysis of outcome,<sup>6</sup> and this can clarify which method of initial management is better for the various glaucomas. In the short term, the studies reviewed indicate successful reduction of IOP in a substantial proportion of treated eyes after initial ALT or filtering surgery. Whether this is beneficial, or sustained, in the long term has not been answered. In the United States, the multicenter

Glaucoma Laser Trial is examining this question. Recruitment for the trial has been completed, and follow-up data are being gathered. Information from this study will clarify the indications and appropriateness of initial ALT for chronic open-angle glaucoma.

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