Argon Laser Treatment of Pigment Epithelial Detachments and of Subretinal Neovascular Membranes in Junius-Kuhn’s Senile Disciform Macular Degeneration

A Prospective, Randomized Study

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Abstract. Results of argon laser treatment of pigment epithelial detachments and of subretinal neovascular membranes in Junius-Kuhn’s senile disciform macular degeneration have been compared in a prospective, randomized investigation with the natural course of these affections. Of several hundred cases 26 eyes met our criteria for treatment. In control periods ranging from 1 to 3 years, six eyes with pigment epithelial detachments received laser treatment and seven served as controls; seven eyes with subretinal neovascular membranes received laser treatment and six served as controls. The results indicate that impairment of vision progresses more rapidly after argon laser treatment than when no such treatment is given.

Introduction

It is generally assumed that Junius-Kuhn’s senile disciform macular degeneration results from pathological changes in Bruch’s membrane, the choriocapillaris and the pigment epithelium. This macular degeneration is a slowly progressive affection that begins with drusen in the posterior pole. In some patients this may lead to a pigment epithelial detachment, with or without a subretinal neovascular membrane underneath. Sometimes it is found that the pigment epithelium has spontaneously reattached itself. The subretinal new vessels can also occur without any prior detachment of the pigment epithelium. Ultimately, in most cases a fibrous connective tissue patch is formed. In the Framingham eye report 1980, it is stated that senile disciform macular degeneration is one of the most common causes of social blindness in the elderly.

Treatment of this macular degeneration with corticosteroids, vitamins, vasodilators and anticoagulants has never produced any clearly positive results. Gass (1967) was the first to report a possibly favorable effect of light coagulation on the subretinal neovascular membranes. Several more publications to the same effect followed (Bird 1974; L’Esperance 1971), but there were also reports (Lewis 1978; Meredith et al. 1979) on the relatively favorable natural course of pigment epithelial detachments in younger persons. Bird et al. (in press) have dealt more fully with these points.

Although the value of treatment thus appeared to be highly controversial, laser coagulation was nevertheless on the way to being accepted by many people as a recognized treatment. This prompted us in 1976 to start a prospective study on the effect of argon laser treatment on pigment epithelial detachments and subretinal neovascular membranes.

Patients and Methods

We wrote to all the ophthalmologists on the mailing list for our postgraduate meetings, requesting them to refer to our outpatient department patients with drusen and pigment epithelial detachments, or with incipient macular degeneration according to Junius-Kuhn, in one or both eyes.

The age range of patients to be admitted to this trial was 40–80 years for those with pigment epithelial detachments, and 50–80 years for those with subretinal vascular neoformation. On their first visit to our department the patients were subjected to a routine ophthalmologic investigation, visual acuity being determined with Landolt optotypes. In each case color photographic slides and a fluorescein angiogram were made, and static perimetry was carried out under photopic and mesopic conditions. The results of the visual field measurements will be published elsewhere. Fluorescein angiograms were made with the Zeiss Oberkochen fundus camera or with the Kowa camera, using 3 ml of 25% fluorescein sodium and Spectrotech filters SE 40A and SB 50.

Patients were excluded from this study for one or more of the following reasons, when:

1. Fluorescein angiography was contraindicated or was precluded by opacity of the media.
2. Intraretinal or preretinal hemorrhages made interpretation of the angiogram impossible.
3. The visual field investigation failed on account of insufficient cooperation on the part of the patient.
4. Diabetic retinopathy, central serous retinopathy, juvenile hemorrhagic maculopathy or ambyloïdia was present.
5. The patient’s general condition made regular attendance at the outpatient department impossible.

On the basis of the fluorescein angiogram it was decided whether a patient was suitable for laser treatment, according to the following criteria:

- Pigment epithelial detachments that had existed for longer than 6 weeks, were larger than one disc diameter on the angiogram, and in which the macula was included, were totally covered with moderately intense confluent coagulations with a diameter of 200 μ; the burns were placed in the form of a horseshoe with the opening towards the disc to spare the fovea area.
- All subretinal neovascular membranes that were more than 200 μ from the fovea were treated by means of heavy confluent
argon laser coagulations with field size 100–200 μ, duration 0.2 s, and intensity 200–600 mW.

Patients were randomly allocated to the treatment or observation group as soon as they had been judged suitable for treatment. This procedure was the same for both pigment epithelial detachments and vascular neoformations, and no subgroups were formed. Light coagulation was carried out as soon as possible after the patient had been allocated to the treatment group. The angiogram was repeated as often as indicated regarding visual acuity and funduscopy findings, but in any case once a year. The laser treatment was repeated if necessary. Two ophthalmologists carried out the treatment. The patients were examined every 3 months, but if visual acuity fell below 1/60 they were reexamined every 6 months; arrangements were made for low-vision aids if required.

Statistical Considerations

The investigation was designed on the basis of a comparison of two groups of 20 eyes each. Scoring was done on a scale that indicated the changes in function of an eye with time. Visual acuity and results of fluorescein angiography were accounted for in this scale. However, it was decided that the investigation should be stopped if either of the following situations arose:

1) The results of the treated group in comparison with the untreated group were such that it appeared impossible that the treated group could show better results at the end of the study (one-sided test at 5% level).

2) The results in the treated group were clearly worse than those in the untreated. In that case continuation of the study would be not only valueless, but also unethical.

At the beginning of 1981, when 26 eyes were under investigation, it was clear that both these conditions were fulfilled, and the study was therefore stopped.

Results

In the 3 years that the study lasted, there were 26 eyes that met our criteria for treatment. Of these, 13 had a pigment epithelial detachment and the other 13 a subretinal neovascular membrane. Figures 1 and 2 show the patients’ ages and the division into two groups. No patient had both eyes admitted to the study and there was no dropout save two patients who died during the study.

Pigment Epithelium Detachments

Figure 3 shows the follow-up period of the treated and untreated eyes with pigment epithelial detachments, while Fig. 4 gives the course of visual acuity for each laser-treated eye with this affection, and Fig. 5 the same for each untreated eye.

Five of the seven untreated eyes acquired a subretinal vascular neoformation after 3, 6, 6, 12 and 18 months respectively. Of the six treated eyes, three developed a subretinal neovascular membrane, two after 2 weeks and one after 6 months. All the treated pigment epithelial detachments had dried up at the end of the observation period. In the untreated eyes, two detachments had dried up and five eyes had acquired a subretinal vascular neoformation.
In Fig. 4 we see that the visual acuity of one of the patients with pigment epithelium detachment fell off rapidly after the laser treatment. Two weeks after treatment this patient still had the same vision of 1/2, only to develop a neovascular membrane 2 weeks later. On repeated laser treatment the vision dropped to 1/60 as a result of a deep hemorrhage.

**Subretinal Neovascular Membranes**

Figure 6 shows the follow-up period of the treated and untreated eyes with a subretinal neovascular membrane. Fig. 7 the course of visual acuity in the treated eyes with this condition, and

Fig. 8 that in the untreated eyes. Seven eyes were treated; six were not.

Two patients of the treated group died, one after 1 year; this patient had a visual acuity of 2/60 before treatment and 5/60 at the last reexamination. The other patient died after 2 years; his visual acuity had remained stationary at 0.4 for a year and had subsequently fallen to 1/60. Figure 7 shows that in two patients with a neovascular membrane the visual acuity deteriorated very rapidly after treatment. On account of personal circumstances, one of these patients had not received treatment until 1½ months after allocation of the treatment group. Since the visual acuity measurement was not repeated immediately before the laser treatment, it is not possible to state with certainty whether the deterioration of vision in this case was actually due to the treatment. The other patient was treated the day after allocation and developed, during the treatment, a small parafoveal hemorrhage, which was found to have increased considerably in size on reexamination a week later. The patient’s vision improved gradually from 0.06 to 0.2 and ultimately fell back to 0.1.

**Discussion**

Our entry criteria were so strict that only 26 eyes could be considered suitable for inclusion out of the several hundred eyes we saw with the affection in question in the study period; nevertheless, the treatment still proved to be ineffective or even harmful. As already stated, we came to the conclusion early in 1981 that continuation of the study was not justified. Note that five of the seven eyes with an untreated pigment epithelium detachment spontaneously acquired subretinal neovascularization. When the original angiograms of these eyes were subsequently reexamined, it was found that one of these patients had probably already had a neovascular membrane at the onset, and that in two other cases hyperfluorescent dots were visible in the pigment epithelium detachment.

Of the eyes treated for pigment epithelium detachment, two were subsequently found to have had small hard exudates, pointing to a subretinal vascular neof ormation. One of these two eyes kept the best visual acuity in this group (0.2), whereas the other had the lowest value (<0.1) before treatment but remained unchanged. Thus, this error of interpretation did not greatly influence the results as regards the pigment epithelium detachments. Bird et al. (in press) found themselves obliged to retract their positive reports (Bird 1974) on treatment of pigment epithelium detachments. They also encountered the same problem in interpreting the angiograms.
Conclusions

Argon laser coagulation of subretinal neovascular membranes and pigment epithelial detachments did not, in our hands, have any beneficial effect on visual acuity. The vision of the treated eyes was found to deteriorate faster than that of the untreated eyes.

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References


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