Results of laser treatment for sub-retinal neovascular membranes

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Summary

A retrospective study was carried out to determine the results of laser treatment for choroidal neovascular membranes in age-related macular degeneration in 92 patients in whom fluorescein angiography was performed for this condition over a 7-year period. Twenty-nine of these patients, treated with the argon laser, were followed up regularly for 15 months. The treatment comprised overlapping laser spots of 200 μm and an average power of 390 mW. The results of this study demonstrated that: (*i*) the majority of membranes were closer than 500 μm from the foveola; (*ii*) the second eye involvement rate in the same patient was 15,79% over 15 months; and (*iii*) a 37,5% significant visual loss or 41% two lines or greater visual loss was seen after 15 months, which compares favourably with results of laser treatment reported by other institutions.

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Age-related macular degeneration with subsequent neovascular membrane formation is a major cause of blindness in patients in the 6th and 7th decades of life.

Neovascularisation results from invasion of the sub-retinal pigment epithelial space by vessels originating in the choriocapillaris.[1,2] The new vessels grow under the retinal pigment epithelium through breaks caused by degenerative changes in Bruch's membrane.[2] It has been suggested that the neovascular membrane may cause the break and not vice versa.[3]

Symptoms occur when the macula is affected by serous or haemorrhagic detachment of the retinal pigment epithelium and sensory retina produced by exudation from these new vessels.[1-3] This exudative and sometimes haemorrhagic process often leads to severe and permanent loss of central vision because of sub-retinal fibrovascular organisation.[2] Progressive functional deterioration has been reported in the natural course of neovascular membranes. The Macular Photocoagulation Study Group in the USA has demonstrated the definite benefits of laser photocoagulation in the treatment of choroidal neovascular membranes and has advised treatment of choroidal new vessels located 200 μm or more from the centre of the foveal avascular zone.[3-7] In their study, severe visual loss was postponed for 18 months.

Subjects and methods

A retrospective study reviewed 92 patients in whom fluorescein angiography was performed for suspected choroidal neovascular membranes and their subsequent clinical course from 1981 to 1988.

Of the 92 cases of fluorescein angiography performed, 29 demonstrated treatable choroidal neovascular membranes and 63 either untreatable membranes or other diagnoses.

The average age of the 63 untreated patients was 66,74 years and the male to female ratio 39:24. Fig. 1 shows the ratio of right to left eyes and the visual acuity at presentation.

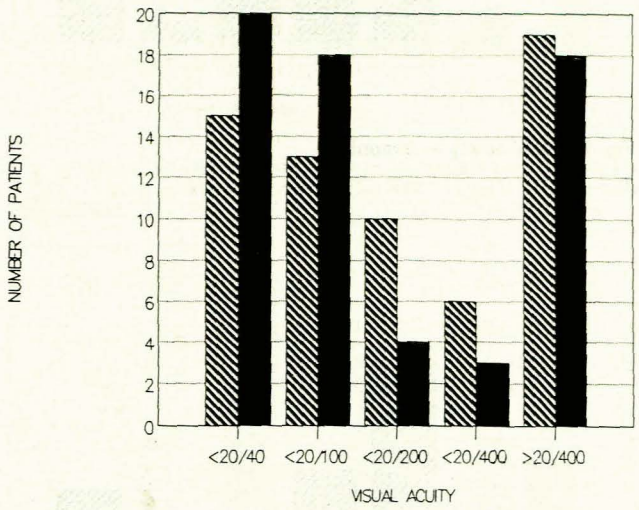

Fig. 1. Untreated patients (▨ = R eyes; ■ = L eyes).

Indications for fluorescein angiography

Of the 63 patients, 42 had a choroidal neovascular membrane in one eye and symptoms or signs on the opposite side. The pathological conditions found in the other 21 untreated patients included haemorrhages, angioid streaks, retinal pigment epithelium detachment in age-related macular degeneration, lacquer cracks and sub-retinal pigment epithelium haemorrhage.

The reasons for which no treatment was carried out included sub-foveal neovascular membranes in 56 eyes and other diagnoses in 70 eyes.

Results

Twenty-nine patients were treated with laser photocoagulation and followed up at regular intervals for a minimum of 15 months. Their ages ranged from 42 years to 80 years (average age 68,51 years). The ratio of right to left eye involvement was 13:16 and the male to female ratio was 11:18. As reported in the clinical notes, the macular appearance was as follows: normal (6,89%); oedema (10,34%); haemorrhage (17,24%); scar tissue (6,89%); dirty grey membrane as the only feature (6,89%); drusen (27,58%); cystoid macular oedema (6,89%); and retinal pigment epithelium detachment (17,24%).

Eighty per cent of patients with membranes had age-related macular degeneration and 20% had other diagnoses.

Patients with symptoms or signs of a neovascular membrane had fluorescein angiography performed and developed and treatment, if necessary, within the space of one morning.

Treatment

All patients were treated with argon photocoagulation with an average power of 390 mW. Low intensity, longer duration spots are advised to avoid haemorrhage.[2] The spot size was 200 μm except for 2 patients who were treated with 100 μm. The intention was to overlap the shots, although, on reviewing the angiograms, some turned out to be in a grid pattern.

If the number of shots is compared with the size of the neovascular membranes, the range was found to be 19,3 shots for a neovascular membrane of ¼ disc diameter; 33,4 shots at ½ disc diameter; 43,6 shots at ¾ disc diameter; 55,6 shots at 1 disc diameter and 60 shots at 2 disc diameters.

The size of the neovascular membane was measured in relation to the disc diameter 2 minutes after injection of fluorescein. The size of membrane did not correlate with the amount of visual loss. The patient was considered treated if the retina remained flat, an atrophic scar formed or no dye leakage occurred.[2]

The majority of membranes were either directly superior or inferior to the foveola.

As regards the distance from the foveola to change in visual acuity, the visual acuity outcome is reported to be worse when the membrane is closer to the foveola.[4,8]

The following observations were made: the majority of membranes were closer than 500 μm from the foveola, probably because the symptoms were noticed earlier. Figs 2-4 illustrate the visual acuity before laser treatment and after 15 months, for varying distances of membranes from the foveola.

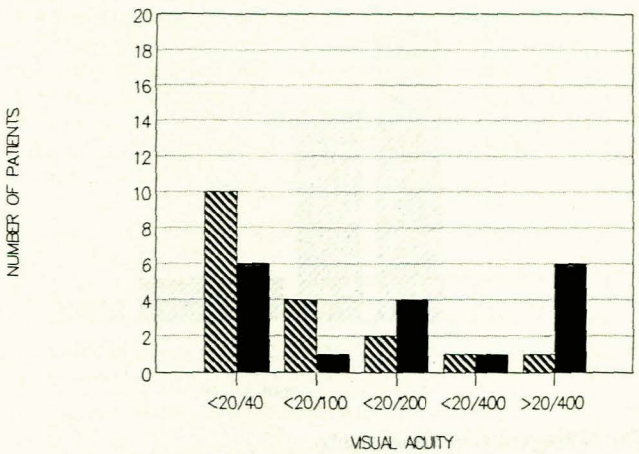

Fig. 2. Less than 500 μm from foveola — pre-operatively to 15 months postoperatively (▨ = visual acuity pre-operatively; ■ = visual acuity 15 months after treatment).

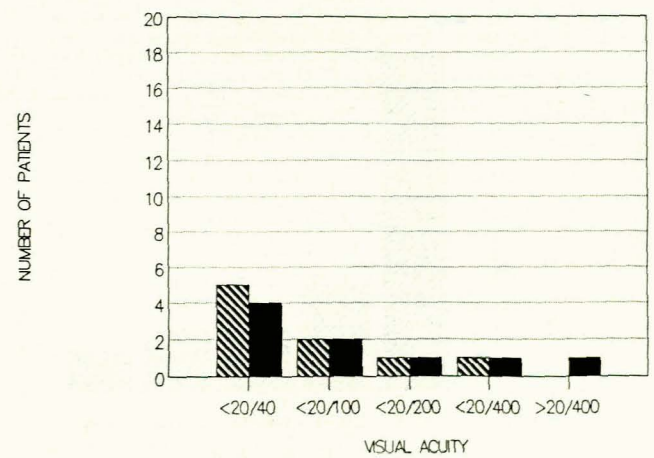

Fig. 3. Less than 1 000 μm from foveola — pre-operatively to 15 months postoperatively (▨ = visual acuity pre-operatively; ■ visual acuity 15 months after treatment).

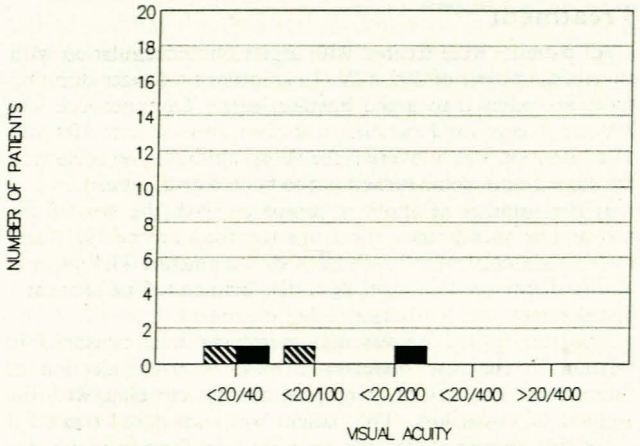

Fig. 4. Greater than 1 000 μm from foveola — pre-operatively to 15 months postoperatively (▨ = visual acuity pre-operatively; ■ = visual acuity 15 months after treatment).

The changing visual acuity in the treated eyes, which were followed up for up to 15 months, are shown in Figs 5-9.

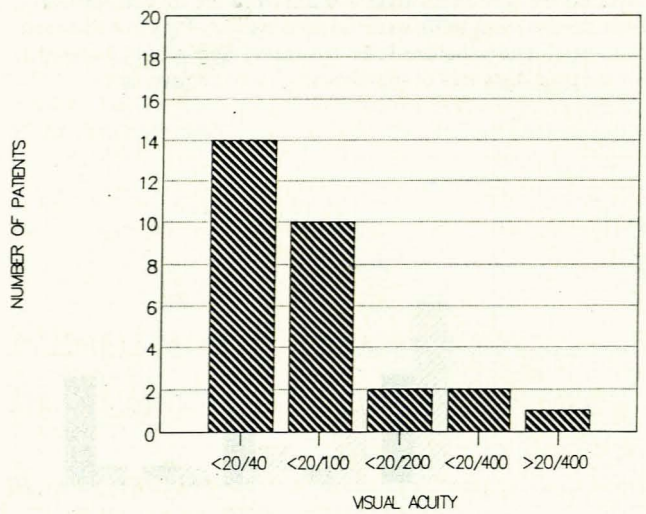

Fig. 5. Pre-operative visual acuity.

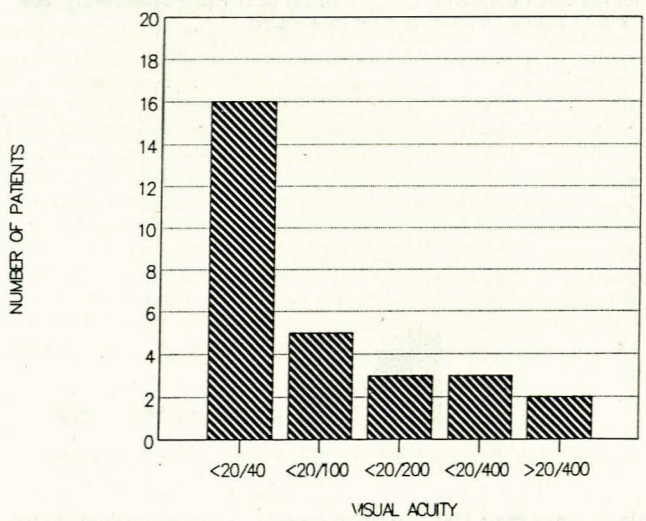

Fig. 6. Visual acuity — 1 month.

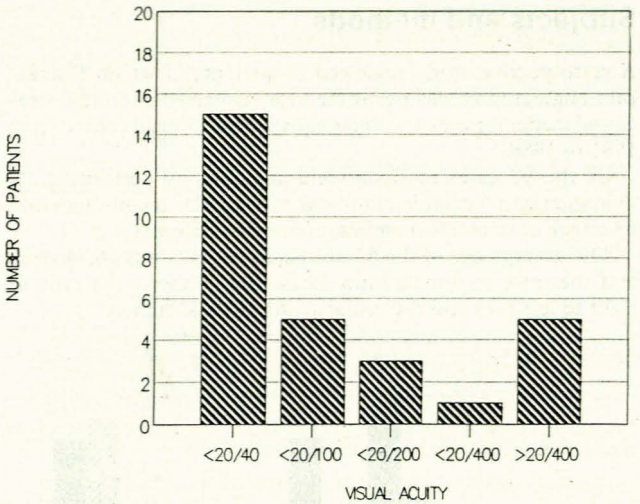

Fig. 7. Visual acuity — 3 months.

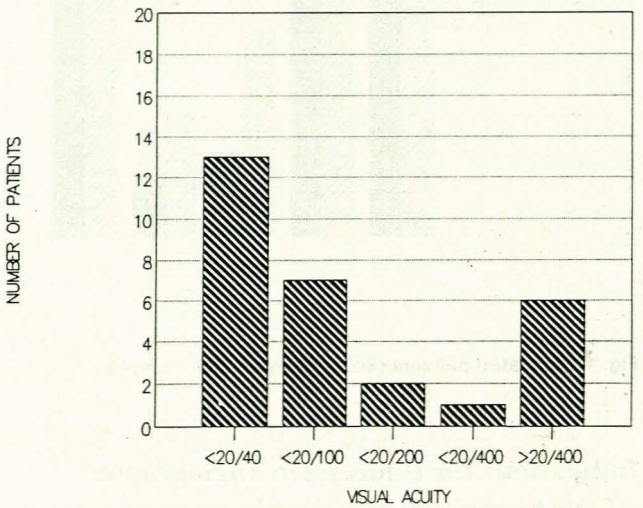

Fig. 8. Visual acuity — 6 months.

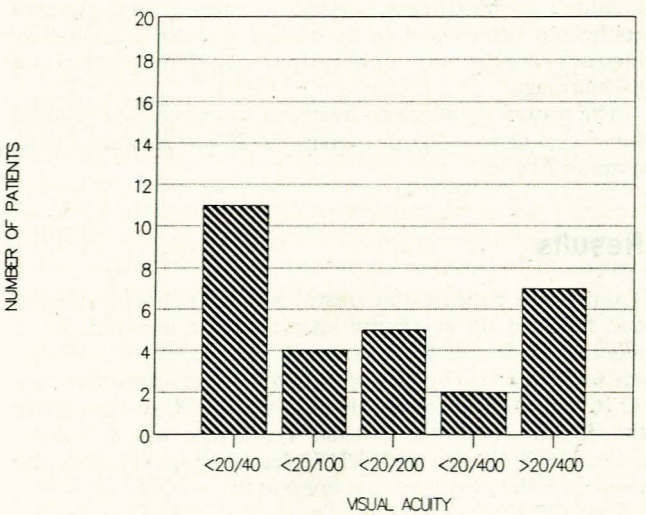

Fig. 9. Visual acuity — 15 months.

Fig. 10 summarises the visual acuity before laser treatment to that at 15 months, with a reasonable number of patients retaining useful vision.

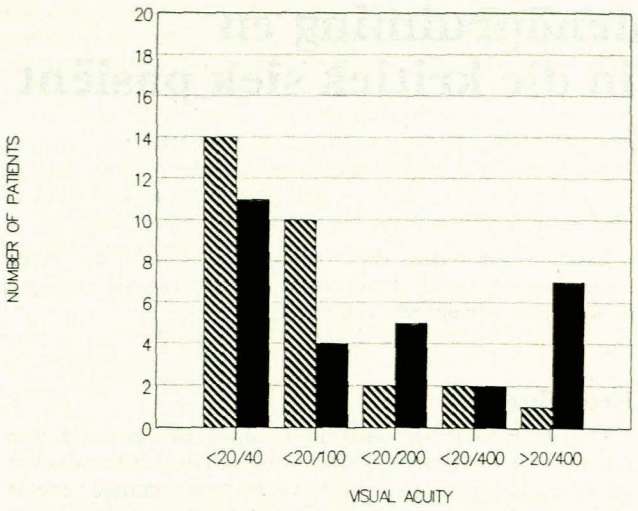

Fig. 10. Visual acuity pre-operatively to 15 months postoperatively (▨ = visual acuity pre-operatively; ■ = visual acuity post-operatively).

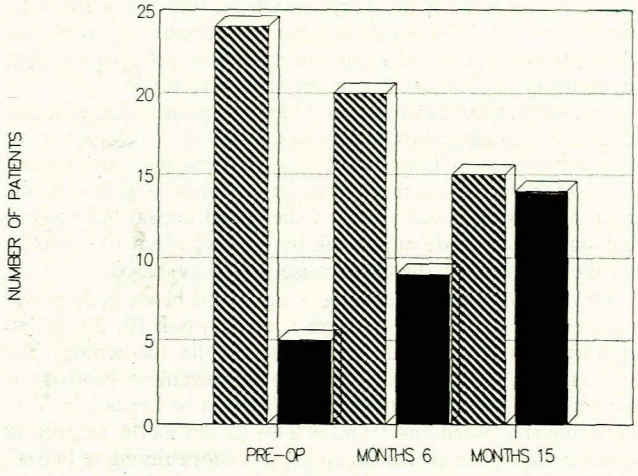

Fig. 11. Visual loss: < 20/100: > 20/100 (▨ = visual acuity better than 20/100; ■ = visual acuity worse than 20/100).

Fig. 11 shows visual loss at > 20/100 to < 20/100 visual acuity.

In Fig. 12 the 5 patients with < 20/100 visual acuity at initial examination are excluded.

If the 10 eyes which were already involved at initial examination are excluded, the second eye involvement rate was 15,79% over 15 months. This illustrates the importance of an Amsler grid, although according to published reports, only 10% of

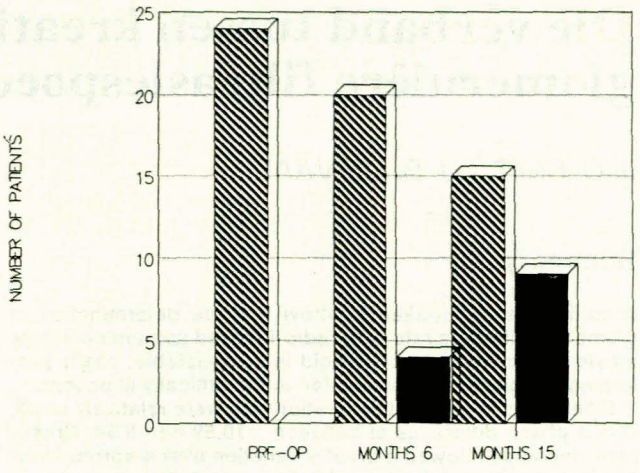

Fig. 12. Visual loss: < 20/100: > 20/100, excluding 5 patients with < 20/100 initial visual acuity (▨ = visual acuity better than 20/100; ■ = visual acuity worse than 20/100).

patients admit that changes in the grid pattern are the first visual symptoms noted. Ninety per cent of our patients noted changes when confronted with an Amsler grid.

In conclusion, the Macular Photocoagulation Study Group in the USA examined untreated and treated eyes with well-defined neovascular membranes ⩾ 200 μm from the centre of the foveal avascular zone and the results showed conclusively that laser photocoagulation was beneficial in reducing the risk of severe visual loss from sub-retinal neovascular membranes associated with age-related macular degeneration by 51% after 1 year to 24% after 3 years.[3,6] Our study showed a 37,5% significant visual loss or a 41% ⩾ two lines loss after 15 months.

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