·Clinical Research·

Low vision aid in exudative macular degeneration treated by photodynamic therapy and thermal laser photocoagulation

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Abstract

• AIM: To determine the efficacy of low vision rehabilitation (LVR) in patients with age-related macular degeneration (AMD) treated by photodynamic therapy (PDT) compared to those treated by thermal laser photocoagulation (TLP).

• METHODS: A retrospective study was performed examining the files of 42 patients (42 eyes) with AMD who had been treated either by TLP (Group 1) and PDT (Group 2). Once AMD was considered to be inactive they underwent visual rehabilitation in the LVR Unit in order to increase their ability for distant and near vision.

• RESULTS: Eighteen eyes had received PDT and 24 had received TLP. Average corrected visual acuity after laser therapy was 0.14 in Group 1, and 0.16 in Group 2. No statistically significant differences were found between both groups before and after laser therapy. Both groups showed improvement after LVR; however, statistically significant differences between both groups were found only for near vision.

• CONCLUSION: Our findings suggest that even though both PDT and TLP are associated to a decreased visual acuity after treatment, LVR may be more successful for near vision among patients treated by PDT

• KEYWORDS: age-related macular degeneration; photodynamic therapy; thermal laser; low vision rehabilitation

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INTRODUCTION

Age-related macular degeneration (AMD) is one of the leading causes of vision loss in developed countries in elderly population[1]. Different therapeutical approaches have been attempted, such as thermal laser photocoagulation (TLP)[2,3], transpupillary thermotherapy [4,5], photodynamic therapy(PDT)[6], macular translocation[7] and antiangiogenic drugs [8]. However, even though the treatment may be successful to close the choroidal neovascularization (CNV), it is not always associated to an improvement in visual acuity (VA) because of the recurrences of CNV and the persistence of central scotoma[6,9].

Low vision rehabilitation (LVR) has been developed to improve life quality in patients with VA under 20/60. LVR includes a range of services and devices aimed to improve the quality of life of patients with low vision helping them to make best use of their remaining eyesight[10].

The purpose of this study is to compare the efficacy of LVR to improve visual function in patients with subfoveal CNV associated to AMD treated by TLP or by PDT.

MATERIALS AND METHODS

A retrospective study was performed, analyzing 824 files from patients who had been treated at LVR Unit at the Instituto Oftalmológico de Alicante. All patients were examined and evaluated by the same specialist in LVR. Patients who had undergone PDT and TLP for exudative AMD with foveal involvement were selected.

VA was determined using standardized ETDRS charts (Lighthouse International, New York) and Metric System tests for the calculation of necessary addition to reach 1M in the near chart. Eyes were classified according to VA and to the treatment performed. Magnification required to achieve a certain visual objective was considered in eyes with different previous VA.

The presence of choroidal juxtafoveal neovascularization was determined by fluorescein angiography (FA). The eyes were treated by TLP [3], or by PDT [6] and repeated when

necessary. One month after the last treatment a new FA was performed to check for complete closure of CNV. Six months after complete closure had been achieved the patients were referred to the Low Vision Unit.

RESULTS

After revising 824 files of patients who had been treated at the LVR Unit, 42 eyes from 42 patients were selected: 24 eyes had been treated by TLP (Group 1) and 18 eyes by PDT (Group 2). Mean age at the time of the laser procedure was 72 years of age in Group 1 (SD 11.5, range 46 to 85) and 72.5 in Group 2 (SD 9, range 46 to 89) (P=0.75, Student's t test for paired data). Average area of the neovascular lesion was 11.49 mm^2 (SD 3.18 range 622 to 16 23) for Group 1 and 9.78 mm^2 (SD 2.81, range 2.46 to 14.24)for Group 2(P= 0.27, Student's $t$test for paired data). The eyes in Group 1 needed an average 2.4 (SD 1.4, range 1 to 5) laser sessions to achieve closure, and those in Group 2 needed 2.5 (SD 1.4, range 1 to 5) PDT sessions.

VA before laser procedures was 0.23 (SD 0.20, range 0.01 to 0.63) and 0.24 (SD 0.17, range 0.01 to 0.70) respectively (P=0.78, Student's t test for paired data).

VA for distance after laser therapy was 0.14 (SD 0.11, range 0.01 to 0.4) in Group 1 and 0.16 (SD 0.10, range 0.05 to 0.4) in Group 2 (P=0.49, Student's $t$test for paired data). There was no statistically significant difference for near vision either (P=0.24, Chi-square test).VA for distance and near vision is compared for both groups in Tables 1 and 2.

Visual acuity loss was statistically significant for both treatments (Group 1, P=0.01; Group 2, P=0.004).

Average VA for distance with LVR was 0.30 (SD 0.26, range 0.01 to 1) and 0.32 (SD 0.18, range 0.05 to 0.8) respectively (P=0.86). Improvement in VA after LVR was statistically significant for Group 1 (P=0.0017, Student's $t$test for paired data) and Group 2 (P=0.0004, Student's t test for paired data).

VA for distance and near vision is compared for both groups in Tables 3 and 4, with the magnification needed to read standard-sized 1M print. No statistically significant differences were observed for both therapies for distant vision after LVR (P=0.5, Student's $t$test for paired data). Patients treated by PDT showed a better rehabilitation for near distance (reading) with better VA (P=0.04, Chi-square test). The need for magnification to achieve 1M was not statistically significant (P=0.24, Chi-square test).

Reading speed capability is recorded in Table 5. No statistically significant difference was found (P=0.26, Chi-square test).

Table 1 Visual acuity for distant vision in Group1 (thermal laser photocoagulation) (TLP) and Group 2 (Photodynamic therapy) (PDT) after laser therapy. (Number of eyes)

VA	TLP	PDT
0.25-0.4	6	5
0.1-0.24	8	8
Under 0.1	10	5

Table 2 Visual acuity for near vision in Group1 (thermal laser photocoagulation) (TLP) and Group 2 (Photodynamic therapy) (PDT) after laser therapy. (Number of eyes)

VA	TLP	PDT
1M	4	3
2M	2	6
3M	2	6
6M-8M	5	0
Not able to read	11	3

Table 3 Visual acuity for distant vision in Group1 (thermal laser photocoagulation) (TLP) and Group 2 (Photodynamic therapy) (PDT) after low vision rehabilitation. (Number of eyes)

VA	TLP	PDT
0.8-1	1	1
0.6	5	2
0.4	3	4
0.2-0.3	4	7
No improvement	11	4

Table 4 Number of patients able to read near distance charts and magnification needed to read 1M chart. Group1 (thermal laser photocoagulation) (TLP) and Group 2 (Photodynamic therapy) (PDT) after low vision rehabilitation. (Number of eyes)

	Group 1 TLP		Group 2 PDT	
VA	*n*	Magnification needed for 1M	*n*	Magnification needed for 1M
1M	3	2.2x (2 eyes) 2x (1 eye)	0	
2M-3M	8	2.2x (8 eyes)	15	2.2x (13 eyes) 6x (2 eyes)
6M	3	2.2x (2 eyes) 5x (1 eye)	0	
8M	3	6x (2 eyes) 7x (1 eye)	0	
Unable to read		7		3

Table 5 Reading capability in Group1 (thermal laser photocoagulation) (TLP) and Group 2 (Photodynamic therapy) (PDT) after low vision rehabilitation. (Number of eyes)

VA	TLP	PDT
Very fluent	5	1
Fluent	5	8
Interrupted	3	1
Slow	4	5
Not able to read	7	3

DISCUSSION

It is generally admitted that PDT and TLP to treat subfoveal CNV in AMD seem to improve the final outcome of this condition. However, it is also known that these procedures can not prevent a certain decrease in VA[2,3,8].

We have found no statistically significant differences between both groups before and after laser treatment, and visual loss has been statistically significant for both. These results are probably caused by the damage induced by both PDT [11] and TLP [12]. PDT causes persistent chorioretinal changes, such as RPE proliferation, closure of the choroidal vasculature, subretinal edema and foveolar thinning as was experimentally demonstrated by Tzkov *et al* [13]. Thermal laser photocoagulation causes more extensive retinal damage. Timberlake [14] showed by scanning laser ophthalmoscope that fixation is performed by a retinal area immediately adjacent to the scotoma. TLP causes central or paracentral scotoma reducing the chances of good visual functioning after LVR[15]. PDT is claimed to reduce the size and intensity of the scotoma [16] so it would be admissible to consider that patients with AMD treated by PDT might have a better visual outcome with LVR than those treated by thermal laser.

Low vision aids seem to be presently a useful additional therapy for patients with AMD[10].

The usefulness of LVR is highly related to the quality and amount of the visual remain. In our series the results achieved after LVR for distant VA were similar for both groups. However, those patients who had been treated by PDT showed a better near vision than those treated by TLP. This finding may be related to the lesser degree of chorioretinal atrophy found in patients treated with PDT[13].

The average area of CNV before laser therapy was similar for both groups. Accordingly, there was no statistically significant difference in reading speed. Ergun *et al* have investigated the correlation between reading speed and scotoma size in patients with subfoveal CNV treated by PDT, finding that the size of absolute scotoma correlated significantly with reading capacity and reading speed[17].

The effect of PDT on the maintenance of central visual field function and preservation of the central visual field has been recently demonstrated. Absolute and relative scotoma sizes remained smaller after therapy, what may influence reading ability and visual rehabilitation [13]. Thermal laser photocoagulation causes an increased scotoma inducing eccentric fixation[18].

The number of patients with fluent or very fluent reading capability has been similar in both groups (42% for TLP, 50% for PDT). This is probably caused by the similar size of CNV in both groups, resulting in a similar size scotoma.

In conclusion, our findings suggest that even though both PDT and TLP are associated to a decreased visual acuity after treatment, LVR may be more successful for near vision among patients treated by PDT. However, larger series are needed to further demonstrate these findings.

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