Integrated versus Customized Neural Photostimulation

Clinical experience of the Low Vision Research Centre of Milan

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Purposes:

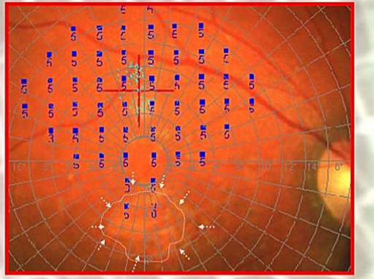
Neural Photostimulation is a biofeed-back method which aims to improve the results of visual rehabilitation on low vision patients. It can increase VEPs, Visual acuity, reading speed and fixation steadiness.

Our thesis is that photostimulation could recover fixation and foveal detection and with a cascade mechanism it could improve all the other visual parameters too.

The purpose of this study is comparing fixation steadiness inside PRL and the resulting increase of visual performances in low vision patients who underwent Customized Photostimulation, versus those who underwent Integrated Photostimulation.

Patients and methods:

We analyzed a sample of 21 low vision patients (34 eyes) who had already undergone visual rehabilitation and neural photostimulation and who



Pict. 1: In the low vision patient the fixation is unstable and eccentric. The visual perfomances are penalized.

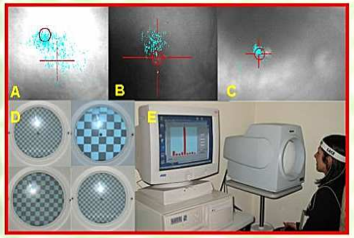
	Integrated NPS			Customized NPS			
	T0	T30	% change	T180	T210	% change	% T210/T0
BCVA	0,31	0,48	53,93%	0,40	0,53	35,30%	72,40%
Residual points	24,24	16,16	33,33%	18,5	14,8	20,03%	39,02%
Aid points	9,27	7,31	21,16%	7,5	6,8	10,04%	26,81%
Sens MP1	6,53	8,19	25,36%	8,4	8,1	-3,77%	23,44%
Dec°	3,00	2,16	28,13%	3,05	2,29	24,91%	23,66%
Fix % 2°	48,24	58,28	20,81%	41,9	68,9	64,39%	42,89%
Fix % 4°	80,85	88,47	9,43%	69,2	88,5	27,82%	9,40%
VEPs	2,64	3,82	44,36%	1,7	3,3	96,20%	25,27%
Ws/Min.	80,50	95,50	18,63%	83,1	94,6	13,91%	17,53%

where clinically stabilized.

All the patients of the sample underwent a periodical treatment of five sessions cycles every six months. At the start we used Integrated Photostimulation (association of Visual Pathfinder, IBIS, Sound Biofeedback). At the end we used Customized Neural Photo-stimulation (association of Visual Pathfinder, IBIS, Sound Biofeedback). We find PRL with microperimeter MP1 by Nidek.

At the beginning and at the end of each cycle we analyze fixation inside foveal 2° and 4°, with steadiness score, BCVA by far, residual near visual acuity, visual acuity with low vision aids, VEPs, reading speed and reading coefficient.

We used Snellen Reading Chart by far, Limoli's Reading Chart in printing types (pt) by near, Nidek's microperimeter MP1 (which makes a microperimetry through an high frequency autotracking program and a device for electrophysiological recordings (Visual Pathfinder LACE)

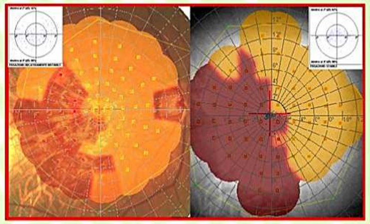


Pict. 2: Customized Neural Photo-stimulation Sound biofeedback by Microperimeter MP1 and his effect about fixation (A, B, C) and optical patterns (D) by Visual Pathfinder (E)

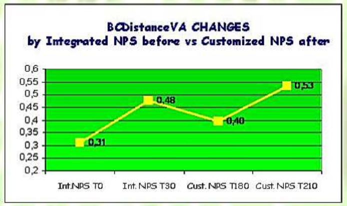
Results:

In this sample integrated photostimulation had increased BCVA from 0.31 to 0.48, residual visual acuity by near from 24.24 to 16.16 pts, near visual acuity with low vision aids from 9.27 to 7.31 pts, residual retinal sensitivity from 6.53 to 8.19 decibels, fixation steadiness inside 2° increased from 48.24% to 58.28%, decentralization improved from 2.85° to 2.04°, VEPs increased from 2.64 to 3.82 micronVolts, reading speed increased from 80,50 to 95,50 word per minute

Six months after the same sample underwent Customized neural photostimulation. With this new method BCVA increased from 0.40 to 0.53, residual visual acuity by near increased from 18.5 to 14.8 pts, visual acuity with low vision aids increased from 7.5 to 6.8 pts, retinal sensitivity increased from 8.4 to 8.1 db, fixation steadiness in foveal 2° increased from 41.9% to 68.9%, decentralization improved from 3.05° to 2.29°, VEPs increased 1.7 to 3.3 micronVolts, reading speed improved from 83,1 to 94,6 words per minute. We have then compared the results obtained with the two different techniques.

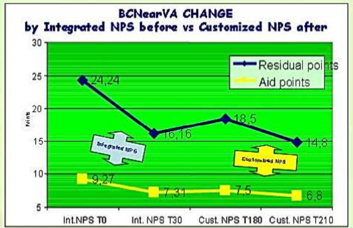


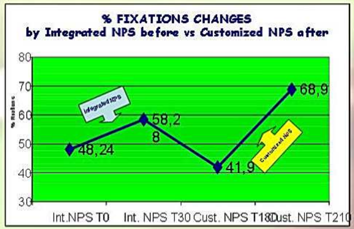
Pict. 3: The customized neural photostimulation improve the fixation

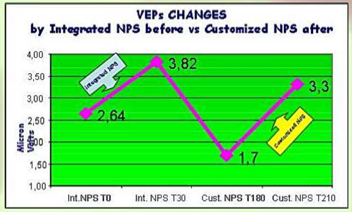


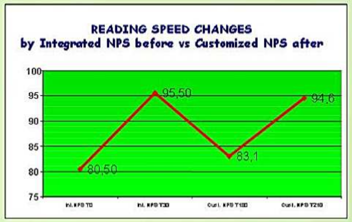
Conclusions:

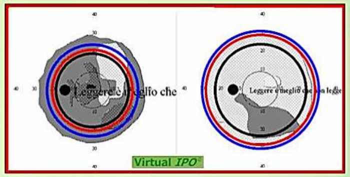
We underline that photostimulation through the stabilization of the PRL inside foveal central 2°, determines an increase of foveal detection thus obtaining an increase of visual acuity, VEPs, and reading performances. This increase can be modulated and improved according to the chosen rehabilitative method.











Pict. 9: Simulation by software Virtual IPO®: the patient, after customized neural photo-stimulation, improve the BCVA (from 0,2 to 0,35), the reading field (from 7 to 9 words per field), the magnification of low vision sistem (from 2,25X to 1,5X).

Customized photostimulation directly stimulates the PRL. In this way we can achieve better rehabilitative results.

Particulary it seems to be better in increasing VEPs and visual acuity by far, by near and with visual aids. There are no significant differences in decentralization degrees.

This therapy ought to be repeated because visual performances tend to relapse after some time, but it is always possible to restore visual acuity increase.

Customized photostimulation lasts only 25 minutes per session if compared with integrated photostimulation which lasts 35 minutes, and so it reveals to be less tiring for the patient as well as for the operator.

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