

# ReSTOR™, Virtual rehabilitation and maculopathy.

## Can we talk about a surgical way for visual rehabilitation?

### Case reports and considerations

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Paolo Limoli MD<sup>\*\*</sup>, Enzo Vingolo PhD<sup>\*\*</sup>, Laura D'Amato MD<sup>o</sup>, Enrico Giacomotti<sup>o</sup>, Roberta Solari,<sup>o</sup> Riccardo Di Corato<sup>o</sup>, Filippo Tassi<sup>o</sup>

<sup>o</sup>Low Vision Research Centre - Milan, <sup>^</sup>La Sapienza University - Rome, <sup>\*</sup>Eye.com – Palermo

paololimoli@libero.it

#### Purposes:

In patients with cataract and maculopathy, the ability to provide, through a virtual rehabilitation software (VirtualIPO<sup>®</sup>), the magnification needed to read can be applied in choosing the IOL by which cataract surgery could become a rehabilitation opportunity.

In our experience, the magnification provided by diffractive IOL and the enlargement obtained with a surgical

myopization allows the reduction of the power of the proper magnifying optical system which can be virtually decided before the operation.

#### Patients and methods:

We have chosen 5 maculopathic patients (8 eyes) aged between 61 and 79 year.

We evaluated the residual visual acuity by near with the proper magnifying device in pts, the real and the virtual magnification, and the dioptric power of the magnifying system.

Then we made a phacoemulsification with apodized diffractive IOL ReSTORE™ implant.

#### Results:

The case reports presented show that

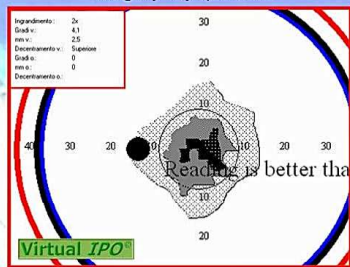
the virtual magnification (2.86 X) coincided with the real one after surgery (2.75 X).

This magnification has been kept unchanged, the power of magnifying system from 10.67 diopters becomes 6.91 diopters after surgery; in this way we have reduced the global power of the magnifying system without altering the magnification required for reading.

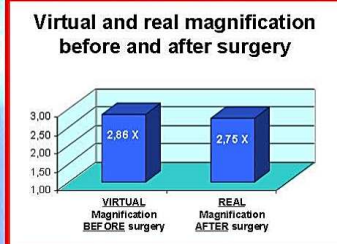
Part of the reduction (3.2 D = 0,8X = 28%) was achieved by using a IOL ReSTORE™, thanks to diffractive characteristics of the lens. A further part of the reduction (average 1.19 D = 0,3X = 11%) was obtained with a surgery myopization calculated at the discretion of the surgeon.

Magnifying power system is: Virtual X \* 4 – diffractive impact factor – surgery myopization

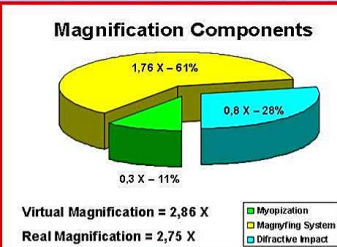
Before Surgery	N°	ES	BCVA T1	pte T1	Mag. X T1	pte Syst T1	Power Syst T1
1	1	1,5	0,15	18	2,5	8	11,5
2	2	0,75	0,1	12,8	NV	18	10,8
3	3	3,12	0,1	42	3	12	15,12
4	4	3	0,05	42	4	22	10
5	5	3	0,6	8	2	6	6,5
6	6	4	0,5	5	2	6	7
7	7	-1,25	0,1	35	2,5	10	11,75
8	8	9	0,1	20	3	10	12
		1,77	0,25	30,05	2,06	12,83	10,67
After surgery	N°	RYOP T1	BCVA T1	pte T1	Real X T1	pte Syst T1	Power Syst T1
1	1	-2	0,4	14	2,5	9	4,5
2	2	-3	0,15	35	2,5	10	4,5
3	3	-1,25	0,1	30	3,5	14	8,25
4	4	-1,25	0,05	42	3,5	22	8,75
5	5	0	0,4	10	2	6	5
6	6	0	0,5	10	2	6	5
7	7	-1,25	0,1	62	3	14	11,75
8	8	-1,25	0,15	18	3	10	7,5
		-1,19	0,24	27,75	2,25	12,38	6,91



Pict. 2: The Virtual Visual Rehabilitation by VirtualIPO<sup>®</sup> allows to forecast the final power of the magnifying system after cataract surgery. It is possible to choose the best power of magnifying system using myopization and diffractive apodized implant and project the best visual rehabilitation for the low vision patient with maculopathy and cataract.



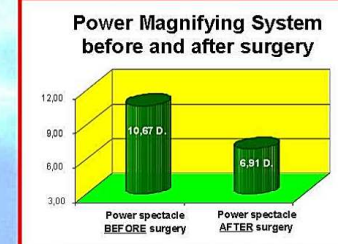
Pict. 3: The magnification designed by VirtualIPO<sup>®</sup> before the surgery is the same of the magnification necessary after the surgery.



Pict. 4: The magnification is obtained by magnifying system but also by myopization and by diffractive impact factor

$$\begin{aligned} \text{In our study is} \\ (2,86 * 4) - 3,2 - 1,19 = \\ 11,44 - 3,2 - 1,19 = \\ 7,04 \text{ D} \end{aligned}$$

The slight discrepancies with the actual figures (7,04>6.91) are attributable to the mild preoperative myopization caused by cataract, to the real correction with step of 0.25 diopters, to even small variations of retinal disease, to possible influence



Pict. 5: The magnification before and after cataract surgery it's the same, but the use of myopization and ReSTORE™ designed by VirtualIPO<sup>®</sup> allows a reduction of the power of the magnifying system, with increase of working distance and reading field.

$$\begin{aligned} \text{Power Magnifying System} \\ \text{After Surgery Formula} \\ = \\ \text{Virtual X} * 4 - \\ \text{Diffractive Impact Factor} - \\ \text{Surgery Myopization} \end{aligned}$$

Pict. 6: Virtual X = Virtual Magnification designed by VirtualIPO<sup>®</sup> (In this case 2.86X = 11,44 Diopters) Diffractive Impact Factor= Magnification Factor by Diffractive Apodized IOL (Constant = 0,8X = 3,2 Diopters) Surgery Myopization (Variable, in this case 0,3X = 1,19 Diopters)

The theoretical Magnifying System after surgery is 7,04 Diopters (Real 6,91 Diopters) instead of 11,44 Diopters before surgery, but the magnification is the same (2,75X instead of 2,86X).

of the position or the pupilar dynamic in the vision through ReSTORE™, the possible absorption of light by the micro levels on the front surface of the IOL.

But the magnification components has reduced the global power of the magnifying system without altering the magnification required for reading planned before surgery with VirtualIPO<sup>®</sup>.

The far distance visus (from 0.25 to 0.21) remains basically unchanged and the residual near visus goes from 38 pts to 27,75 pts.

#### Conclusions:

The reduction of magnifying power system determines a proportional increase in working distance and field offered by the system, which means that the patient reads at a greater distance seeing a greater number of letters in the field.

Lowering the system power below 10 diopters makes the surgery option suitable for the creation of binocular systems which are more useful to the process of rehabilitation and more aesthetically accepted.

The virtual analysis of the maculopathic patient, compared to the visual assessment alone, seems to be more effective in forecasting magnification.

We believe that the surgical way for visual rehabilitation, below a visus remaining 30 pts, and only in selected cases from virtual analysis, can be a less discriminatory way to rehabilitate low vision patients with maculopathy. In a more ethical approach to visual rehabilitation, we believe it is important to deepen the benefits and limits of this approach, further widening the case studies.

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