# Comparative Study of Visual Quality and Performance of 3 Diffractive Multifocal IOLs

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## Previous

Today, we are ever more dependent on being able to perform rapidly alternating far and close-up tasks, such as reading from a tablet or mobile phone while watching

Modern cataract surgery became very safe and reproducible, **It is the most common surgical procedure performed around the globe.**

*People is doing cataract surgery earlier also **to become free from glasses***

Younger patients are more active and **they want to be able to see at all distances.**

something similar to a "dynamic vision focusing" as the ability of the eyes to clearly focus on objects quickly and at varying distances is often necessary today, especially in the working-age population.

Cillino G, Casuccio A, Pasti M, Bono V, Mencucci R, Cillino S. Working-Age Cataract Patients: Visual Results, Reading Performance, and Quality of Life with Three Diffractive Multifocal Intraocular Lenses. *Ophthalmology*. 2014;121(1):34-44

## Purpose

Evaluate and compare the visual performance and optical quality between three different diffractive multifocal lenses:

*The Tecnis® three-piece model ZMA00; the Tecnis® one piece model ZMB00; the AcrySof® ReSTOR® one-piece model SN6AD1.*

## Patients and Methods

▶ **Prospective, comparative and nonrandomized** study model.

▶ Evaluate **108 eyes of 54 patients** referred for cataract surgery and candidates for **multifocal IOL implantation**. We compared **before** surgery and **after 180 days**.

▶ **Exclusion criteria**:  Corneal astigmatism **greater than 1.00** cylinder diopter; any **previous eye surgery**; any **other ocular disease** or even **systemic diseases** that could had reduced visual field or contrast sensitivity.

▶ **Same Surgeon** (W.T.H), phacoemulsification using **2.2 or 2.4 mm** near clear cornea incision at the **steepest axis**.

## Patients and Methods – Measures

- Preoperative and post operative **spherical equivalent.**

- **Uncorrected Distance Visual acuity and Corrected distance visual acuity** pre and post operative ( **ETDRS 4m** ).

- **Uncorrected Near** visual acuity post operative (**ETDRS 33cm**).

- **Contrast sensitivity** under photopic and mesopic conditions . (**Optec 6500P** - Stereo Optical Company) – FACT CHART

- **Wave Front Aberrometry** (**OPD -Scan III** - Nidek).

- **Defocus visual curve** (ETDRS 4 m , 0.50 spherical diopters steps, from -5.00 D to +2.50 D).

- **TYPE Quality Survey** for TECNIS ZMB00 IOL.

## Results — Homogeneous groups

| p value | Age | IOL Power | AL |
|---|---|---|---|
| Anova | 0,172 | 0,742 | 0,363 |
| Kruskal Wallis | 0,121 | 0,902 | 0,951 |

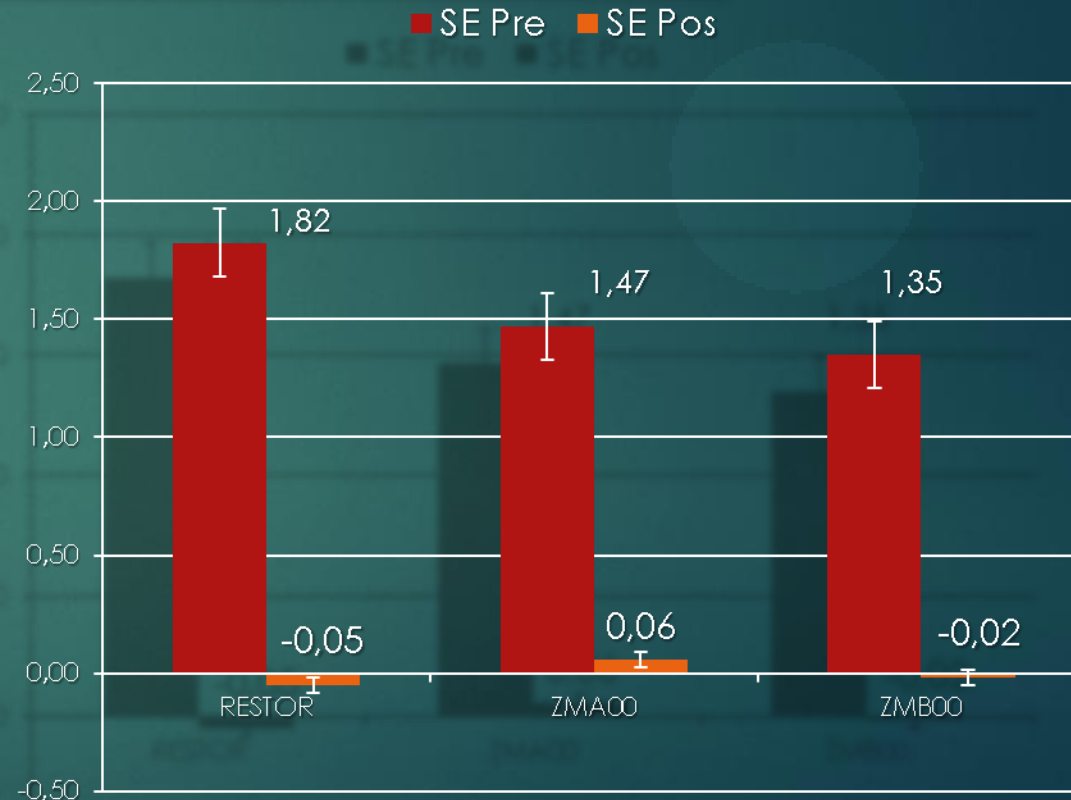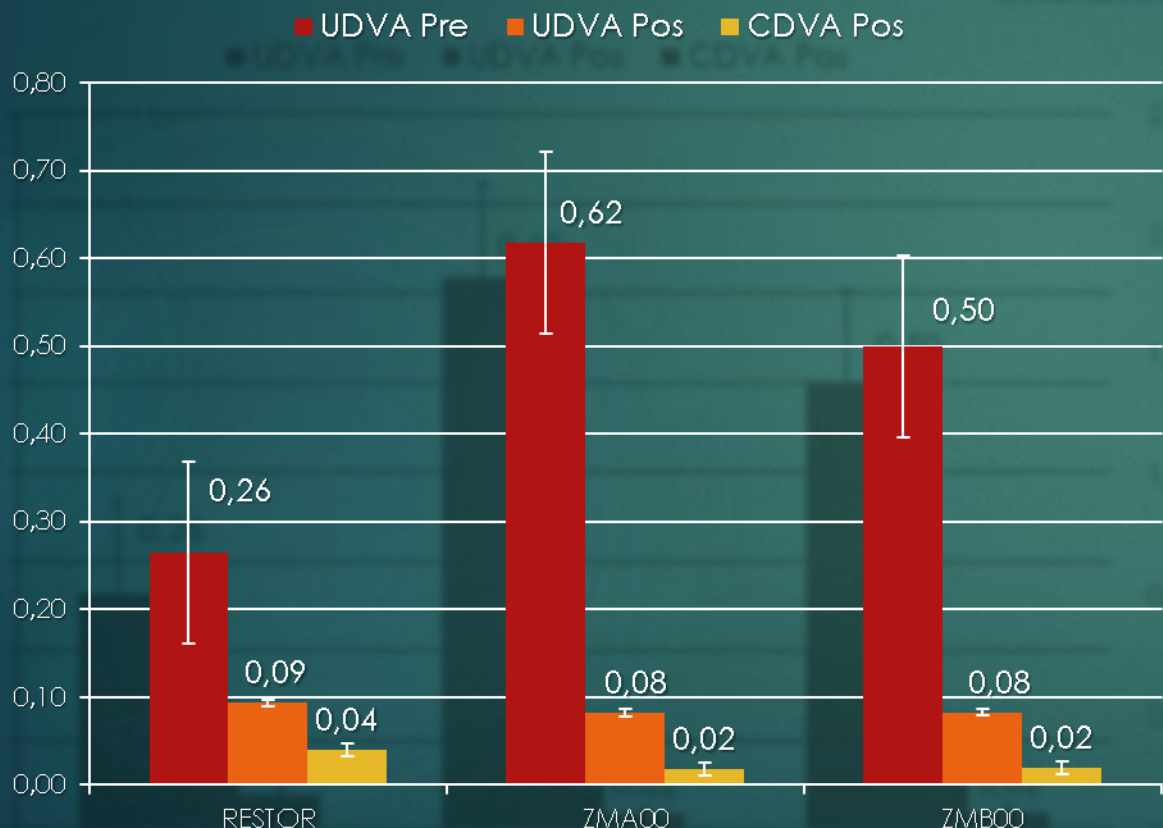| | | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound | | |
| Age | Restor SN6AD1 | 34 | 62,12 | 5,48 | 0,94 | 60,21 | 64,03 | 51,00 | 72,00 |
| | Tecnis ZMA00 | 34 | 64,65 | 5,90 | 1,01 | 62,59 | 66,70 | 56,00 | 77,00 |
| | Tecnis ZMB00 | 40 | 63,85 | 5,59 | 0,88 | 62,06 | 65,64 | 53,00 | 76,00 |
| | Total | 108 | 63,56 | 5,70 | 0,55 | 62,47 | 64,64 | 51,00 | 77,00 |
| IOL Power | Restor SN6AD1 | 34 | 22,26 | 3,20 | 0,55 | 21,15 | 23,38 | 17,50 | 31,00 |
| | Tecnis ZMA00 | 34 | 21,79 | 2,49 | 0,43 | 20,93 | 22,66 | 15,50 | 26,00 |
| | Tecnis ZMB00 | 40 | 22,24 | 2,82 | 0,45 | 21,34 | 23,14 | 14,00 | 27,00 |
| | Total | 108 | 22,11 | 2,83 | 0,27 | 21,57 | 22,65 | 14,00 | 31,00 |
| Axial Length | Restor SN6AD1 | 34 | 23,16 | 1,00 | 0,17 | 22,81 | 23,51 | 20,60 | 24,75 |
| | Tecnis ZMA00 | 34 | 23,24 | 0,88 | 0,15 | 22,93 | 23,55 | 21,94 | 25,26 |
| | Tecnis ZMB00 | 40 | 23,47 | 1,06 | 0,17 | 23,13 | 23,81 | 22,08 | 25,94 |
| | Total | 108 | 23,30 | 0,99 | 0,10 | 23,11 | 23,49 | 20,60 | 25,94 |

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## COMPARATIVE STUDY OF VISUAL QUALITY AND PERFORMANCE OF 3 DIFFRACTIVE MULTIFOCAL IOLS

## Results

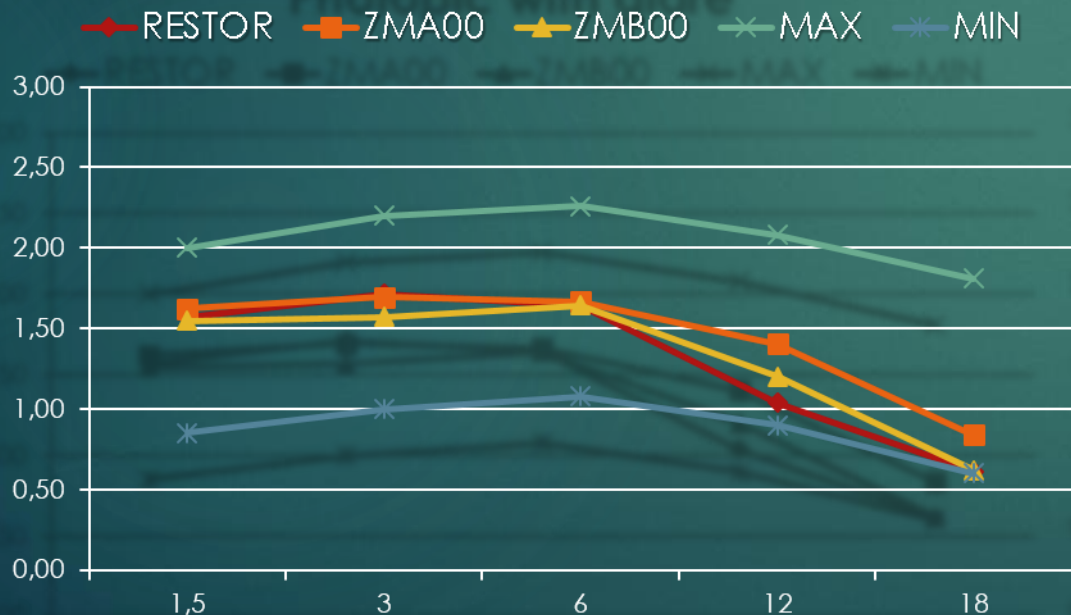| p value | SE Pos | UDVA Pos | CDVA Pos |
|---|---|---|---|
| Anova | 0,352 | 0,868 | 0,068 |
| Kruskal Wallis | 0,121 | 0,258 | 0,086 |



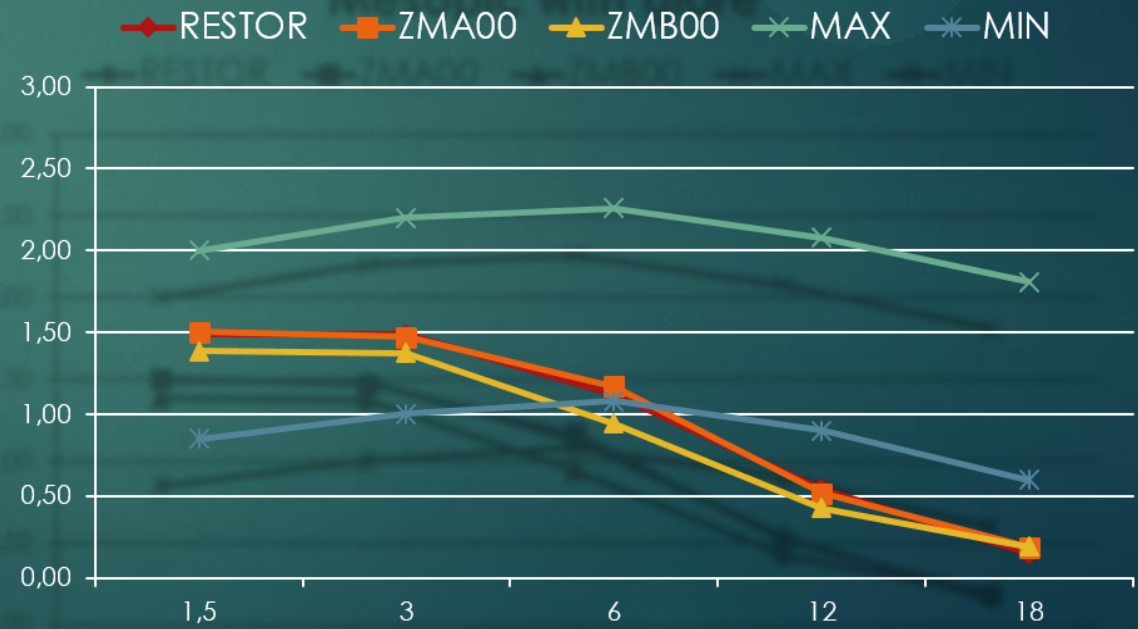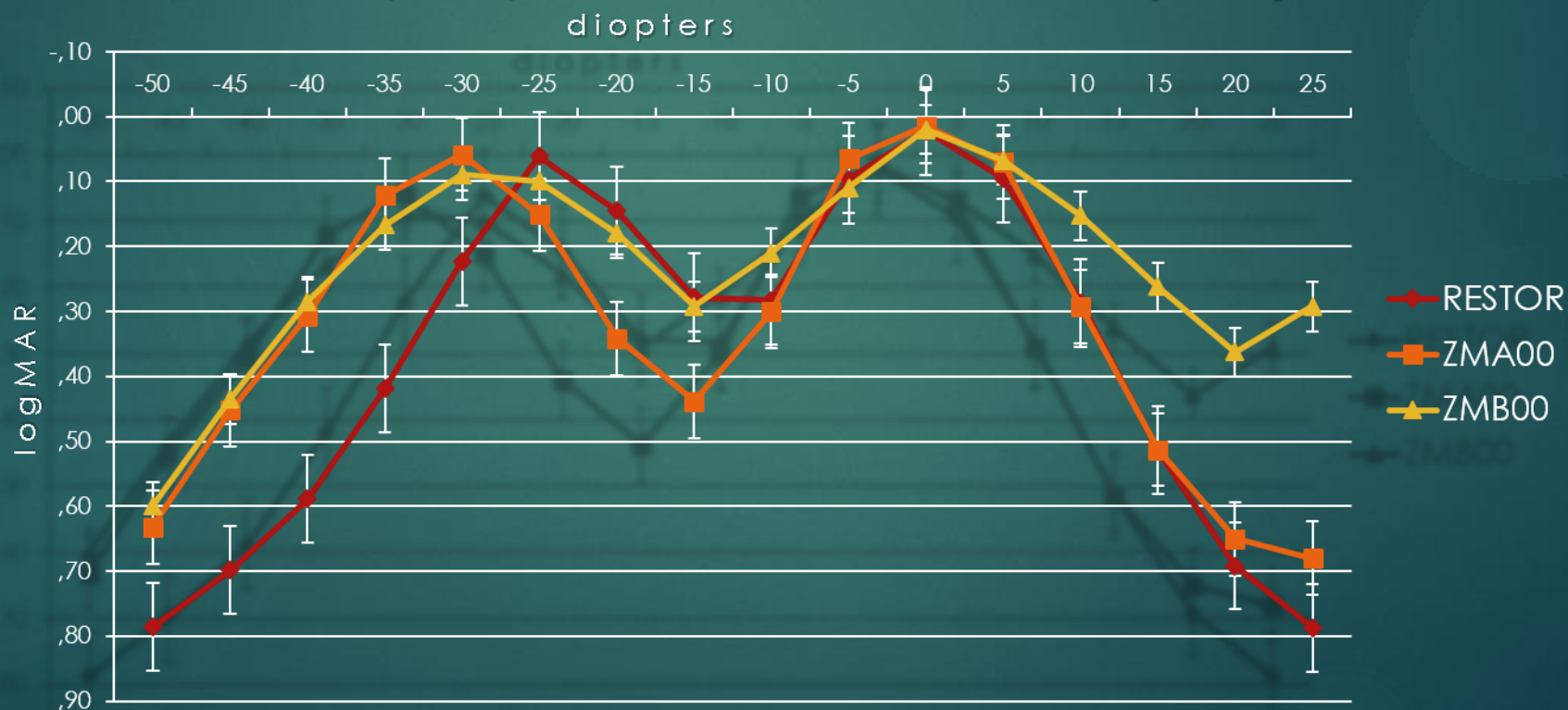Visual Acuity = logMAR / SE = diopters

## Contrast Sensitivity

**Photopic conditions with glare**: ZMB00 and ZMA00 better at high frequencies (18cpd). (Anova p=0,007/ Kruskal-Wallis p=0,041)

**Mesopic conditions with glare**: ZMB00 worse at low frequencies (1.5 and 3 cpd) but without statistical significance. (p>0.05)



Visual Acuity = 10 base logMAR

## Defocus  visual curve

Tecnis **ZMB00 and ZMA00** were better at **33 cm near vision**  (-3.0D). Restor **SN6AD1** was better at **40 cm near vision** (-2.5D). ZMA00 was worse **at 66cm (-1.5D) intermediate vision**. (p<0.05)
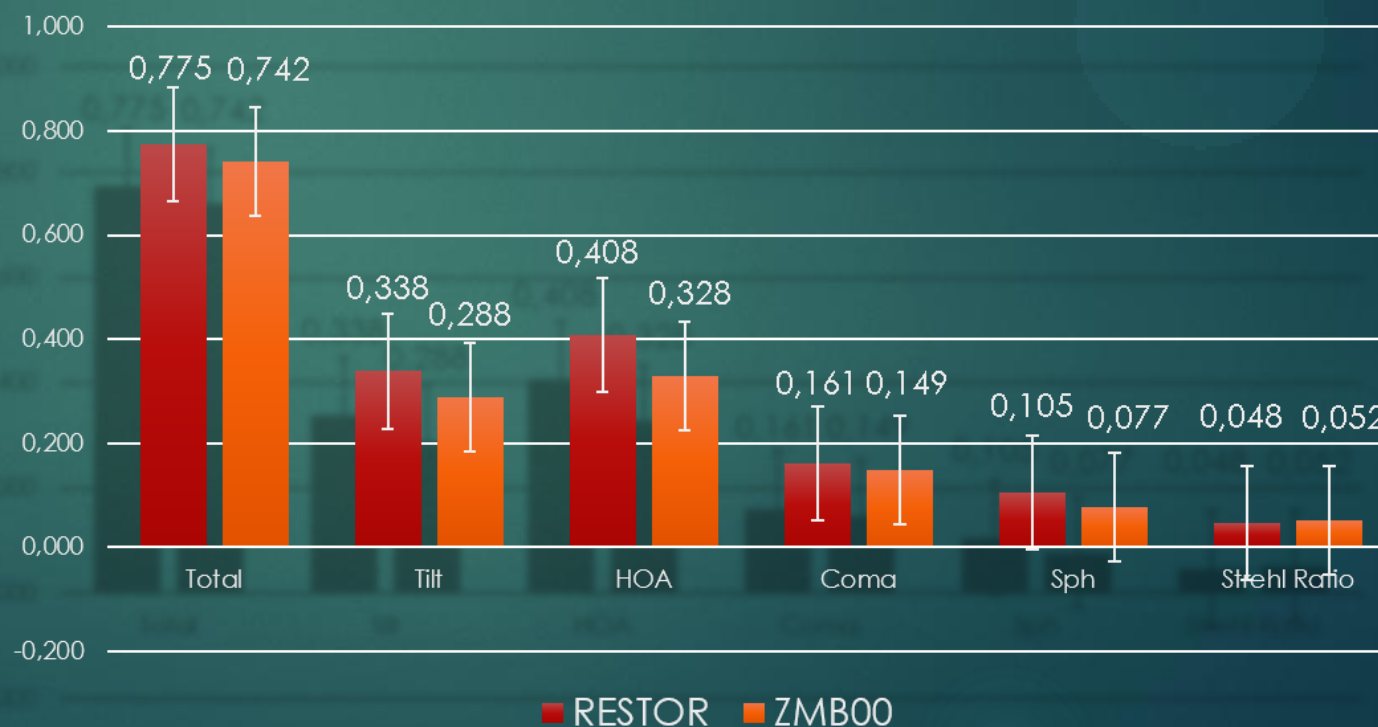
## Aberrometry

Wavefront Analysis **with pupil in physiological state** between Restor SN6AD1and Tecnis ZMB00**: No statistically significant difference  (OPD-Scan III – Nidek).**

| | .p Value | |
|---|---|---|
| | t-Student | Mann-Whitney |
| Total | 0,784 | 0,793 |
| Tilt | 0,554 | 0,734 |
| HOA | 0,231 | 0,156 |
| Coma | 0,785 | 0,422 |
| Sph | 0,400 | 0,107 |
| Strehl Ratio | 0,663 | 0,459 |

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## TYPE Quality Survey

### TYPE Survey for Tecnis ZMB00 IOL

| Distance vision | |
|---|---|
| Excellent | n=14 (73,68%) |
| Satisfactory | n=5 (26,31%) |
| Unsatisfactory | n=0 (0%) |
| Bad | n=0 (0%) |
| **Intermadiate vision** | |
| Excellent | n=10 (52,63%) |
| Satisfactory | n=7 (36,84%) |
| Unsatisfactory | n=2 (10,52%) |
| Bad | n=0 (0%) |
| **Near vision** | |
| Excellent | n=15 (78,94%) |
| Satisfactory | n=2 (10,52%) |
| Unsatisfactory | n=2 (10,52%) |
| Bad | n=0 (0%) |

| Glare | |
|---|---|
| Present | n=10 (52,63%) |
| None | n=9 (47,36%) |
| **Halos at day** | |
| Present | n=3 (15,78%) |
| None | n=16 (84,21%) |
| **Halos at night** | |
| Present | n=17 (89,47%) |
| None | n=2 (10,52%) |

## Conclusion

▶ The three lenses were effective on **visual rehabilitation** in patients undergoing cataract extraction. All patients **became glasses independent.**

▶ ZMB00 and SN6AD1 IOLs **were equivalent for intermediate** and better than ZMA00 IOL.

▶ ZMB00 and ZMA00 IOLs had better outcomes regarding contrast sensitivity under **photopic conditions with glare** at high spatial frequencies compared to SN6AD1.

▶ ZMB00 and SN6AD1 IOLs were **equivalent at wavefront analysis**.

▶ The **satisfaction rates** of ZMB00 implantation were similar to literature*.

* Sood P, Woodward MA. Patient acceptability of the Tecnis multifocal intraocular lens. *Clinical ophthalmology (Auckland, N.Z.). /* 2011;5:403-410.