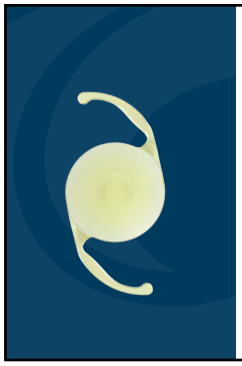


Paul H. Ernest, M.D.

PRESBYOPIA CORRECTING IOLS

1

Presbyopia Correcting IOLs

Presbyopia correcting lenses have currently evolved into two main categories

Trifocal (PanOptix)

EDOF (Vivity)

2

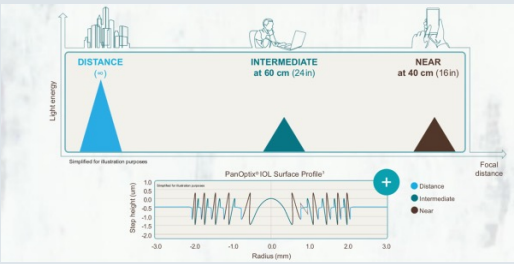
PanOptix

- More than 18 months of experience
- Personally, have more than 800 patient eyes
- Only lens that gives total independence from glasses.
- Less halos than any other multifocal lens
- Centration Mandatory – reason for the femtosecond laser*

*Higher Order Aberrations in Femtosecond Laser–Assisted Versus Manual Cataract Surgery: A Retrospective Cohort Study.
Paul H. Ernest, MD; Marko Popovic, MD; Matthew B. Schlenker, MD; Lindsay Klumpp, OD; Iqbal Ike K. Ahmed, MD, Journal of Refractive Surgery. 2019;35(2):102-108

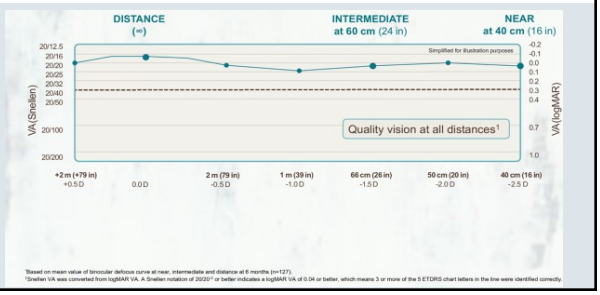
3

PanOptix



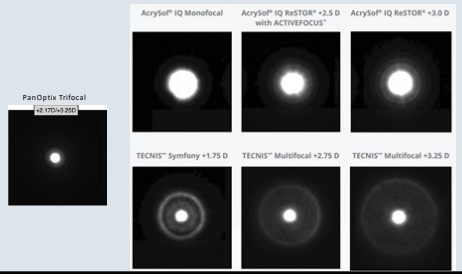
4

PanOptix



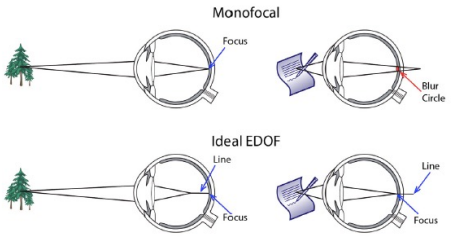
5

Dysphotopsias



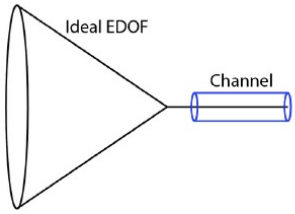
6

Extended Depth of Focus



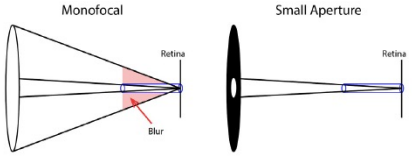
7

Ideal EDOF



8

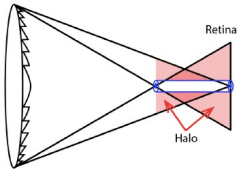
Small Aperture IOLs



May be problematic under low lighting conditions.

9

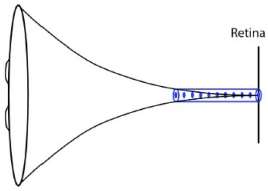
Diffractive IOLs



Diffractive lenses split the light into two or more foci. Here, a bifocal diffractive lens creates two distinct foci within in channel. While these rays again come to focus within the EDOF channel, away from these points, the rays lay outside of the channel leading to halo.

10

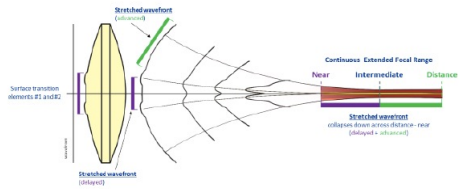
Wavefront Shaping



Wavefront shaping in the lens leads to light that is mainly confined to the EDOF channel with a halo profile similar to that of a monofocal lens.

11

X-Wave Technology (Vivity IOL)



- Surface transition element #1 alters the wavefront, stretching it
- Surface transition element #2 shifts the wavefront
- The simultaneous actions deliver a naturally occurring continuous extended focal range
- **Femtosecond laser used to ensure centration of 2.2mm central zone of Vivity.**

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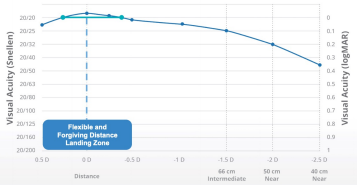
Vivity

13

OUTSTANDING OVERALL PERFORMANCE:
DESIGNED TO PROVIDE A CONTINUOUS EXTENDED RANGE OF VISION

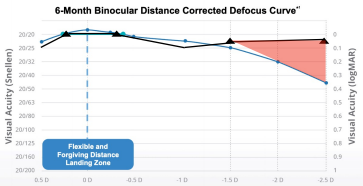
6-Month Binocular Distance Corrected Defocus Curve[11]



14

OUTSTANDING OVERALL PERFORMANCE:
DESIGNED TO PROVIDE A CONTINUOUS EXTENDED RANGE OF VISION

6-Month Binocular Distance Corrected Defocus Curve[11]



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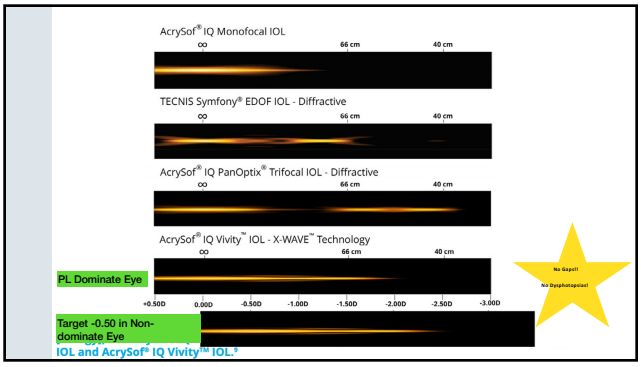
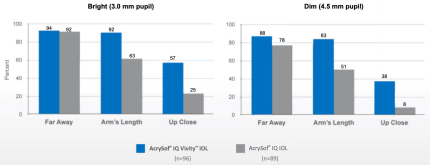


16

VISUAL QUALITY WITHOUT SPECTACLES:
ENHANCED PERFORMANCE IN BRIGHT AND DIM LIGHT[1]

Percent of Patients Reporting Good or Very Good Vision
Without Spectacles at 6 Months in Validated IOLSAT Questionnaire™



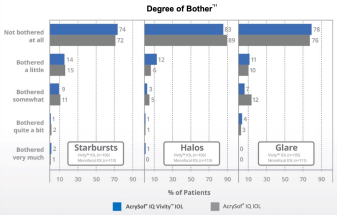
17

PATIENT-REPORTED VISUAL DISTURBANCES:
LOW LEVELS OF BOTHER SIMILAR TO MONOFOCAL[1]

Degree of Bother[21]

Validated QUVID Questionnaire:
"In the past 7 days, how much were you bothered with starbursts, halos, and glare?"

Percent of patients bothered very much[1]:
- 2% by starbursts
- 1% by halos
- 0% by glare



18

Vivity vs. PanOptix
How I Determine Which Lens to Chose for your Patients

Vivity More natural vision	• Natural EDOF of a 45-year-old with no side effects • 100% light energy to distance which is then "stretched" to give up to -1.50D depth-of-focus • Advise patients should be able to read newspaper print at 20 inches without glasses
PanOptix More functional vision	• Distance, middle and near without glasses, willing to tolerate segmented vision • Light energy distributed as follows • 50% Distance, 25% Intermediate, 25% near • Minimal dysphotopsias (halos)

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Case Studies
Basic Use of Vivity Lens with Femtosecond Laser

- T.E., 65 y.o.
- Vivity 1-month post-op
- Surgery dates: 12/22/20 OD and 12/29/20 OS
- SC VA: 20/25+2 OD, OS at distance, 20/20 OU at a little greater than 20 in (about 22in)

AR: -1.00 +0.75 x 065
-1.25 +0.50 x 123

Refraction: Plano +0.50 x 055 20/20
Plano +0.50 x 135 20/20
20/20 at near

Overall, he was REALLY HAPPY with the lenses. Works on a computer all day for work without problems. Reads his phone/newspaper without readers. Notices he has to extend his arm out but not bothered by it.

- D.C. , 76 y.o.
- OD: Vivity Toric, OS: Vivity.
- UCVA distance 20/15 OU. Near 20/20- OU at 20 inches.

Using reading glasses for some small print inside 20 inches but OVERJOYED with results.

20

MONOVISION

21

Previous Attempts to Treat Monovison

Monovision

- Historically for decades
  - One eye distance vision (plano)
  - Other eye near vision (-2.00D)
- Neither eye has middle bucket vision

Past Attempts to give patients "middle bucket" vision

- Multifocal lenses
- Proved unsuccessful in several patients.
  - If a multifocal was used in the distance eye patients were disappointed with the quality of their distance vision and did not appreciate what they gained in middle bucket vision.
  - If used in near eye and targeted -1.00D, patients were disappointed in their quality of near vision and in certain cases (Symphony lens) they would develop a spiderweb dysphotopsia.

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Better Approach to Monovision

- Plan: Use a Vivity lens in distance eye
  - Patient has same quality of distance vision as with a monofocal lens
  - Patient has depth of focus of 1.5D giving them middle bucket vision
- The beauty of using Vivity in the distance eye for monovision patients, you are not taking anything away from the distance vision to give them middle vision.
- You're giving the patients something **EXTRA** they didn't have with traditional monovision.

23

Better Approach to Monovision

- Near Eye
  - Prefer Vivity (Target -1.50 D)
  - Gives a nice depth-of-focus to -3.00D
  - When combined with distance eye (Vivity) get great range of vision
  - If patient can not afford two Vivity lenses, use a monofocal lens for near eye (target -2.00D)

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Case Study - Monovision

- 63 yo -3.50 D refractive error in each eye, wears contact lens in OD for distance, wears contact lens in OS set -2.00 D. Occasionally goes without contact for near activity up close.
- Vivity in OD, set for distance
- Vivity in OS, set for -2.00 D (in the near eye she has from -2.00 D > -3.50 D)
- The left eye has the same -2.00D for near as with the contact lens plus a depth-of-focus to -3.50D similar to uncorrected visual acuity pre-op.

25

Case Study - Monovision

- 66 yo female
- Pre-op refraction
  - OD -3.00 + 1.00 x 180
  - OS -2.75 + 1.00 x 180
  - Wears Toric CLs in Monovision Fashion
    - OD Distance
    - OS Near
  - She likes her vision in left eye to be from 14" -> 18"
  - Plan:
    - OD Vivity Toric -> Distance with depth-of-focus to -1.50D
    - OS Vivity Toric -> Target -2.00D with depth-of-focus -3.50D

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Case Study - Monovision

- Dr. Thomas Cunningham 64 y.o. optometrist wears SCLs in monovision fashion
  - OD Distance, OS Near (-2.00D)
- Pre-Op
  - OD -7.50 + 2.50 x 21 20/40
  - OS -7.50 + 1.25 x 17 20/30
- Surgery
  - O.D. 1/22/2021 – Vivity Toric Lens with Femto target plano
  - O.S. 1/28/2021 – Vivity Lens with Femto target -2.00 D
- Results
  - Refraction date 2/09/2021
  - O.D. Pl -0.375x135 20/15
  - O.S. -2.00 sph 20/15
- With No Glasses
  - O.D. has VA 20/20 from distance to 21 inches (53 cm)
  - O.S. has near vision of 20/20 from 18 inches -> 9 inches (23 cm)

27

> *I am ecstatic and will restrain myself and not hug Dr. Ernest next time I see him. I would describe myself as very Type A about my vision and I have to work at many different ranges. I wore mono vision correction in the exam room and never achieved this quality of vision.*
>
> *-Thomas Cunningham, O.D.*

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Vivity Lens "In Reverse"

- Instead of setting Vivity Lens for:
  - Distance -> Middle -> Functional Near at 20"
- Reverse Process to:
  - Near -> Middle -> Functional Distance
  - Great for patients who spend vast majority of their day in middle and near vision
  - Great for low to moderate myopic patients who like to go without glasses most of their day except for distance activities

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Case Study – Vivity Lens "In Reverse"

- 67 yo female, myopic, 90% of her day is middle to near activities, only small part of her day she spends walking her dog, watching tv and a little bit of driving.
- Pre-Op Refraction Pre-Op K's
  - OD -4.25 – 2.50 x 105 OD 45.25 x 44.75
  - OS -5.50 - 1.25 x 95 OS 45.50 x 45.50
- Plan:
  - Use Vivity in each eye. Target -1.00D OU
  - Result will be range of vision from -1.00D -> -2.50D
  - Patient will be able to do all her middle -> near activities without glasses
  - Patient will be able to do many distance activities without glasses (tv, walking her dog)
  - Patient will need driving glasses only (no bifocals or trifocals)
  - Patient thrilled with her outcome

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Case Study – Vivity Lens "In Reverse"

- R.L. 61 yo
- Pre-op Refractive Error
  - OD -2.25 SE
  - OS -2.50 SE
  - Has diplopia distance vision – wears prism ½ BD OD. Takes glasses off for near vision with no diplopia.
- Plan:
  - Vivity both eyes. Target -1.50D OU.
  - Patient will wear distance glasses with prism
  - Patient will go without glasses for middle -> near vision

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Case Study – Vivity Lens "In Reverse"

- 38 yo OD -7.00D with 4 +NS, OS -3.00D with no cataract
- Vivity in OD, target -2.00D
- The two eyes will be relatively the same for reading.
- The depth-of-focus of his OD will be similar to his natural accommodation of his OS eye.
- He will need glasses for distance vision.

32

Case Study

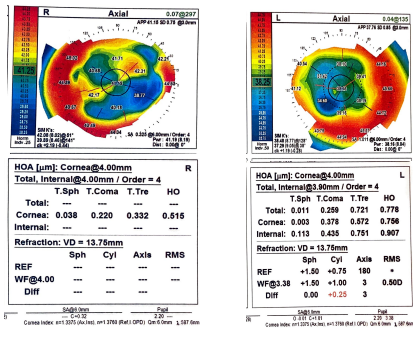
- 68 yo female -1.50 D OU, wears contact lens over OS for distance, leaves OD uncorrected for middle vision and wears +1.25 when she wants to read small print
- Vivity lens in distance eye, patients loves it
- Wanted Vivity lens in second eye
- Wears +1.25 for reading small print inside 20 inches

33

Case Study

- 61 yo female
- 4 RK OU
- Pre-Op Refractive Error
- OD +1.75 + 1.50 x 22 k's 39.25 x 41.00 x 49
- OS +3.75 + 1.25 x 156 k's 37.25 x 38.25 x 138

34



35

Cast Study Cont.

Plan

- OD Vivity toric 22.5 T4
- OS Vivty 25.0

Post-Op Refraction

- OD -0.25 + 0.50 x 164
- OS Plano + 0.75 x 129

36

Case Study – Mix and Match

- Dr. Rod Hathaway, 69 yo optometrist
- Pre-Op
  - OD -4.50 + 2.50 x 167
  - OS -4.00 + 0.25 x 95
- Surgery
  - 1/28/21 KPE OD 13.5 T3 PanOptix with Femto
  - 2/2/21 KPE OS 14.5 D PanOptix with Femto or 15 D Vivity with Femto target -0.50 giving mid to near vision
  - Patient elected to have Vivity and Femto in OS
- Final Post-Op Rx
  - OD Plano 20/20
  - OS -0.25 -0.25 x 105 20/20

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Case Study – Mix and Match

- Dr. Hathaway's opinion – Both eyes work well together
- Right eye (PanOptix)
  - Better quantitative vision at Near 16" / Mid Range 24" / and Distance
  - Some halos – not too bothersome
- Left Eye (Vivity)
  - Mid -> Near Vision
  - Natural Vision
  - Great Dept-of-Focus
  - No Glare / No Halos
  - Vivity Helps offset the glare from PanOptix O.D.

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PANOPTIX VS. VIVITY

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Patient Selection
Pre-op Discussion

- Using the bucket analogy, I determine relative hours spent in each bucket (distance, middle, and near)
- Get an idea of what activities your patient is most passionate about
- Ask the patient: Where is it most important for you to be spectacle free (near, distance)?
- Determine what is more important to the patient
  - Quantity of vision (spectacle independence)
  - Quality of vision (natural depth-of-focus)

40

Patient Selection
Ocular Examination

Clinical findings that favor Vivity over PanOptix

- Condition of the corneal surface (dry eyes)
- Fuch's Corneal Endothelial Dystrophy
- ERM
- Measure corneal coma (pre-existing HOA)
- Macular Drusen
- Previous LASIK
- Compare Patient's complaint, of glare relative to the nature and type of cataract. Does the cataract match the glare complaint?
- Patients with significant OCD personality that look for imperfections in one's vision.

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Patient Selection

- Vivity is a monofocal lens with an EDOF
- Anywhere you would use a monofocal IOL you could use Vivity
- Exceptions are patients with poor visual prognosis due to severe ARMD, Advanced Glaucoma, and ION

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"The Hassle Factor"

- Surgeon and optometrists are preferring Vivity to PanOptix due to lack of complaints from patients about their vision.
- Expectations are also predictable, patients aware of need for low power readers post-op for print smaller than that of a newspaper or inside 20 inches.

43

Pseudo Accommodating Myopic Shift

- Patients end up with a MR more Myopic than all calculations would indicate
- Example:
  - 66yo female
  - IOL calculation for emmetropia is 17.00 D
  - Used 16.50 D target plano -> +0.50 D
  - 1 week post op -0.25D sphere
  - 2-3 weeks post-op -0.75D sphere

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Summary

- PanOptix and Vivity are two wonderful presbyopia correcting lenses
- Vivity gives more natural vision and PanOptix gives more functional vision (quality vs. quantity)
- Vivity allows one to customize a patient's vision and to use in special circumstances (Monovision and Vivity "In Reverse").
- Vivity works best at refractive error of -0.25D -> +0.25D
- PanOptix works best at refractive error of +0.25D

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QUESTIONS

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