

Refractive Enhancement After Presbyopia-Correcting IOLs

Residual Refractive Error, Bioptics & Secondary Surgical Strategies

01 / PLATFORM-SPECIFIC OBSERVATIONS • UNEQUAL EVIDENCE • NO POOLED RISK

Enhancement After Presbyopia-Correcting IOLs — What Do We Know?

FineVision

LASER ENHANCEMENT EVIDENCE

Barakova 2022 [3] • Micro F

61/1,129 eyes • 5.4%

Cataract / RLE • laser • variable follow-up

Ito 2026 [24] • FineVision family*

89/1,477 eyes • 6.0%

Cataract / clear lensectomy • LASIK

175-1,540 days to enhancement

PanOptix family

ALCON • MODELS KEPT SEPARATE

PanOptix Toric • RLE [1]

1.1% at 3 mo / 7.6% at 12 mo

Reported laser rates; 4,933-eye RLE cohort.

Time-specific risk denominators remain uncertain.

TFNT00 [2]: no laser-incidence estimate.

Clareon PanOptix Pro [23,27]: insufficient comparable incidence evidence.

TECNIS family

JOHNSON & JOHNSON • DISTINCT OPTICS

Symfony ZXR00 / ZXT [16]

5/96 patients • 5.2%

Cataract • laser touch-up • 4-6 months

Completers; combined non-toric / toric cohort. Enhanced eye count not stated.

Odyssey [27]: insufficient comparable incidence evidence; no Symfony transfer.

Non-diffractive EDOF

VIVITY / PURESEE • EVIDENCE GAP

Insufficient comparable incidence evidence

AcrySof Vivity / TECNIS PureSee [28]: enhancement and exchange patients excluded. Clareon Vivity is a distinct material platform; no rate transferred.

Mixed-platform cohort

BROADER CLINICAL CONTEXT • [4]

47/552 eyes • 8.5%

RLE / CLE • TransPRK • variable window

Planned + unplanned not separable. Mixed optical categories; no per-model implantation denominators. Not a pure PCIOL incidence estimate.

Historical RLE cohort

BROADER CLINICAL CONTEXT • [25]

5,810/35,206 eyes • 16.5%

RLE • excimer laser • 2013-2019 implants

Enhancement timing / planned status unclear. Not a standardized 3-month risk or single-model estimate.

*Ito: exact models not fully specified. FineVision HP [26] has no comparable enhancement estimate. No cohorts pooled.

Different windows, populations, units and endpoints prevent a universal risk or defensible cross-platform range. Details: p. 9.

Diagnose Before Treating

A refractive miss is actionable only when correction improves the symptom that matters. [9,14,17,24]

02 / COMPLAINT → REPRODUCIBLE FINDING → FUNCTIONAL TRIAL

Clarify distance, near, night vision and binocular goals

Measure the refractive contribution

Manifest refraction; cycloplegia when indicated.
Repeat inconsistent findings; check subjective far focus in trifocal optics.
Trial correction at distance, intermediate and near.
Tear film; topography / tomography; epithelium where relevant.

TRIAL BENEFIT ≠ AUTOMATIC EMETROPIC TARGET

Find competing causes

Macular OCT when indicated; fellow-eye refraction.
PCO; IOL axis, centration, tilt and stability.
Capsular contraction; zonules; postoperative inflammation.
Dysphotopsia, optical intolerance and neuroadaptation.

DO NOT ATTRIBUTE ALL DISSATISFACTION TO REFRACTION

Does useful trial benefit persist after optimization?

Refractive

Stable findings + useful benefit.
Apply the first-strategy pathway (p. 3).

Mixed

Treat surface / retina / capsule drivers.
Repeat refraction and trial correction.

Non-refractive

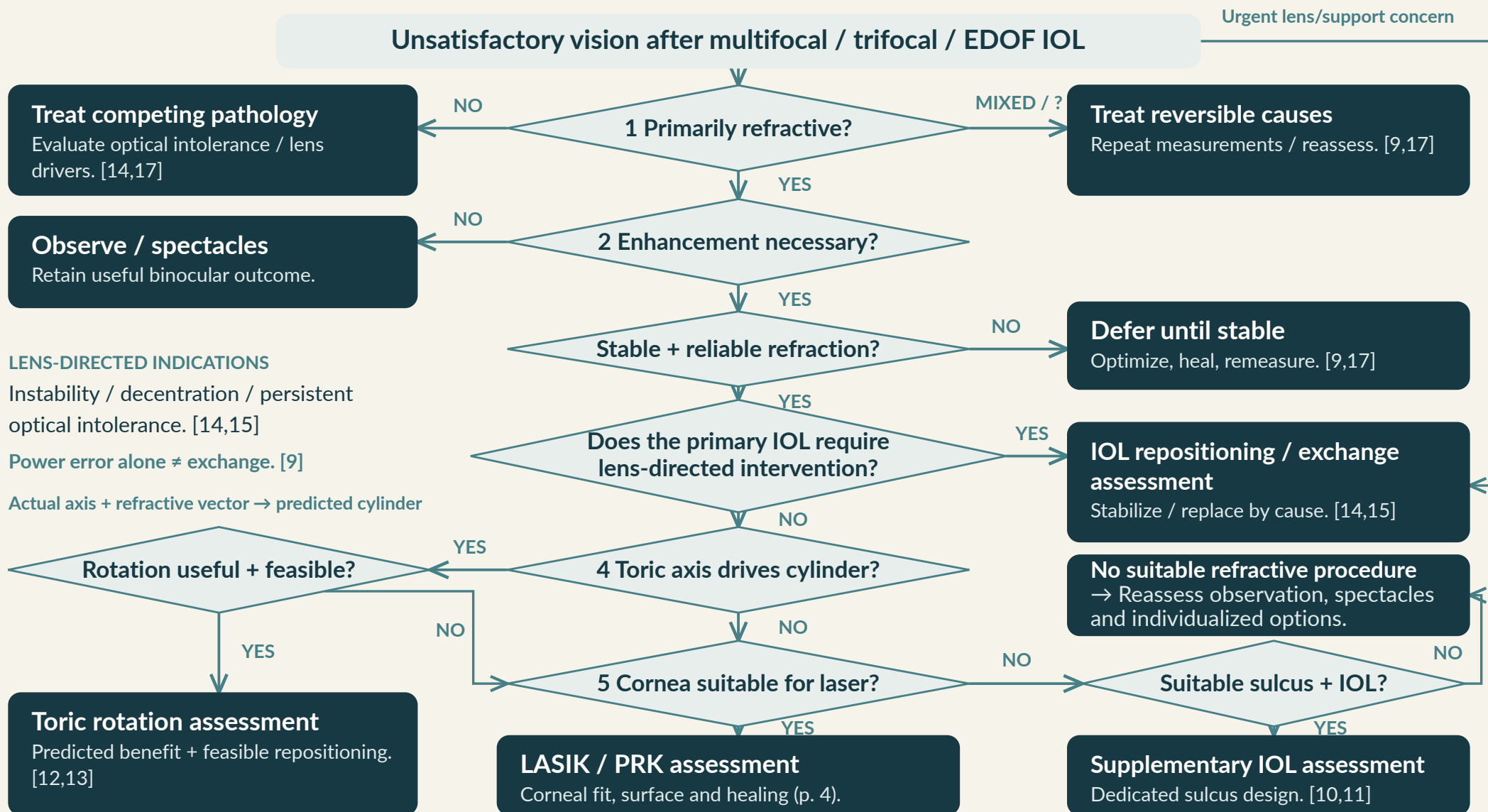
Manage the cause or optical intolerance.
Do not ablate unexplained complaints.

Before Nd:YAG: preserve exchange options when lens replacement remains plausible. [14,15]

Clinical Enhancement Decision Tree

Multifocal / trifocal / EDOF IOLs. Diagnose the cause, confirm benefit, then select a suitable route.

03 / INDEPENDENT OIE PATHWAY • NOT AN EXTERNALLY VALIDATED ALGORITHM



LASIK or PRK?

Choose the treatment that fits the cornea and healing profile, not a universal procedure ranking. [3-6,9,21,22,24]

04 / CORNEAL ELIGIBILITY COMES BEFORE FLAP VERSUS SURFACE

Abnormal / unstable tomography, inadequate tissue reserve or active surface disease? Defer laser and reassess.

Laser remains suitable

Assess LASIK first when...

CLINICAL FIT

Rapid recovery priority; flap acceptable; stable tomography; adequate stromal reserve.

RECONSIDER

Dry eye; late flap relift / epithelial ingrowth; interface risk; uncertain prior flap / tissue history.

Assess PRK first when...

CLINICAL FIT

Flap undesirable; eligible cornea; tissue budget / epithelial healing acceptable.

RECONSIDER

Healing risk, discomfort / slower recovery, haze. Ectasia-risk corneas remain unsuitable.

Previous corneal surgery

Prior LASIK / PRK: verify records, flap / ablation, tomography and reserve. Specific retreatment plan.

Ablation + optical quality

Hyperopic centration / zone; myopic tissue budget; regular cylinder. HOA / near trade-offs. No reliable cure for lens-driven halos.

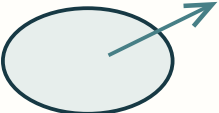
TransPRK

Epithelial-profile assumptions; selected mixed-optics series. Feasibility supported; superiority unproven. [4]

Intraocular Strategies: Correct the Lens-Related Cause

A satisfactory primary IOL can sometimes be retained; safety and predictability depend on anatomy. [10-15]

05 / CALCULATE BENEFIT → CHECK SUPPORT → CHOOSE THE LEAST DISRUPTIVE SUITABLE ROUTE

	PRIMARY PLAN	AVOID / RECONSIDER	BENEFIT / ALTERNATIVE
Toric rotation Axis-related cylinder 	Manifest refraction + measured axis + toric power → optimal axis / predicted cylinder.	Fibrosis; recurrent rotation; wrong toric power; little predicted gain.	Useful / feasible? Rotate. Otherwise laser / add-on. Capsular manipulation risk. [12,13]
Supplementary IOL Acceptable primary lens 	Dedicated sulcus design; spherical / toric power calculation. Primary position and iris clearance.	Crowded sulcus; iris / pigment / IOP risk; primary instability or intolerance.	Retains primary IOL; rotation / decentration / secondary surgery possible. Verify local availability / label. [10,11]
Reposition / exchange Optics / capsule / support 	Cause + replacement optics / target; capsule, zonules, fibrosis and prior YAG.	Open capsule / weak support: plan vitreous management and fixation. Refractive miss alone ≠ exchange.	Reposition / stabilize when adequate; exchange causative lens. Discuss spectacle trade-offs / surgical risk. [14,15]

Small regular cylinder: arcuate incisions may be considered; limited sphere correction and variable nomogram response. [9]

Clinical Cases I: Small Errors, Different Decisions

Fictional educational scenarios; illustrative clinical judgment, not measured treatment outcomes.

06 / PATIENT → CLINICAL FINDING → PREFERRED FIRST CONSIDERATION

CASE 1

Low hyperopia after trifocal IOL

+0.50 D

TRIFOCAL IOL

Stable refraction; laser-eligible cornea;
meaningful functional trial benefit.



PREFERRED FIRST CONSIDERATION

Assess excimer enhancement

Alternative: Spectacles / observation; LASIK versus PRK by corneal fit.

What changes the decision? Symptoms, surface, reserve, healing. +0.50 D alone is not an indication.

CASE 2

Residual EDOF myopia: preserve useful function?

-0.75 D

EDOF IOL

Near / intermediate satisfactory; monocular
distance weaker.



PREFERRED FIRST CONSIDERATION

**Assess binocular goals; retain useful
mini-monovision if met**

Alternative: Distance spectacles; laser if distance gains outweigh near benefit.

What changes the decision? Fellow eye, binocular trial, near trade-off and patient priorities.

CASE 3

Residual cylinder after toric IOL

~1.00 D

TORIC PCIOR

Measured axis deviation; regular cornea;
reproducible refraction.



PREFERRED FIRST CONSIDERATION

**Evaluate vector-predicted rotation benefit
first**

Alternative: Laser / add-on if rotation will not resolve the relevant error.

What changes the decision? Actual axis, toric power, predicted cylinder, fibrosis and repeat rotation.

Case values are not universal intervention thresholds. Corresponding actions are connected in the tree on p. 3.

Clinical Cases II: When the Lens or Anatomy Leads

Fictional educational scenarios; illustrative clinical judgment, not measured treatment outcomes.

07 / PATIENT → CLINICAL FINDING → PREFERRED FIRST CONSIDERATION

CASE 4

+2.50 D

ACCEPTABLE IOL

Higher hyperopia; corneal laser unsuitable

Stable lens / refraction; acceptable primary optics; unsuitable cornea.



PREFERRED FIRST CONSIDERATION

Assess a dedicated supplementary sulcus IOL

Alternative: Compare with exchange according to anatomy, prediction and risk.

What changes the decision? Sulcus clearance, capsule, iris / IOP, calculation and local label.

CASE 5

Near plano

TRIFOCAL IOL

Severe photic symptoms; little refractive benefit

Halos / night-driving burden; little meaningful trial-correction benefit.



PREFERRED FIRST CONSIDERATION

Evaluate optical intolerance and competing causes

Alternative: Persistent, disabling lens-related symptoms after evaluation: discuss exchange.

What changes the decision? Surface, capsule, centration, OCT, adaptation. Preserve capsule options.

CASE 6

Unstable IOL

CAPSULE / ZONULES

Capsular contraction / pseudophacodonesis

Possible decentration; uncertain support; prior Nd:YAG may be present.



PREFERRED FIRST CONSIDERATION

Assess anatomy and IOL stability before touch-up

Alternative: Specialist stabilization / fixation or exchange; defer routine enhancement.

What changes the decision? Zonules, capsule, vitreous, retinal risk and urgency.

Case values are not universal intervention thresholds. Corresponding actions are connected in the tree on p. 3.

When Is the Eye Ready for Enhancement?

Clinical readiness determines elective timing; an urgent anatomical problem follows a different pathway. [9,13-17]

08 / STABILITY, HEALING AND GOALS – NOT ONE UNIVERSAL WAITING PERIOD

Refraction
Stable, reproducible subjective result

Cornea
Stable keratometry / tomography

Surface + inflammation
Optimized tear film; inflammation resolved

IOL + capsule
Position, capsule and zonules stable

Healing
Wound and tissue ready for the chosen procedure

Goals
Useful trial benefit; binocular / near target agreed

Toric rotation: balance stability against fibrosis. Lens complications may need earlier action. Reconsider premature Nd:YAG.

VERIFY FOUR OUTCOMES AFTER TREATMENT

Refraction
MRSE windows; cylinder; stability

Function
UDVA / CDVA; intermediate / near; binocular

Quality
Contrast; halos / glare; PROMs; HOA

Safety
Healing, IOP, rotation; CDVA loss; retreatment

ADJUSTABLE OPTICS / CURRENT LENSES VERSUS DEVELOPMENT [18-20]

Conventional LAL
Purpose-built implanted lens; adjustment + lock-in.

LAL+
Broader functional range; selection and targets matter.

Future adjustable PCIOL
Alcon–RxSight, 6 July 2026: development announcement.

Light cannot adjust an existing conventional multifocal / trifocal / EDOF IOL. Future optics are not established touch-up treatments.

Scientific Evidence: Incidence, Applicability and Uncertainty

Clinical evidence through 14 October 2026. Population, endpoint and follow-up determine applicability.

09 / WHY THERE IS NO UNIVERSAL AVERAGE – AND WHAT THE STUDIES CAN SUPPORT

INCIDENCE SYNTHESIS

Separate MRSE accuracy (± 0.25 / ± 0.50 / ± 1.00 D), cylinder, symptoms, unplanned treatment and planned bioptics. Require original cohort, unit, procedure, eligibility and event window.

No random-effects pooling or I^2 : no common risk window, planning definition or inter-eye covariance. FineVision any-retreatment [29]: 14/202 (6.9%), variable observation; not laser-only. Eye/patient units remain separate.

Fixed 3/6/12-month windows, unplanned enhancement only and consistent patient/eye units do not yield a compatible synthesis set. FineVision cohorts do not define a cross-platform risk or average.

TIME-SPECIFIC PANOPTIX TORIC REPORT [1]

3 months: 1.1% (95% CI 0.8-1.4%); 12 months: 7.6% (6.9-8.3%). 4,933 RLE eyes; median follow-up 3 months. Uncertain risk denominators and differing follow-up preclude pooled incidence.

PATIENT UNITS / SAMPLING UNCERTAINTY

Symphony [16]: 5/96 completers, 5.2% (OIE Wilson 95% CI 2.2-11.6%), 4-6 months. FineVision [24]: 59/843, 7.0% (5.5-8.9%), variable observation. Separate crude contexts; CIs do not correct selection or follow-up bias.

Micro F [3] laser: cataract 30/679 (4.4%); RLE 31/450 (6.9%).

ADDITIONAL CLINICAL EVIDENCE [24-28]

Ito [24]: retrospective FineVision family cohort; 89/1,477 eyes. Stable refraction / dissatisfaction; LASIK 175-1,540 days postimplant. Exact models unspecified. ± 0.50 D results conflict: 80.9% / 93.8% (abstract/body); no single accuracy estimate adopted.

Brenner [25]: retrospective RLE; 5,810/35,206 eyes (16.5%). Timing / planning unclear; no 3-month risk. FineVision HP [26]: RLE accuracy, not incidence. Odyssey/Pro [27]: early outcomes. Vivity/PureSee [28]: enhancement/exchange patients excluded.

PROCEDURE OUTCOMES ARE STUDY-SPECIFIC

Historical laser [5]: 782 selected eyes, 98.7% refractive multifocal; 90.4% within ± 0.50 D, 99.5% within ± 1.00 D; mean 6.3 ± 4.4 months. Mild DLK 33/713 LASIK; mild haze 2/69 PRK. Not modern head-to-head evidence.

TransPRK [4]: 43 analysed eyes, 3 months; 91% / 100% within 0.50 / 1.00 D. Two preplanned eyes in the analysed subset; abstract/method patient counts conflict. Mixed models include ZCT; no pure unplanned PCIOL risk.

CONFIDENCE IN THE CLINICAL PATHWAY

Laser / rotation / add-on / lens procedures: observational support; comparative certainty low. Diagnostic and stability branches: guidance plus OIE judgment. Ordering and cases are not trial-validated. ESCRS [17] supports assessment, not this algorithm.

Study-level definitions and limitations are retained in the evidence workbook. No formal GRADE rating or pooled incidence.

Scientific References I

Original-source attribution; numbered citations remain consistent with V1.0.

10 / COMPLETE REFERENCES · PRIMARY DATA, GUIDANCE AND TECHNOLOGY SOURCES

- [1] Wallerstein A, et al. Toric Trifocal Intraocular Lens for Refractive Lens Exchange: A Multi-center, Multi-surgeon Large Cohort Study. *J Refract Surg.* 2023;39(5):302-310. doi:10.3928/1081597X-20230308-01.
- [2] Kohnen T, et al. Clinical Outcomes After Bilateral Implantation of a Diffractive Trifocal Intraocular Lens: A Worldwide Pooled Analysis of Prospective Clinical Investigations. *Clin Ophthalmol.* 2023;17:155-163. doi:10.2147/OPTH.S377234.
- [3] Barakova D, Jordanovova D, Sramka M, Kaluzakova A, Sajdikova M. The incidence and results of laser enhancement after cataract and refractive surgery with trifocal lens implantation. *Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub.* 2022;166(2):222-227. doi:10.5507/bp.2021.010.
- [4] de Ortueta D. Transepithelial Photorefractive Keratectomy after a Clear Lens Exchange. *Vision (Basel).* 2021;5(1):8. doi:10.3390/vision5010008.
- [5] Schallhorn SC, et al. Outcomes of excimer laser enhancements in pseudophakic patients with multifocal intraocular lens. *Clin Ophthalmol.* 2016;10:765-776. doi:10.2147/OPTH.S106731.
- [6] Rohlf D, La Nasa A, Terveen D, Shafer B, Thompson V, Berdahl J. Outcomes of LASIK vs PRK enhancement in eyes with prior cataract surgery. *J Cataract Refract Surg.* 2023;49(1):62-68. doi:10.1097/j.jcrs.0000000000001028.
- [7] von Beckerath AK, Katz T, Harfst A, Druchkiv V, Frings A. Diffractive trifocal lens implantation with or without excimer laser enhancement: is a touch-up procedure a negative predictor for refractive and subjective outcome? *Graefes Arch Clin Exp Ophthalmol.* 2020;258:1115-1121. doi:10.1007/s00417-020-04628-5.
- [8] Alorainy J, et al. Visual and Safety Outcomes of Refractive Correction Procedures Following Lens Removal for Residual Refractive Error: A Systematic Review and Meta-analysis. *J Refract Surg.* 2025;41(1):e73-e87. doi:10.3928/1081597X-20241113-03.
- [9] Sales CS, Manche EE. Managing residual refractive error after cataract surgery. *J Cataract Refract Surg.* 2015;41(6):1289-1299. doi:10.1016/j.jcrs.2015.05.001.
- [10] Rocha-de-Lossada C, et al. Supplemental Toric Intraocular Lenses in the Ciliary Sulcus for Correction of Residual Refractive Astigmatism: A Review. *Ophthalmol Ther.* 2023;12:1813-1826. doi:10.1007/s40123-023-00721-0.
- [11] Gundersen KG, Potvin R. Refractive and Visual Outcomes After Implantation of a Secondary Toric Sulcus Intraocular Lenses. *Clin Ophthalmol.* 2020;14:1337-1342. doi:10.2147/OPTH.S255725.
- [12] Hu EH. Repositioning Rates of Toric IOLs Implanted in Cataract Surgery Patients: A Retrospective Chart Review. *Clin Ophthalmol.* 2023;17:4001-4007. doi:10.2147/OPTH.S441524.
- [13] Ma D, et al. Optimal Timing of Repositioning Surgery for a Plate-Haptic Toric Intraocular Lens: A Multicenter Retrospective Study. *J Refract Surg.* 2023;39(2):120-126. doi:10.3928/1081597X-20221221-02.
- [14] Woodward MA, Randleman JB, Stulting RD. Dissatisfaction after multifocal intraocular lens implantation. *J Cataract Refract Surg.* 2009;35(6):992-997. doi:10.1016/j.jcrs.2009.01.031.
- [15] Kaiser KP, Jandewerth T, Davidova P, Kohnen T. Surgical implications in intraocular lens exchange with an open posterior capsule: a retrospective case series and review of the literature. *J Cataract Refract Surg.* 2025;51(4):314-322. doi:10.1097/j.jcrs.0000000000001604.

Scientific References II

Original-source attribution; numbered citations remain consistent with V1.0.

11 / COMPLETE REFERENCES · PRIMARY DATA, GUIDANCE AND TECHNOLOGY SOURCES

- [16] Choi M, et al. Visual Outcomes after Bilateral Implantation of an Extended Depth of Focus Intraocular Lens: A Multicenter Study. *Korean J Ophthalmol.* 2020;34(6):439-445. doi:10.3341/kjo.2020.0042.
- [17] European Society of Cataract and Refractive Surgeons. Recommendations for Cataract Surgery. Extended guidance, sections 4.2.1, 4.2.7-8, 4.3.3-4. Accessed 14 Oct 2026.
- [18] Alcon and RxSight. Alcon and RxSight Announce Collaboration to Develop Adjustable PCIOs. Company announcement. 6 July 2026. Accessed 14 Oct 2026.
- [19] RxSight. Light Adjustable Lens and Light Delivery Device: indications and important safety information. Professional product information. Accessed 14 Oct 2026.
- [20] Doane J, et al. Clinical data registry comparing outcomes of two light adjustable lenses. *J Cataract Refract Surg.* 2025;51(11):948-954. doi:10.1097/j.jcrs.0000000000001721.
- [21] Mayordomo-Cerda F, et al. Laser corneal enhancement after trifocal intraocular lens implantation in eyes that previously had photoablative corneal refractive surgery. *J Cataract Refract Surg.* 2022;48(7):790-798. doi:10.1097/j.jcrs.0000000000000847.
- [22] Fan YY, Sun CC, Chen HC, Ma DH. Photorefractive keratectomy for correcting residual refractive error following cataract surgery with premium intraocular lens implantation. *Taiwan J Ophthalmol.* 2018;8(3):149-158. doi:10.4103/tjo.tjo_51_18.
- [23] ClinicalTrials.gov. Clareon PanOptix Pro vs. Clareon PanOptix - Study A. NCT06400745. Trial registry. Accessed 14 Oct 2026.
- [24] Ito M, Watabe M, Obikane K, Yamamoto T, Yukawa S. Precision refraction methodology for LASIK enhancement after trifocal intraocular lens implantation: clinical outcomes and technique. *J Cataract Refract Surg.* 2026;52(1):52-60. doi:10.1097/j.jcrs.0000000000001765.
- [25] Brenner LF, Nistad K, Schonbeck U. Rethinking presbyopia: results of bilateral refractive lens exchange with trifocal intraocular lenses in 17 603 patients. *Br J Ophthalmol.* 2023;107(7):912-919. doi:10.1136/bjophthalmol-2021-319732.
- [26] Bosc C, Le Malefan E, Boury P, Bernier M. Bilateral Refractive Lens Exchange with a Hydrophobic Trifocal Intraocular Lens. *Clin Ophthalmol.* 2026;20:633749. doi:10.2147/OPTH.S633749.
- [27] Alomar ZO, et al. A Comparative Study of the Visual Outcomes of Two Common Diffractive Trifocal Intraocular Lenses in a Matched Cohort. *Cureus.* 2026;18(8):e114447. doi:10.7759/cureus.114447.
- [28] Koh K, Tuuminen R, Na DG, Jeon S. Patient-reported outcome measures after non-diffractive extended range of field IOL implantation: PureSee versus Vivify. *Acta Ophthalmol.* 2026;104(6):649-655. doi:10.1111/aos.70076.
- [29] Gundersen KG, Makari S, Ostenstad S, Potvin R. Retreatments after multifocal intraocular lens implantation: an analysis. *Clin Ophthalmol.* 2016;10:365-371. doi:10.2147/OPTH.S100840.
- [30] Fernandez-Buenaga R, et al. Resolving refractive error after cataract surgery: IOL exchange, piggyback lens, or LASIK. *J Refract Surg.* 2013;29(10):676-683. doi:10.3928/1081597X-20130826-01.

Independent OIE clinical framework; no society / manufacturer endorsement. Funding: This publication received no external funding.

Conflicts of Interest: The author declares no relevant financial conflicts of interest related to this publication.

Editorial Independence: This review was independently prepared by Ophthalmic Intelligence Europe. No IOL manufacturer was involved in the selection, interpretation, preparation or approval of its content.