



SMILE® Clinical Compendium

Peer-reviewed journal articles



Seeing beyond

Contents

SMILE technology **4**

Overview
Incorporating SMILE into practice
SMILE in the USA

Clinical advantages of SMILE **6**

Corneal sensitivity and dry eye
Nerve fibre regeneration
Corneal biomechanical stability
Higher order aberrations

Patient's experience or satisfaction **10**

Visual outcomes **11**

Low, moderate, high myopia and myopic astigmatism
Monovision
Learning curve and visual outcomes
Follow up <3 years
Follow up >3 years
Visual recovery and quality
Comparison with surface ablation
Comparison with LASIK
Comparison with Flex
Comparison with ICL

Treatment parameters **18**

Cap thickness
Lenticule depth
Minimum thickness
Optical zone
Incision size
Nomogram
Cap-lenticule diameter difference
Energy setting

Surgical technique **21**

Tips & pearls in SMILE technique
Centration
Manual cyclotorsion compensation technique
Pocket irrigation
Cap repositioning
Surgical instrument
Alternative surgical techniques
Alternative surgical instrument

SMILE enhancement **24**

Risks & safety **25**

Overview
SMILE and keratectasia
Suction loss
Intraoperative black areas
Diffuse lamellar keratitis
Interface fluid syndrome
Delayed / residual lenticule removal
Transient light sensitivity syndrome

Visual or safety related investigations **28**

VisuMax laser cut quality and accuracy
Centration accuracy
Opaque bubble layer
Changes to corneal curvature and power
Wound healing / inflammatory response
Effect on endothelial cells
SMILE & corneal opacity
Percentage tissue altered
Corneal epithelium
Intraocular pressure
Corneal densitometry
Intraocular scattering
Accommodation

Experimental applications **33**

SMILE lenticule re-implantation / transplantation
SMILE with collagen cross-linking
SMILE with keratoplasty / keratotomy
SMILE on flap

Future development **37**

Hyperopia correction

Patient's examination or selection **38**

Overview
Keratoconus
Corneal epithelium
Dry eye assessment
Cycloplegia
Contrast sensitivity
Corneal properties

SMILE technology

“Using the straight-out-of-the-box algorithm for SMILE, without nomogram adjustments, investigators in the clinical trial achieved outcomes comparable to those achieved with excimer laser technology with the benefit of 23 years of optimization.”

Doane JF, Cataract Refractive Surgery Today 2018 Nov

“After a detailed review of the technique itself, we then focus on the scientific evidence for the safety and efficacy of SMILE and its current indications. Advantages of SMILE will be discussed in comparison to the conventional techniques, particularly concerning dry eye and the risk of corneal ectasia related to LASIK. Lastly, the current limitations of SMILE (indications, retreatment) are discussed, and future applications are considered regarding new improvements in the technique.”

Chiche A et al, Journal Francais d'Ophthalmologie 2018 Jun

“Overall, this procedure has proved to be promising, delivering equivalent, or better visual and refractive results to LASIK and providing clear advantage in terms of being a flapless, minimally invasive procedure with minimal pain and postoperative discomfort thus offering high patient satisfaction.”

Ganesh S et al, Indian Journal of Ophthalmology 2018 Jan

Overview

Practice pearls for ReLEx SMILE in 2018. [Full text](#)
European Ophthalmic Review 2018 Aug, Reinstein DZ

SMILE (Small Incision Lenticule Extraction) among the corneal refractive surgeries in 2018.

[Abstract](#)

Journal Francais d'Ophthalmologie 2018 Jun, Chiche A, Trinh L, Baudouin C, Denoyer A

Refractive lenticule extraction SMILE: a new refractive surgery paradigm. [Full text](#)

Indian Journal of Ophthalmology 2018 Jan, Ganesh S, Brar S, Arra RR

Historical overview of the clinical development of the small incision lenticule extraction surgery (SMILE). [Article in German] [Abstract](#)

Klinische Monatsblätter für Augenheilkunde 2017 Feb, Blum M, Kunert KS, Sekundo W

Refractive lenticule extraction (ReLEx) through a small incision (SMILE) for correction of myopia and myopic astigmatism: current perspectives.

[Full text](#)

Clinical Ophthalmology 2016 Oct, Ağca A, Demirok A, Yıldırım Y, Demircan A, Yaşa D, Yeşilkaya C, Perente I, Taşkapılı M

Femtosecond laser refractive surgery: small incision lenticule extraction vs. femtosecond laser-assisted LASIK. [Abstract](#)

Current Opinion in Ophthalmology 2015 Jul, Lee JK, Chuck RS, Park CY

Small incision lenticule extraction (SMILE) in 2015. [Full text](#)

Cornea 2015 Apr, Reinstein DZ

Advances in refractive surgery. [Full text](#)

Asia-Pacific Journal of Ophthalmology 2015 Mar, Mysore N and Krueger R

Small incision lenticule extraction. [Abstract](#)

Journal of Cataract & Refractive Surgery 2015 Mar, Moshirfar M, McCaughey MV, Reinstein DZ, Shah R, Santiago-Caban L, Fenzl CR

Small incision lenticule extraction (SMILE) history, fundamentals of a new refractive surgery technique and clinical outcomes.

[Full text](#)

Eye and Vision 2014 Oct, Reinstein DZ, Archer TJ, Gobbe M

Incorporating SMILE into practice

Adopting new refractive technology. [Full text](#)

CRS Today 2018 Apr, Bafna S, Parkhurst GD, Piracha AR, Rebenitsch L, Visco DM

SMILE in the USA

Initial single-site surgical experience with SMILE: a comparison of results to FDA SMILE, and the earliest and latest generation of LASIK.

[Full text](#)

Ophthalmology and Therapy 2018 Dec, Moshirfar M, Murri MS, Shah TJ, Linn SH, Ronquillo Y, Birdsong OC, Hoopes Jr PC

That SMILE keeps growing. [Full text](#)

Cataract & Refractive Surgery Today 2018 Nov, Doane JF

What's behind that SMILE. [Full text](#)

Review of Ophthalmology 2018 Feb, Manche E (USA)

A refractive surgery to SMILE about. [Full text](#)

Ophthalmology Management 2017 Jun, Jon D, René L

Refractive surgeons look to SMILE into the new year. [Full text](#)

Ocular Surgery News U.S. Edition, 2017 Feb, Jackson MA

An update on SMILE - views from Europe and the United States. [Full text](#)

Cataract & Refractive Surgery Today 2016 Jul, Reinstein DZ, Slade SG

Clinical advantages of SMILE

"SMILE is a safe way to correct for myopia higher than -10 D, with PCEs remaining stable 2 years after surgery."

Zhou X et al, The British Journal of Ophthalmology 2019 Apr

"Small-incision lenticule extraction demonstrated that the induction of total HOAs was comparable to corneal wavefront-guided transepithelial PRK, accompanied by smaller spherical aberration induction and larger coma aberration induction. During small-incision lenticule extraction, surgeons should aim to obtain optimum centration for smaller induction of corneal HOAs."

Lee H et al, Journal of Cataract & Refractive Surgery 2018 Jun

"According to this meta-analysis, the SMILE procedure has fewer negative impacts on the ocular surface and corneal innervation than does FS-LASIK. Furthermore, SMILE shows superiority over FS-LASIK by exhibiting a lower risk of postoperative dry eye."

Kobashi H et al, Cornea 2017 Jan

Corneal sensitivity and dry eye

Influence of incision size on dry eye symptoms in the SMILE procedure. [Abstract](#)

Cornea 2019 Jan, Cetinkaya S, Gulmez M, Mestan E, Ucar F, Ali N

Dry eye evaluation and correlation analysis between tear film stability and corneal surface regularity after SMILE. [Abstract](#)

International Journal of Ophthalmology 2018 Dec, Zhang H, Wang Y

Tear meniscus evaluation after microkeratome LASIK, FS-LASIK and SMILE using AS-OCT.

[Full text](#)

Clinical Ophthalmology 2018 Jul, Shaaban YM, Badran TAF

Evaluation of femtosecond laser in flap and cap creation in corneal refractive surgery for myopia: a 3-year follow-up.

[Full text](#)

Clinical Ophthalmology 2018 May, Elmohamady MN, Abdelghaffar W, Daifalla A, Salem T

Dry eye and corneal sensitivity after SMILE and FS-LASIK: a meta-analysis. [Full text](#)

International Journal of Ophthalmology 2017 May, Cai W, Liu Q, Ren C, Wei Q, Liu J, Wang Q, Du Y, He M, Yu J

Dry eye after SMILE and femtosecond laser-assisted LASIK: meta-analysis. [Abstract](#)

Cornea 2017 Jan, Kobashi H, Kamiya K, Shimizu K

Corneal sensitivity after small incision lenticule extraction and laser in situ keratomileusis.

[Abstract](#)

Journal of Cataract & Refractive Surgery 2015 Aug, Reinstein DZ, Archer TJ, Gobbe M, Bartoli E

Dry eye disease after refractive surgery: comparative outcomes of small incision lenticule extraction versus LASIK. [Abstract](#)

Ophthalmology 2015 Apr, Denoyer A, Landman E, Trinh L, Faure JF, Auclin F, Baudouin C

Central corneal sensitivity after small incision lenticule extraction versus femtosecond laser-assisted LASIK for myopia: a meta-analysis of comparative studies. [Full text](#)

BioMed Central Ophthalmology 2015 Apr, He M, Huang W, Zhong X

Nerve fibre regeneration

Corneal re-innervation following refractive surgery treatments. [Full text](#)

Neural Regeneration Research 2019 Apr, Bandeira F, Yusoff NZ, Yam GH, Mehta JS

Regeneration of corneal nerve after SMILE, FS-LASIK and T-PRK surgery and study its relationship with subjective visual quality. [Abstract](#)

Zhonghua Yan Ke Za Zhi 2018 Oct, Wang LX, Li Y

Fellow eye comparison of nerve fiber regeneration after SMILE and femtosecond laser-assisted LASIK: a confocal microscopy study. [Abstract](#)

Journal of Refractive Surgery 2015 Sep, Agca A, Cankaya KI, Yilmaz I, Yildirim Y, Yasa D, Olcucu O, Demircan A, Demirok A, Yilmaz OF

Corneal regeneration after femtosecond laser small incision lenticule extraction: a prospective study. [Abstract](#)

Graefe's Archive for Clinical and Experimental Ophthalmology 2015 Jul, Liu M, Zhang T, Zhou Y, Sun Y, Wang D, Zheng H, Liu Q

Influence of femtosecond lenticule extraction and small incision lenticule extraction on corneal nerve density and ocular surface: a 1-year prospective, confocal, microscopic study. [Abstract](#)

Journal of Refractive Surgery 2015 Jan, Ishii R, Shimizu K, Igarashi A, Kobashi H, Kamiya K

Corneal biomechanical stability

Biomechanics of LASIK flap and SMILE cap: a prospective, clinical study. [Abstract](#)

Journal of Refractive Surgery 2019 May, Khamar P, Shetty R, Vaishnav R, Francis M, Nuijts RMMA, Sinha Roy A

Two-year observation of posterior corneal elevations after small-incision lenticule extraction (SMILE) for myopia higher than -10 dptres. [Abstract](#)

The British Journal of Ophthalmology 2019 Apr, Zhou X, Shang J, Qin B, Zhao Y, Zhou X

Comparison of corneal biomechanical changes after refractive surgery by noncontact tonometry: small-incision lenticule extraction versus flap-based refractive surgery – a systematic review. [Abstract](#)
Acta Ophthalmologica 2019 Mar, Raevdal P, Grauslund J, Vestergaard AH

Review of corneal biomechanical properties following LASIK and SMILE for myopia and myopic astigmatism. [Full text](#)
The Open Ophthalmology Journal 2018 Jul, Damgaard IB, Reffat M, Hjortdal J

Biomechanical properties of human cornea tested by two-dimensional extensometry ex vivo in fellow eyes: femtosecond laser-assisted LASIK versus SMILE. [Abstract](#)
Journal of Refractive Surgery 2018 Jun, Spiru B, Kling S, Hafezi F, Sekundo W

Corneal biomechanics after laser refractive surgery: unmasking differences between techniques. [Abstract](#)
Journal of Cataract & Refractive Surgery 2018 Mar, Fernández J, Rodríguez-Vallejo M, Martínez J, Tauste A, Piñero DP

Corneal biomechanical changes and tissue remodelling after SMILE and LASIK. [Full text](#)
Investigative Ophthalmology & Visual Science 2017 Nov, Shetty R, Francis M, Shroff R, Pahuja N, Khamar P, Girish M, Nuijts R, Roy AS

Contralateral eye comparison of SMILE and flap-based corneal refractive surgery: computational analysis of biomechanical impact. [Full text](#)
Journal of Refractive Surgery 2017 Jul, Seven I, Vahdati A, Pedersen IB, Vestergaard A, Hjortdal J, Roberts CJ, Dupps WJ Jr

New parameters for evaluating corneal biomechanics and IOP after SMILE by Scheimpflug-based dynamic tonometry. [Abstract](#)
Journal of Cataract & Refractive Surgery 2017 Jun, Fernández J, Rodríguez-Vallejo M, Martínez J, Tauste A, Salvestrini P, Piñero DP

Corneal biomechanics after small-incision lenticule extraction versus Q-value-guided femtosecond laser-assisted in situ keratomileusis. [Full text](#)
Journal of Current Ophthalmology 2016 Dec, Zhang J, Zheng L, Zhao X, Xu Y, Chen S

Comparison of biomechanical effects of SMILE and LASEK. [Abstract](#)
Acta Ophthalmologica 2016 Nov, Chen M, Yu M, Dai J

Corneal biomechanical changes in eyes with SMILE and LASIK. [Full text](#)
BioMed Central Ophthalmology 2016 Jul, Osman IM, Helaly HA, Abdalla M, Shousha MA

Comparison of corneal biomechanical characteristics after surface ablation refractive surgery and novel lamellar refractive surgery. [Abstract](#)
Cornea 2015 Nov, Dou R, Wang Y, Xu L, Wu D, Wu W, Li X

Comparison of biomechanical effects of small incision lenticule extraction and laser in situ keratomileusis: finite-element analysis. [Abstract](#)
Journal of Cataract & Refractive Surgery 2014 Jun, Sinha Roy A, Dupps WJ Jr, Roberts CJ

Higher order aberrations

Optical and visual quality after small-incision lenticule extraction. [Full text](#)
Journal of Cataract & Refractive Surgery 2019 Jan, Gyldenkerne A, Ivarsen A, Hjortdal J

Corneal HOA of the anterior surface, posterior surface, and total cornea after SMILE: high myopia versus mild to moderate myopia. [Full text](#)
BioMed Central Ophthalmology 2018 Nov, Jin HY, Wan T, Yu XN, Wu F, Yao K

Comparing corneal higher-order-aberrations in corneal wavefront-guided transepithelial photorefractive keratectomy versus small-incision lenticule extraction. [Full text](#)
Journal of Cataract & Refractive Surgery 2018 Jun, Lee H, Yong Kang DS, Reinstein DZ, Arba-Mosquera S, Kim EK, Seo KY, Kim TI

Corneal spherical aberration and corneal asphericity after SMILE and FS-LASIK. [Full text](#)
Journal of Ophthalmology 2017 Sep, Zhang H, Wang Y, Li H

Comparison of visual results and higher-order aberrations after SMILE: high myopia vs. mild to moderate myopia. [Full text](#)
BioMed Central Ophthalmology 2017 Jul, Jin HY, Wan T, Wu F, Yao K

Simulated night vision after small incision lenticule extraction. [Abstract](#)
Journal of Cataract & Refractive Surgery 2016 Aug, Ang M, Farook M, Htoon HM, Tan D, Mehta JS

Statistical characteristics of aberrations of human eyes after small incision lenticule extraction surgery and analysis of visual performance with individual eye model. [Abstract](#)
Applied Optics 2015 Sep, Lou Q, Wang Y, Wang Z, Liu Y, Zhang L, Fang H

Aberration compensation between anterior and posterior corneal surfaces after small incision lenticule extraction and Femtosecond Laser Assisted laser in-situ keratomileusis. [Abstract](#)
Ophthalmic & Physiological Optics 2015 Sep, Li X, Wang Y, Dou R

Comparison of corneal shape changes and aberrations induced by FS-LASIK and SMILE for myopia. [Abstract](#)
Journal of Refractive Surgery 2015 Apr, Gyldenkerne A, Ivarsen A, Hjortdal JØ

Postoperative ocular higher-order aberrations and contrast sensitivity: femtosecond lenticule extraction versus pseudo small incision lenticule extraction. [Abstract](#)
Journal of Cataract & Refractive Surgery 2015 Mar, Tan DK, Tay WT, Chan C, Tan DT, Mehta JS

Patient's experience or satisfaction

"All 3 modalities were effective for myopic astigmatism at the end of 1 year. Quality of vision and patient satisfaction with T-ICL and ReLEx SMILE were similar and better than FS-LASIK."

Ganesh S et al, Clinical Ophthalmology 2017 Jul

Uncorrected visual acuity, postoperative astigmatism, and dry eye symptoms are major determinants of patient satisfaction: a comparative, real-life study of femtosecond laser in situ keratomileusis and small incision lenticule extraction for myopia. [Full text](#)

Clinical Ophthalmology 2018 Sep, Pietilä J, Huhtala A, Mäkinen P, Nättinen J, Rajala T, Salmenhaara K, Uusitalo H

Intraoperative patient experience and postoperative visual quality after SMILE and LASIK in a randomized, paired-eye, controlled study. [Abstract](#)

Journal of Refractive Surgery 2018 Feb, Damgaard IB, Ang M, Farook MZ, Htoon HM, Mehta JS

Matched population comparison of visual outcomes and patient satisfaction between 3 modalities for the correction of low to moderate myopic astigmatism. [Full text](#)

Clinical Ophthalmology 2017 Jul, Ganesh S, Brar S, Pawar A

Visual Outcomes

"SMILE in mild-to-moderate myopia offers predictable correction of SE refractive error. Refractive results were stable at the long-term follow-up."

Ağca A at al, Journal of Cataract & Refractive Surgery 2019 Apr

"Almost 25% of the variation after small-incision lenticule extraction for myopic astigmatism might be explained by the size of the attempted cylinder correction and ATR/WTR astigmatism. Incorporating these parameters in preoperative planning might produce more consistent results in high cylinder corrections."

Ivarsen A at al, Journal of Cataract & Refractive Surgery 2018 Sep

"This is a review aimed to examine the current literature that describes and compares the corneal biomechanical properties after Laser Assisted In-situ Keratomileusis (LASIK) and Small Incision Lenticule Extraction (SMILE)."

Damgaard IB at al, The Open Ophthalmology Journal 2018 Jul

Low, moderate, high myopia and myopic astigmatism

Long-term (5 years) follow-up of small-incision lenticule extraction in mild-to-moderate myopia.

[Abstract](#)

Journal of Cataract & Refractive Surgery 2019 Apr, Ağca A, Tülü B, Yaşa D, Yıldırım Y, Yıldız BK, Demirok A

Correction of myopic astigmatism by small incision lenticule extraction: does laterality matter? [Abstract](#)

Lasers in Medical Science 2019 Mar, Yıldız BK, Urdem U, Goksel Ulas M, Yıldırım Y, Ağca A, Fazil K, Aygıt ED, Taskapili M, Demirok A

15-month visual outcomes and corneal power changes of SMILE in treating high myopia with maximum myopic meridian exceeding 10.00 D.

[Abstract](#)

Journal of Refractive Surgery 2019 Jan, Yang X, Liu F, Liu M, Liu Q, Weng S, Lin H

Influence of preoperative astigmatism type and magnitude on the effectiveness of SMILE correction. [Abstract](#)

Journal of Refractive Surgery 2019 Jan, Pérez-Izquierdo R, Rodríguez-Vallejo M, Matamoros A, Martínez J, Garzón N, Poyales F, Fernández J

Small-incision lenticule extraction in a patient with high astigmatism and nystagmus. [Abstract](#)

Journal of Cataract & Refractive Surgery 2019 Apr, Reinstein DZ, Vida RS, Archer TJ

Small-incision lenticule extraction for the correction of myopic astigmatism. [Full text](#)

Journal of Cataract & Refractive Surgery 2019 Jan, Taneri S, Kießler S, Rost A, Schultz T, Dick HB

Visual and refractive outcomes of SMILE in high myopia: 5-year results. [Full text](#)

Journal of Ophthalmology 2018 Oct, Ağca A, Aygün B, Yaşa D, Yıldırım Y, Yıldız B, and Demirok A

Correction of astigmatism with small-incision lenticule extraction: impact of against-the-rule and with-the-rule astigmatism. [Full text](#)
Journal of Cataract & Refractive Surgery 2018 Sep, Ivarsen A, Gyldenkerne A, Hjortdal J

Vector analysis of high ($\geq 3D$) astigmatism correction using SMILE and LASIK. [Abstract](#)
Journal of Cataract & Refractive Surgery 2018 Jul, Chan TCY, Wang Y, Ng ALK, Zhang J, Yu MCY, Jhanji V, Cheng GPM

Early visual outcomes and optical quality after femtosecond laser SMILE for myopia and myopic astigmatism correction of over -10 dioptres. [Abstract](#)
Acta Ophthalmologica 2018 May, Qin B, Li M, Chen X, Sekundo W, Zhou X

Visual and refractive outcomes of SMILE in mild, moderate, and high myopia: six-month results. [Abstract](#)
Journal of Cataract & Refractive Surgery 2017 Apr, Torky MA, Alzafiri YA

One-year outcomes of small incision lenticule extraction (SMILE): mild to moderate myopia vs. high myopia. [Abstract](#)
BioMed Central Ophthalmology 2015 Jun, Kim JR, Kim BK, Mun SJ, Chung YT, Kim HS

Anterior and posterior corneal astigmatism after refractive lenticule extraction for myopic astigmatism. [Full text](#)
Journal of Ophthalmology 2015 May, Kamiya K, Shimizu K, Mayumi Yamagishi, Igarashi A, and Kobashi H

SMILE: refractive lenticule extraction for myopic correction. [Abstract](#)
Journal Français D'Ophthalmologie 2015 Mar, Albou-Ganem C, Lavaud A, Amar R

Monovision

Retrospective observational study of micro-monovision small incision lenticule extraction (SMILE) for the correction of presbyopia and myopia. [Abstract](#)
Medicine (Baltimore) 2018 Dec, Kim JS, Ra H, Rho CR

Small incision lenticule extraction (SMILE) monovision for presbyopia correction. [Full text](#)
European Journal of Ophthalmology 2018 May, Luft N, Siedlecki J, Sekundo W, Wertheimer C, Kreutzer TC, Mayer WJ, Priglinger SG, Dirisamer M

Safety and satisfaction of myopic SMILE combined with monovision. [Full text](#)
BioMed Central Ophthalmology 2018 May, Fu D, Zeng L, Zhao J, Miao H, Yu Z, Zhou X

Learning curve and visual outcomes

Early clinical outcomes after SMILE. [Abstract](#)
Contact Lens & Anterior Eye 2018 Feb, Recchioni A, Hartwig A, Dermott J, Vaswani S, Bhatt J, Morris R, O'Donnell C

Effect of the learning curve on visual and refractive outcomes of SMILE. [Abstract](#)

Cornea 2017 Sep, Chan TCY, Ng ALK, Cheng GPM, Woo VCP, Zhang J, Wang Y, Jhanji V

Experience with introduction of SMILE: learning phase of our first 200 treatments. [article in German] [Abstract](#)

Klinische Monatsblätter für Augenheilkunde 2017 Jan, Taneri S, Kießler S, Rost A, Dick B

Follow up <3 years

Three-year outcomes of small incision lenticule extraction (SMILE) and femtosecond laser-assisted laser in situ keratomileusis (FS-LASIK) for myopia and myopic astigmatism. [Full text](#)

The British Journal of Ophthalmology 2019 Apr, Han T, Xu Y, Han X, Zeng L, Shang J, Chen X, Zhou X

A multicenter study on early outcomes of Small-Incision Lenticule Extraction for myopia. [Full text](#)

Scientific Reports 2019 Mar, Kamiya K, Takahashi M, Nakamura T, Kojima T, Toda I, Kariya M

Three-year results of small incision lenticule extraction and wavefront-guided femtosecond laser-assisted laser in situ keratomileusis for correction of high myopia and myopic astigmatism. [Full text](#)

International Journal of Ophthalmology 2018 Mar, Xia LK, Ma J, Liu HN, Shi C, Huang Q

Follow up >3 years

Five-year results of small incision lenticule extraction (SMILE) and femtosecond laser LASIK (FS-LASIK) for myopia. [Abstract](#)

Acta Ophthalmologica 2019 May, Li M, Li M, Chen Y, Miao H, Yang D, Ni K, Zhou X

Long-term (5 years) follow-up of small-incision lenticule extraction in mild-to-moderate myopia. [Abstract](#)

Journal of Cataract & Refractive Surgery 2019 Apr, Ağca A, Tülü B, Yaşa D, Yıldırım Y, Yıldız BK, Demirok A

Visual and refractive outcomes of small-incision lenticule extraction in high myopia: 5-year results. [Full text](#)

Journal of Ophthalmology 2018 Oct, Ağca A, Çakır İ, Aygün BT, Dilek Yaşa, Yıldırım Y, Yıldız BK, Demirok A

Visual outcomes 5 years after small incision lenticule extraction (SMILE), surgery on spherocylindrical myopia eyes, from 616 eyes. [Abstract](#)

Journal Francais d'Ophthalmologie 2018 May, Burazovitch J, Ferguene H, Naguszewski D

Five-year results of small incision lenticule extraction (ReLEx SMILE). [Abstract](#)

The British Journal of Ophthalmology 2016 Sep, Blum M, Täubig K, Gruhn C, Sekundo W, Kunert KS

Four-year observation of predictability and stability of SMILE. [Full text](#)

BioMed Central Ophthalmology 2016 Aug, Han T, Zheng K, Chen YJ, Gao Y, He L, Zhou X

Visual recovery and quality

SMILE with low energy levels: assessment of early visual and optical quality recovery. [Abstract](#)

Journal of Refractive Surgery 2019 May, Donate R, Thaëron R

Optical and visual quality after small-incision lenticule extraction. [Full text](#)

Journal of Cataract & Refractive Surgery 2019 Jan, Gyldenkerne A, Ivarsen A, Hjortdal J

Regeneration of corneal nerve after SMILE, FS-LASIK and T-PRK surgery and study its relationship with subjective visual quality.

[Abstract](#)

Zhonghua Yan Ke Za Zhi 2018 Oct, Wang LX, Li Y

Early recovery of quality of vision and optical performance after refractive surgery: small-incision lenticule extraction versus laser in situ keratomileusis. [Full text](#)

Journal of Cataract & Refractive Surgery 2018 Sep, Chiche A, Trinh L, Saada O, Faure JF, Auclin F, Baudouin C, Denoyer A

Interface healing and its correlation with visual recovery and quality of vision following SMILE.

[Full text](#)

Indian Journal of Ophthalmology 2018 Feb, Ganesh S, Brar S, Pandey R, Pawar A

SMILE for correction of myopia and myopic astigmatism: first 24-hour outcomes. [Full text](#)

Journal of Ophthalmology 2017 Jun, Liu TX, Dan T, and Luo Y

Corneal clarity and visual outcomes after SMILE and comparison to FS-LASIK. [Full text](#)

Journal of Ophthalmology 2017 Mar, Lazaridis A, Droutsas K, Sekundo W, Petrak M, and Schulze S

Comparison of the optical quality between SMILE and Femto-LASIK. [Full text](#)

Journal of Ophthalmology 2016 Nov, Jin Y, Wang Y, Xu LL, Zuo T, Li H, Dou R, Zhang JM

Comparison with surface ablation

Comparative study of wave-front aberration and corneal asphericity after SMILE and LASEK for myopia: a short and long term study. [Full text](#)

BMC Ophthalmology 2019 Mar, Yu M, Chen M, Liu W, Dai J

Comparing corneal HOAs in corneal wavefront-guided transepithelial PRK vs SMILE. [Abstract](#)

Journal of Cataract & Refractive Surgery 2018 Jun, Lee H, Yong Kang DS, Reinstein DZ, Arba-Mosquera S, Kim EK, Seo KY, Kim TI

Comparison of ReLEx SMILE and PRK in terms of visual and refractive outcomes for the correction of low myopia. [Abstract](#)

International Journal of Ophthalmology 2018 Jun, Ganesh S, Brar S, Patel U

Clinical outcomes of SMILE with a triple centration technique and corneal wavefront-guided trans-epithelial PRK in high astigmatism.

[Abstract](#)

Journal of Refractive Surgery 2018 Mar, Jun I, Kang DSY, Reinstein DZ, Arba-Mosquera S, Archer TJ, Seo KY, Kim TI

Visual outcomes after SMILE, LASEK, and LASEK combined with corneal collagen cross-linking for high myopic correction. [Abstract](#)

Cornea 2017 Apr, Hyun S, Lee S, Kim JH

Early outcomes after SMILE and PRK for correction of high myopia. [Full text](#)

Scientific Reports 2016 Sep, Chan CY, Yu CY, Ng A, Wang Z, Cheng PM, Jhanji V

Comparison with LASIK

Five-year results of small incision lenticule extraction (SMILE) and femtosecond laser LASIK (FS-LASIK) for myopia. [Abstract](#)

Acta Ophthalmologica 2019 May, Li M, Li M, Chen Y, Miao H, Yang D, Ni K, Zhou X

Visual and optical quality outcomes of SMILE and FS-LASIK for myopia in the very early phase after surgery. [Full text](#)

BMC Ophthalmology 2019 Apr, Liu T, Lu G, Chen K, Kan Q, Bai J

Three-year outcomes of small incision lenticule extraction (SMILE) and femtosecond laser-assisted laser in situ keratomileusis (FS-LASIK) for myopia and myopic astigmatism. [Full text](#)

The British Journal of Ophthalmology 2019 Apr, Han T, Xu Y, Han X, Zeng L, Shang J, Chen X, Zhou X

Quality of life after refractive surgery: ReLEx SMILE vs. Femto-LASIK. [Full text](#)

Clinical Ophthalmology 2019 Mar, Klokova OA, Sakhnov SN, Geydenrikh MS, Damashauskas RO

Effect of corneal curvature on optical zone decentration and its impact on astigmatism and higher-order aberrations in SMILE and LASIK.

[Abstract](#)

Graefes Archive for Clinical and Experimental Ophthalmology 2019 Jan, Chan TCY, Wan KH, Kang DSY, Tso THK, Cheng GPM, Wang Y

Comparison of changes in refractive error and corneal curvature following small-incision lenticule extraction and femtosecond laser-assisted in situ keratomileusis surgery.

[Full text](#)

Indian Journal of Ophthalmology 2018 Nov, Zhang YL, Cao LJ, Chen HW, Xu XH, Li ZN, Liu L

Comparison between Q-adjusted LASIK and small-incision lenticule extraction for correction of myopia and myopic astigmatism. [Abstract](#)

Eye & Contact Lens 2018 Nov, El-Mayah E, Anis M, Salem M, Pinero D, Hosny M

Comparison of effective optical zone after small-incision lenticule extraction and femtosecond laser-assisted in situ keratomileusis for myopia. [Abstract](#)
Journal of Cataract & Refractive Surgery 2018 Oct, Hou J, Wang Y, Lei Y, Zheng X

Early recovery of quality of vision and optical performance after refractive surgery: small-incision lenticule extraction versus laser in situ keratomileusis. [Full text](#)
Journal of Cataract & Refractive Surgery 2018 Sep, Chiche A, Trinh L, Saada O, Faure JF, Auclin F, Baudouin C, Denoyer A

Review of corneal biomechanical properties following LASIK and SMILE for myopia and myopic astigmatism. [Full text](#)
The Open Ophthalmology Journal 2018 Jul, Damgaard IB, Reffat M, Hjortdal J

Control-matched comparison of refractive and visual outcomes between SMILE and femtosecond laser-assisted LASIK. [Full text](#)
Clinical Ophthalmology 2018 May, Kataoka T, Nishida T, Murata A, Ito M, Isogai N, Horai R, Kojima T, Yoshida Y, Nakamura T

Three-year results of SMILE and wavefront-guided FS-LASIK for correction of high myopia and myopic astigmatism. [Full text](#)
International Journal of Ophthalmology 2018 Mar Xia LK, Ma J, Liu HN, Shi C, Huang Q

Two-years results of SMILE and wavefront-guided LASIK for myopia. [Abstract](#)
Acta Ophthalmologica 2018 Mar, Kobashi H, Kamiya K, Igarashi A, Takahashi M, Shimizu K

Clinical outcomes of SMILE versus FS LASIK for myopia: a meta-analysis. [Full text](#)
International Journal of Ophthalmology 2017 Sep, Yan H, Gong LY, Huang W, Peng YL

Vector analysis of astigmatic changes after SMILE and wavefront-guided LASIK. [Abstract](#)
Journal of Cataract & Refractive Surgery 2017 Jun, Khalifa MA, Ghoneim AM, Shaheen MS, Piñero DP

SMILE versus FS-LASIK for myopia: a systematic review and meta-analysis. [Full text](#)
PLoS ONE 2016 Jul, Shen Z, Shi K, Yu Y, Yu X, Lin Y, Yao K

Comparison of moderate to high astigmatism corrections using wavefront-guided LASIK and SMILE. [Abstract](#)
Cornea 2016 Apr, Zhang J, Wang Y, Chen X

Clinical outcomes of SMILE and FS-LASIK used to treat myopia: a meta-analysis. [Abstract](#)
Journal of Refractive Surgery 2016 Apr, Zhang Y, Shen Q, Jia Y, Zhou D, Zhou J

Comparison with Flex

Efficacy, safety, predictability, aberrations and corneal biomechanical parameters after SMILE and FLEx: meta-analysis. [Full text](#)

International Journal of Ophthalmology 2016 Jun, Ma J, Cao NJ, Xia LK

Comparison of astigmatic correction after femtosecond lenticule extraction and small incision lenticule extraction for myopic astigmatism. [Full text](#)

PLOS One 2015 Apr, Kobashi H, Kamiya K, Ali MA, Igarashi A, Elewa ME, Shimizu K

Comparison with ICL

ICL versus SMILE in management of anisometropic myopic amblyopia in children.

[Abstract](#)

Canadian Journal of Ophthalmology 2018 Dec, Eissa S, Badr Eldin N

Treatment parameters

“For high myopic corrections, a 160- μm cap caused less anterior curvature flattening and more posterior steepening than a 110- μm cap, and consequently less myopic correction. The inflation test revealed a reduction in the biomechanical strength after SMILE; this was similar when using a 110- or 160- μm cap thickness.”

Damgaard IB et al, Investigative Ophthalmology & Visual Science 2018 Apr

“The lower end of the energy studied was associated with a better postoperative UDVA in this population. The spot-track-distance of 4.5 μm with 125 nJ energy was the optimal combination within this range.”

Li L et al, Journal of Refractive Surgery 2018 Jan

Cap thickness

Contralateral eye comparison between 2 cap thicknesses in Small Incision Lenticule Extraction: 110 versus 130 μm . [Abstract](#)

Cornea 2019 May, Wu F, Yin H, Yang Y

Corneal cap thickness and its effect on visual acuity and corneal biomechanics in eyes undergoing SMILE. [Full text](#)

Journal of Ophthalmology 2018 Jun, Liu T, Yu T, Liu L, Chen K, Bai J

Refractive correction and biomechanical strength following SMILE with a 110- or 160- μm cap thickness, evaluated ex vivo by inflation test. [Full text](#)

Investigative Ophthalmology & Visual Science 2018 Apr, Damgaard IB, Ivarsen A, Hjortdal J

Evaluation of human corneal lenticule quality after SMILE with different cap thicknesses using scanning electron microscopy. [Abstract](#)

Cornea 2018 Jan, Weng S, Liu M, Yang X, Liu F, Zhou Y, Lin H, Liu Q

Comparison of 120- and 140- μm SMILE cap thickness results in eyes with thick corneas.

[Abstract](#)

Cornea 2016 Oct, Liu M, Zhou Y, Wu X, Ye T, Liu Q

SMILE procedures with four different cap thicknesses for the correction of myopia and myopic astigmatism. [Abstract](#)

Journal of Refractive Surgery 2015 Sep, Güell JL, Verdaguer P, Mateu-Figueras G, Elies D, Gris O, El Hussein MA, Manero F, Morral M

Lenticule depth

Contralateral eye comparison between femtosecond small-incision intrastromal lenticule extraction at depths of 100 and 160 μm . [Abstract](#)

Cornea 2015 Oct, El-Massry AA, Goweida MB, Shama Ael-S, Elkhawaga MH, Abdalla MF

Minimum thickness

Variation of lenticule thickness for SMILE in low myopia. [Abstract](#)

Journal of Refractive Surgery 2018 Jul, Siedlecki J, Luft N, Keidel L, Mayer WJ, Kreutzer T, Priglinger SG, Archer TJ, Reinstein DZ, Dirisamer M

Optical zone

Functional optical zone and centration following SMILE and LASIK: a prospective, randomized, contralateral eye study. [Abstract](#)

Journal of Refractive Surgery 2019 Apr, Damgaard IB, Ang M, Mahmoud AM, Farook M, Roberts CJ, Mehta JS

Comparison of effective optical zone after small-incision lenticule extraction and femtosecond laser-assisted in situ keratomileusis for myopia. [Abstract](#)

Journal of Cataract & Refractive Surgery 2018 Oct, Hou J, Wang Y, Lei Y, Zheng X

Functional optical zone after small-incision lenticule extraction as stratified by attempted correction and optical zone. [Abstract](#)

Cornea 2018 Sep, Fu D, Wang L, Zhou X, Yu Z

Corneal power distribution and functional optical zone following small incision lenticule extraction for myopia. [Abstract](#)

Journal of Refractive Surgery 2015 Aug, Qian Y, Huang J, Zhou X, Hanna RB

Incision size

Influence of incision size on dry eye symptoms in the SMILE procedure. [Abstract](#)

Cornea 2019 Jan, Cetinkaya S, Gulmez M, Mestan E, Ucar F, Ali N

Comparison of corneal biomechanics after microincision lenticule extraction (MILE) and SMILE. [Abstract](#)

The British Journal of Ophthalmology 2017 May, Wu Z, Wang Y, Zhang J, Chan TCY, Ng ALK, Cheng GPM, Jhanji V

Nomogram

Adjustment of spherical equivalent correction according to cap thickness for myopic SMILE. [Abstract](#)

Journal of Refractive Surgery 2019 Mar, Lee H, Kang D, Reinstein D, Roberts CJ, Ambrósio R, Archer T, Jean S, Kim E, Seo K, Jun I, Kim T

Influence of preoperative astigmatism type and magnitude on the effectiveness of SMILE correction. [Abstract](#)

Journal of Refractive Surgery 2019 Jan, Pérez-Izquierdo R, Rodríguez-Vallejo M, Matamoros A, Martínez J, Garzón N, Poyales F, Fernández J

Changes in astigmatism, densitometry, and aberrations after SMILE for low to high myopic astigmatism: a 12-month prospective study. [Abstract](#)

Journal of Refractive Surgery 2017 Jan, Pedersen IB, Ivarsen A, Hjortdal J

Vector analysis of low to moderate astigmatism with small incision lenticule extraction (SMILE): results of a 1-year follow-up. [Full text](#)

BioMed Central Ophthalmology 2015 Jan, Zhang J, Wang Y, Wu W, Xu L, Li X, Dou R

Cap-lenticule diameter difference

Effect of cap-lenticule diameter difference (CLDD) on the visual outcome and higher-order aberrations in SMILE: 0.4 mm versus 1.0 mm.

[Full text](#)

Journal of Ophthalmology 2017 Nov, Acar BT, Acar S

Energy setting

Energy setting and visual outcomes in SMILE: a retrospective cohort study. [Abstract](#)

Journal of Refractive Surgery 2018 Jan, Li L, Schallhorn JM, Ma J, Cui T, Wang Y

Effect of lowering laser energy on the surface roughness of human corneal lenticules in SMILE.

[Abstract](#)

Journal of Refractive Surgery 2017 Sep, Ji YW, Kim M, Kang DSY, Reinstein DZ, Archer TJ, Choi JY, Kim EK, Lee HK, Seo KY, Kim TI

Lower laser energy levels lead to better visual recovery after SMILE: prospective randomized clinical trial. [Abstract](#)

American Journal of Ophthalmology 2017 Jul, Ji YW, Kim M, Kang DSY, Reinstein DZ, Archer TJ, Choi JY, Kim EK, Lee HK, Seo KY, Kim TI

Three years follow-up study after SMILE using 500 kHz femtosecond laser in "fast mode".

[Abstract](#)

Klinische Monatsblätter für Augenheilkunde 2017 Feb, Messerschmidt-Roth A, Sekundo W, Lazaridis A, Schulze S

Effect of femtosecond laser setting on visual performance after small incision lenticule extraction for myopia. [Abstract](#)

The British Journal of Ophthalmology 2015 Oct, Kamiya K, Shimizu K, Igarashi A, Kobashi H

Surgical technique

“The presence of a clear and appropriate tear film in SMILE enhanced predictability, minimized variability, and ensured stability of refractive outcomes. An uncontrolled tear film might render cutting imprecise and trigger severe OBL formation. TFC-SMILE had more predictable results than DD-SMILE.”

Koh IH et al, Graefe’s Archive for Clinical and Experimental Ophthalmology 2018 Nov

“We herein review the patient selection for SMILE and various surgical techniques of SMILE with their pros and cons. With increasing surgeon experience, a standard technique is expected to evolve that may be performed in all types of cases with optimal outcomes and minimal adverse effects.”

Titiyal JS et al, Clinical Ophthalmology 2018 Sep

Tips & pearls in SMILE technique

Flushing versus not flushing the interface during SMILE. [Abstract](#)

Journal of Cataract and Refractive Surgery 2019 May, Kind R, Kiraly L, Taneri S, Troeber L, Wiltfang R, Bechmann M, Meyer B, Greene B, Sekundo W

Enhancement of refractive outcomes of small-incision lenticule extraction via tear-film control. [Abstract](#)

Graefe’s Archive for Clinical and Experimental Ophthalmology 2018 Nov, Koh IH, Seo KY, Park SB, Yang H, Kim I, Nam SM

Small incision lenticule extraction (SMILE) technique: patient selection and perspectives. [Full text](#)

Clinical Ophthalmology 2018 Sep, Titiyal JS, Kaur M, Shaikh F, Gagrani M, Brar AS, Rathi A

Practice pearls for ReLEx SMILE in 2018. [Full text](#)
European Ophthalmic Review 2018 Aug, Reinstein DZ

Five signs of unintended initial dissection of the posterior plane during SMILE. [Full text + video](#)

Journal of Refractive Surgery 2018 Jan, Zheng K, Xu Y, Han T, Han Y, Zhou X

Perform SMILE like an expert. [Full text](#)

CRS Today 2017 Dec, Doane JF

Refractive lenticule extraction - the ReLEx/SMILE technique: video article [Article in German] [Abstract](#)

Der Ophthalmologe 2017 Sep, Blum M, Sekundo W

Tips for a better SMILE. [Full text](#)

Review of Ophthalmology 2017 Feb, Hjortdal J

Centration

Functional optical zone and centration following SMILE and LASIK: a prospective, randomized, contralateral eye study. [Abstract](#)

Journal of Refractive Surgery 2019 Apr, Damgaard IB, Ang M, Mahmoud AM, Farook M, Roberts CJ, Mehta JS

Comparison of the distribution of lenticule decentration following SMILE by subjective patient fixation or triple marking centration.

[Abstract](#)

Journal of Refractive Surgery 2018 Jul, Kang DSY, Lee H, Reinstein DZ, Roberts CJ, Arba-Mosquera S, Archer TJ, Kim EK, Seo KY, Kim TI

Manual cyclotorsion compensation technique

Comparison of SMILE surgery with and without cyclotorsion error correction for patients with astigmatism. [Abstract](#)

Cornea 2019 Jun, Chen P, Ye Y, Yu N, Zhang X, He J, Zheng H, Wei H, Zhuang J, Yu K

Effect of cyclotorsion compensation with a novel technique in SMILE surgery for the correction of myopic astigmatism. [Abstract](#)

Journal of Refractive Surgery 2019 May, Xu J, Liu F, Liu M, Yang X, Weng S, Lin L, Lin H, Xie Y, Liu Q

Correction of astigmatism with SMILE with axis alignment: 6-month results from 622 eyes.

[Abstract](#)

Journal of Refractive Surgery 2019 Mar, Chen P, Ye Y, Yu N, Zhang X, Zhuang J, Yu K

Results of intraoperative manual cyclotorsion compensation for myopic astigmatism in patients undergoing SMILE. [Abstract](#)

Journal of Refractive Surgery 2017 Aug, Ganesh S, Brar S, Pawar A

Pocket irrigation

Effect of intraoperative corneal stromal pocket irrigation in small-incision lenticule extraction.

[Full text](#)

Biomed Research International 2015 Jul, Liu YC, Jayasinghe L, Ang HP, Lwin NC, Yam GH, Mehta JS

Cap repositioning

Intra-operative cap repositioning in SMILE for enhanced visual recovery. [Abstract](#)

Current Eye Research 2016 Dec, Shetty R, Shroff R, Kaweri L, Jayadev C, Kummelil MK, Sinha Roy A

Surgical instrument

Editorial: surgical instruments for small incision lenticule extraction (SMILE). [Full text](#)

Expert Review of Ophthalmology 2016 May, Mehta JS, Liu YC

Alternative surgical techniques

Development of the modified lenticule edge dissection technique for small incision lenticule extraction. [Abstract](#)

Cornea 2018 Oct, Liu M, Wang H, Lin H, Liu Q

Development of a liquid dissection technique for small-incision lenticule extraction: clinical results and ultra-structural evaluation. [Full text](#)

Journal of Cataract & Refractive Surgery 2018 Sep, Weng S, Yang X, Liu F, Lin H, Liu M, Liu Q

Short-term observation of intraocular scattering and Bowman's layer microdistortions after SMILE-CCL. [Abstract](#)

Journal of Refractive Surgery 2018 Jun, Miao H, Liu X, Tian M, Zhao J, Fang X, Zhou X

Microscope-integrated intraoperative OCT-guided SMILE: new surgical technique. [Abstract](#)

Journal of Cataract & Refractive Surgery 2017 Oct, Sharma N, Urkude J, Chaniyara M, Titiyal JS

Lenticuloschisis: a "no dissection" technique for lenticule extraction in SMILE. [Abstract](#)

Journal of Refractive Surgery 2017 Aug, Ganesh S, Brar S

Chung's swing technique: a new technique for SMILE. [Full text](#)

BioMed Central Ophthalmology 2016 Sep, Kim BK, Mun SJ, Lee DG, Choi HT, Chung YT

Development of the continuous curvilinear lenticulerrhexis technique for small incision lenticule extraction. [Abstract](#)

Journal of Refractive Surgery 2015 Jan, Zhao Y, Li M, Yao P, Shah R, Knorz MC, Zhou X

Alternative surgical instrument

Intraoperative complications of refractive SMILE in the early learning curve. [Full text](#)

Clinical Ophthalmology 2018 Apr, Hamed AM, Abdelwahab SM, Soliman TT

Refractive small incision lenticule extraction: push-up and push-down techniques. [Full text](#)

Journal of Cataract & Refractive Surgery 2016 Dec, Hamed A, Fekry A

SMILE enhancement

“In this first study directly comparing surface ablation versus CIRCLE enhancement after SMILE, both methods yielded comparable results at 3 months. However, CIRCLE re-treated eyes showed a markedly increased speed of recovery concerning UDVA and CDVA compared to surface ablation.”

Siedlecki J et al, Journal of Refractive Surgery 2019 May

“This review discusses major advantages and disadvantages of these options and compares the visual outcomes based on the existing literature. An algorithmic approach created from this analysis is presented to guide retreatment decision-making.”

Moshirfar M, Journal of Refractive Surgery 2018 Nov

Surface Ablation versus CIRCLE for myopic enhancement after SMILE: a matched comparative study. [Abstract](#)

Journal of Refractive Surgery 2019 May, Siedlecki J, Siedlecki M, Luft N, Kook D, Meyer B, Bechmann M, Wiltfang R, Sekundo W, Priglinger SG, Dirisamer M

Surgical options for retreatment after small-incision lenticule extraction: advantages and disadvantages. [Full text](#)

Journal of Cataract & Refractive Surgery 2018 Nov, Moshirfar M, Shah TJ, Masud M, Linn SH, Ronquillo Y, Hoopes PC Sr

Inferior pseudo-hinge fulcrum technique and intraoperative complications of laser in situ keratomileusis retreatment after small-incision lenticule extraction. [Full text](#)

Journal of Cataract & Refractive Surgery 2018 Nov, Reinstein DZ, Carp GI, Archer TJ, Vida RS

Outcomes of re-treatment by LASIK after SMILE. [Abstract](#)

Journal of Refractive Surgery 2018 Sep, Reinstein DZ, Carp GI, Archer TJ, Vida RS

CIRCLE enhancement after myopic SMILE. [Abstract](#)

Journal of Refractive Surgery 2018 May, Siedlecki J, Luft N, Mayer WJ, Siedlecki M, Kook D, Meyer B, Bechmann M, Wiltfang R, Priglinger SG, Dirisamer M

Cap-preserving SMILE enhancement surgery. [Full text](#)

BioMed Central Ophthalmology 2018 Feb, Sedky AN, Wahba SS, Roshdy MM, Ayaad NR

Enhancement after SMILE using surface ablation. [Abstract](#)

Journal of Refractive Surgery 2017 Aug, Siedlecki J, Luft N, Kook D, Wertheimer C, Mayer WJ, Bechmann M, Wiltfang R, Priglinger SG, Sekundo W, Dirisamer M

Enhancement after SMILE: incidence, risk factors, and outcomes. [Abstract](#)

Ophthalmology 2017 Jun, Liu YC, Rosman M, Mehta JS

Biomechanical weakening of different re-treatment options after SMILE. [Abstract](#)

Journal of Refractive Surgery 2017 Mar, Kling S, Spuru B, Hafezi F, Sekundo W

SMILE: re-treatment options - techniques and results. [Article in German]. [Abstract](#)

Klinische Monatsblätter für Augenheilkunde 2017 Jan, Meyer B, Kunert KS

The sub-cap method for SMILE enhancement. [Full text](#)

Corneal Refractive Surgery Today Europe 2016 Jun, Donate D, Thaëron R

Risks & safety

“Although SMILE is a promising technique for the correction of myopia and myopic astigmatism with predictable, efficient, safe refractive and visual outcomes, complications can occur. However, most of them are related to inexperience and are included in the learning curve of the technique. More studies with a bigger number of eyes are required to efficiently evaluate the intraoperative complications and standardize their management strategies.”

Hamed A et al, International Journal of Ophthalmology 2019 Feb

“With appropriate management, it is possible for the SMILE procedure to be completed on the same day by either continuing with SMILE or converting to LASIK depending on the progress of the femtosecond laser cutting.”

Reinstein DZ et al, Journal of Refractive Surgery 2018 Dec

Overview

Postoperative corneal complications in SMILE: long-term study. [Abstract](#)

Journal of Refractive Surgery 2019 Mar, Wang Y, Ma J, Zhang L, Zou H, Li J, Zhang Y, Jhanji V

SMILE intraoperative complications: incidence and management. [Full text](#)

International Journal of Ophthalmology 2019 Feb, Hamed A, Heikal M, Soliman T, Daifalla A, Said-Ahmed K

A review of small incision lenticule extraction complications. [Abstract](#)

Current Opinion in Ophthalmology 2018 Jul, Krueger RR, Meister CS

Incidence and management of intraoperative complications during SMILE in 3004 cases.

[Abstract](#)

Journal of Cataract & Refractive Surgery 2017 Jun, Wang Y, Ma JN, Zhang JM, Dou R, Hui Zhang H, Li LY, Zhao W, Wei PH

Safety and complications of more than 1500 small incision lenticule extraction procedures.

[Abstract](#)

Ophthalmology 2014 Apr, Ivarsen A, Asp S, Hjortdal J

SMILE and keratectasia

Ectasia following small incision lenticule extraction (SMILE): a review of the literature.

[Full text](#)

Clinical Ophthalmology 2017 Sep, Moshirfar M, Albarracin JC, Desautels JD, Birdsong OC, Linn SH, Hoopes PC Sr (USA)

Risk profiles of ectasia after keratorefractive surgery. [Abstract](#)

Current Opinion in Ophthalmology 2017 Jul, Giri P, Azar DT (USA)

Bilateral ectasia after femtosecond laser-assisted SMILE (case report). [Abstract](#)

Journal of Refractive Surgery 2016 Jul, Mattila JS, Holopainen JM

Corneal ectasia after femtosecond laser-assisted small incision lenticule extraction in eyes with subclinical keratoconus/forme fruste keratoconus. [Abstract](#)

Journal of Cataract & Refractive Surgery 2015 Jul, Remy M, Kohnen T

Corneal ectasia 6.5 months after small incision lenticule extraction. [Abstract](#)

Journal of Cataract & Refractive Surgery 2015 May, Wang Y, Cui C, Li Z, Tao X, Zhang C, Zhang X, Mu G

Bilateral ectasia after femtosecond laser assisted small incision lenticule extraction. [Abstract](#)

Journal of Cataract & Refractive Surgery 2015 Apr, El-Naggar MT

Suction loss

Clinical study of suction loss in small incision lenticule extraction. [Abstract](#)

Zhonghua Yan Ke Za Zhi 2018 Dec, Ma JN, Wang Y, Zhang L, Zhang JM

Suction stability management in SMILE: development of a decision tree for managing eye movements and suction loss. [Abstract](#)

Journal of Refractive Surgery 2018 Dec, Reinstein DZ, Archer TJ, Vida RS, Carp GI

Comparison of immediate small incision lenticule extraction after suction loss with uneventful small incision lenticule extraction. [Abstract](#)

Journal of Cataract & Refractive Surgery 2017 Apr, Park JH, Koo HJ

Refraction outcomes after suction loss during SMILE. [Full text](#)

Clinical Ophthalmology 2017 Mar, By Gab-Alla AA

Impact of suction loss during small incision lenticule extraction (SMILE). [Abstract](#)

Journal of Refractive Surgery 2016 Oct, Liu M, Wang J, Zhong W, Wang D, Zhou Y, Liu Q

Suction loss during femtosecond laser-assisted SMILE: incidence and analysis of risk factors. [Abstract](#)

Journal of Cataract & Refractive Surgery 2016 Feb, Osman IM, Awad R, Shi W, Abou Shousha M

Intraoperative black areas

Possible risk factors and clinical outcomes of black areas in SMILE. [Abstract](#)

Cornea 2018 Aug, Ma J, Wang Y, Chan TCY

Diffuse lamellar keratitis

Incidence and outcomes of sterile multifocal inflammatory keratitis and diffuse lamellar keratitis after SMILE. [Abstract](#)

Journal of Refractive Surgery 2018 Nov, Reinstein DZ, Stuart AJ, Vida RS, Archer TJ, Carp G

Atypical presentation of diffuse lamellar keratitis after small-incision lenticule extraction: sterile multifocal inflammatory keratitis. [Full text](#)

Journal of Cataract & Refractive Surgery 2018 Jun, Stuart A, Reinstein DZ, Vida RS, Archer TJ, Carp G

Diffuse lamellar keratitis after small incision lenticule extraction. [Abstract](#)

Journal of Cataract & Refractive Surgery 2015 Feb, Zhao J, He L, Yao P, Shen Y, Zhou Z, Miao H, Wang X, Zhou X

Interface fluid syndrome

Corneal densitometry changes in a patient with interface fluid syndrome after SMILE. [Full text](#)

BioMed Central Ophthalmology 2017 Mar, Zheng K, Han T, Li M, Han Y, Xu Y, Shah R, Zhou XT

Shifting “ectasia”: interface fluid collection after SMILE. [Abstract](#)

Journal of Refractive Surgery 2016 Nov, Bansal AK, Murthy SI, Maaz SM, Sachdev MS

Delayed / residual lenticule removal

CIRCLE software for the management of retained lenticule tissue following complicated SMILE surgery. [Abstract](#)

Journal of Refractive Surgery 2019 Jan, Ganesh S, Brar S, K V M

Retained lenticule or lenticular fragments after SMILE. [Full text](#)

Journal of Refractive Surgery 2018 Jul, Singh R, Tripathy K

Secondary lenticule remnant removal after SMILE. [Abstract](#)

Journal of Refractive Surgery 2017 Nov, Ng ALK, Kwok PSK, Chan TCY

SMILE rescue: delayed lenticule removal in a patient with high myopia. [Abstract](#)

Journal of Refractive Surgery 2017 Mar, Tong JY, Cherepanoff S, Males JJ

Transient light sensitivity syndrome

Case of presumed transient light-sensitivity syndrome (TLSS) after SMILE. [Abstract](#)

Cornea 2017 Sep, Desautels JD, Moshirfar M, Quist TS, Skanchy DF, Hoopes PC

Visual or safety related investigations

"This study suggests that the predictability between the achieved and VisuMax readout is favorable. The lenticule thickness at the pupil center is closer to the VisuMax readout than corneal vertex."

Zhou J et al, Eye & Contact Lens 2018 Nov

"After SMILE, CDVA was significantly worse in eyes with a preoperatively displaced corneal apex compared to eyes with a more central corneal apex. However, good visual results were achieved in both groups."

Steinwender G et al, Journal of Refractive Surgery 2018 Jul

VisuMax laser cut quality and accuracy

Lenticule thickness accuracy and influence in predictability and stability for different refractive errors after SMILE in Chinese myopic eyes. [Abstract](#)

Current Eye Research 2019 Jan, Wang D, Li Y, Sun M, Guo N, Zhang F

Predictability of the achieved lenticule thickness in small incision lenticule extraction for myopia correction. [Abstract](#)

Eye & Contact Lens 2018 Nov, Zhou J, Zhang Y, Li M, Sun L, Zhou X

Stromal remodeling and lenticule thickness accuracy in SMILE: one-year results. [Abstract](#)

Journal of Cataract & Refractive Surgery 2017 Jun, Luft N, Priglinger SG, Ring MH, Mayer WJ, Mursch-Edlmayr AS, Kreutzer TC, Bolz M, Dirisamer M

Centration accuracy

Effect of corneal curvature on optical zone decentration and its impact on astigmatism and higher-order aberrations in SMILE and LASIK. [Abstract](#)

Graefes Archive for Clinical and Experimental Ophthalmology 2019 Jan, Chan TCY, Wan KH, Kang DSY, Tso THK, Cheng GPM, Wang Y

Impact of a displaced corneal apex in small incision lenticule extraction. [Abstract](#)

Journal of Refractive Surgery 2018 Jul, Steinwender G, Shajari M, Mayer WJ, Kook D, Ardjomand N, Vidic B, Kohnen T, Wedrich A

Relationship between decentration and induced corneal HOAs following SMILE procedure.

[Full text](#)

Investigative Ophthalmology and Visual Science 2018 May, Lee H, Roberts CJ, Arba-Mosquera S, Kang DSY, Reinstein DZ, Kim TI

Impact of treatment decentration on higher-order aberrations after SMILE. [Full text](#)
Journal of Ophthalmology 2017 Mar, Yu Y, Zhang WW, Cheng XL, Cai JR, Chen H

Optical zone centration accuracy using corneal fixation-based SMILE compared to eye tracker based femtosecond laser-assisted LASIK for myopia. [Abstract](#)
Journal of Refractive Surgery 2015 Sep, Reinstein DZ, Gobbe M, Gobbe L, Archer TJ, Carp GI

Decentration of optical zone center and its impact on visual outcomes following SMILE. [Abstract](#)
Cornea 2015 Apr, Liu M, Sun Y, Wang D, Zhang T, Zhou Y, Zheng H, Liu Q

Opaque bubble layer

Corneal thickness, residual stromal thickness, and its effect on opaque bubble layer in SMILE. [Abstract](#)
International Journal of Ophthalmology 2018 Oct, Ma J, Wang Y, Li L, Zhang J

Risk factors for opaque bubble layer in SMILE. [Abstract](#)
Journal of Refractive Surgery 2017 Nov, Li L, Schallhorn JM, Ma J, Zhang L, Dou R, Wang Y

Possible risk factors and clinical effects of opaque bubble layer in SMILE. [Abstract](#)
Journal of Refractive Surgery 2017 Jan, Son G, Lee J, Jang C, Choi KY, Cho BJ, Lim TH

Changes to corneal curvature and power

Effect of corneal curvature on optical zone decentration and its impact on astigmatism and higher-order aberrations in SMILE and LASIK. [Abstract](#)
Graefes Archive for Clinical and Experimental Ophthalmology 2019 Jan, Chan TCY, Wan KH, Kang DSY, Tso THK, Cheng GPM, Wang Y

Comparison of changes in refractive error and corneal curvature following small-incision lenticule extraction and femtosecond laser-assisted in situ keratomileusis surgery. [Full text](#)
Indian Journal of Ophthalmology 2018 Nov, Zhang YL, Cao LJ, Chen HW, Xu XH, Li ZN, Liu L

Corneal irregular astigmatism and curvature changes after SMILE: 3-year follow-up. [Abstract](#)
Cornea 2018 Jul, Sideroudi H, Lazaridis A, Messerschmidt-Roth A, Labiris G, Kozobolis V, Sekundo W

Determining total corneal power after SMILE in myopic eyes. [Abstract](#)
Journal of Cataract & Refractive Surgery 2017 Nov, Wei P, Wang Y, Chan TCY, Ng ALK, Cheng GPM, Jhanji V

Comparison of the change in posterior corneal elevation (PCE) and corneal biomechanical parameters after SMILE and FS-LASIK for high myopia correction. [Full text](#)

Contact Lens & Anterior Eye 2016 Jun, Wang Bj, Zhang ZY, Naidu RK, Chu RY, Dai JH, Qu XM, Yu ZQ, Zhou H

Assessing the corneal power change after refractive surgery using Scheimpflug imaging.

[Abstract](#)

Ophthalmic & Physiological Optics 2015 May, Gyldenkerne A, Ivarsen A, Hjortdal JØ

Wound healing/inflammatory response

Wound healing, inflammation, and corneal ultrastructure after SMILE and femtosecond laser-assisted LASIK: a human ex vivo study.

[Abstract](#)

Journal of Refractive Surgery 2018 Jun, Luft N, Schumann RG, Dirisamer M, Kook D, Siedlecki J, Wertheimer C, Priglinger SG, Mayer WJ

In vivo and ex vivo evaluation of inflammation and apoptosis induced after SMILE procedures for different refractive error range. [Abstract](#)

Current Eye Research 2017 May, Mastropasqua L, Calienno R, Curcio C, Mastropasqua R, Nubile M, Salgari N, Lanzini M

Comparison of corneal biological healing after FS-LASIK and SMILE procedure. [Abstract](#)

Current Eye Research 2016 Sep, Xia L, Zhang J, Wu J, Yu K

Early corneal wound healing and inflammatory responses after SMILE: Comparison of the effects of different refractive corrections and surgical experiences. [Abstract](#)

Journal of Refractive Surgery 2016 May, Liu YC, Teo EP, Lwin NC, Yam GH, Mehta JS

Effect on endothelial cells

Short term effects of SMILE surgery on corneal endothelium. [Full text](#)

International Journal of Ophthalmology 2016 Apr, Wang DY, Liu ML, Chen YL, Zhang XY, Xu YT, Wang JC, To CH, Wang JG, Liu Q

Short-term and long-term effects of small incision lenticule extraction (SMILE) on corneal endothelial cells. [Abstract](#)

Contact Lens & Anterior Eye 2015 Oct, Zhang H, Wang Y, Xie S, Wu D, Wu W, Xu L

SMILE & corneal opacity

The observation during SMILE for myopia with corneal opacity. [Full text](#)

BioMed Central Ophthalmology 2017 Jun, Zhang SW, Xu HP, Zheng K, Zhao J, Jian WJ, Li MY, Zhou XT

Percentage tissue altered

Impact of different percent tissue altered (PTA) values on visual outcome after ReLEx SMILE.

[Article in German]. [Abstract](#)

Klinische Monatsblätter für Augenheilkunde 2017

Jan, Breyer DR, Hagen P, Kaymak H, Klabe K,

Auffarth GU, Kretz FT

Corneal epithelium

Comparison of corneal epithelial remodeling over 2 years in LASIK versus SMILE: A contralateral eye study. [Abstract](#)

Cornea 2019 Mar, Kanellopoulos AJ

Corneal remodeling and spatial profiles following small incision lenticule extraction.

[Abstract](#)

International Ophthalmology 2018 Aug, Zhang L,

Wang Y, Zhao W, Cheng W, Cui T

Comparison of corneal epithelial remodeling after femtosecond laser-assisted LASIK and SMILE. [Abstract](#)

Journal of Refractive Surgery 2017 Apr, Ryu IH, Kim BJ, Lee JH, Kim SW

Epithelial thickness profile changes following SMILE for myopia and myopic astigmatism.

[Abstract](#)

Journal of Refractive Surgery 2016 Jul, Ganesh S,

Brar S, Relekar KJ

Corneal epithelial remodeling induced by SMILE.

[Full text](#)

IOVS 2016 Jul, Luft N, Ring MH; Dirisamer M,

Mursch-Edlmayr AS, Kreutzer TC, Pretzl J, Bolz M,

Priglinger SG

Intraocular pressure

Intraocular pressure changes in eyes with small incision lenticules and laser in situ keratomileusis. [Abstract](#)

Clinical & Experimental Optometry 2018 Dec,

Wang KJ, Wang WW, Tsai CL, Wang JJ

Real-time intraocular pressure measurements in the vitreous chamber of rabbit eyes during small incision lenticule extraction (SMILE). [Abstract](#)

Current Eye Research 2018 Oct, Cheng W, Liu L, Yu

S, Jing Y, Zuo T, Cui T, Zhang H, Ma J, Wei P,

Hao W, Ng A, Cheng G, Woo V, Chiu K, Wang Y

Comparison of different IOP measurement techniques in normal eyes and post SMILE.

[Full text](#)

Clinical Ophthalmology 2017 Jul, Hosny M,

Aboalazayem F, Shiwiy HE, Salem M

Corneal densitometry

Corneal densitometry after FS-LASIK and SMILE.

Abstract

Current Eye Research 2018 May, Shajari M, Wanner E, Rusev V, Mir Mohi Sefat S, Mayer WJ, Kohnen T, Priglinger S, Kook D

Corneal densitometry after PRK, FS-LASIK, and SMILE. *Abstract*

Eye 2017 Dec, Poyales F, Garzón N, Mendicute J, Illarramendi I, Caro P, Jáñez O, Argüeso F, López A

Intraocular scattering

Cap morphology after SMILE and its effects on intraocular scattering. *Full text*

International Journal of Ophthalmology 2018 May, Fu D, Wang L, Zhou XT, Yu ZQ

Accommodation

Accommodative changes after SMILE for moderate to high myopia correction. *Full text*

BioMed Central Ophthalmology 2016 Oct, Zheng K, Han T, Zhou XT

Experimental applications

“A donor lenticule from SMILE surgery is a useful adjunct to seal macroperforations in deep anterior lamellar keratoplasty because the thin uniform lamellar tissue is easily applied using fibrin glue and gives uniform and good apposition on both host and donor sides. It can be used immediately without further preparation unlike hand-fashioned patch grafts.”

Jacob S et al, Cornea 2019 Jun

“Both SFII and PKP surgical procedures resulted in a stable corneal volume and improved visual acuity in this long-term study. SFII was less invasive and more efficient compared with PKP.”

Jin H et al, Cornea 2019 Apr

SMILE lenticule re-implantation / transplantation

Fibrin glue-assisted closure of macroperforation in predescemetic deep anterior lamellar keratoplasty with a donor obtained from SMILE.

[Abstract](#)

Cornea 2019 Jun, Jacob S, Dhawan P, Tsatsos M, Agarwal A, Narasimhan S, Kumar A

Small-incision femtosecond laser-assisted intracorneal concave lenticule implantation (SFII) in patients with keratoconus. [Abstract](#)

Cornea 2019 Apr, Jin H, He M, Liu H, Zhong X, Wu J, Liu L, Ding H, Zhang C, Zhong X

Partial thickness cornea tissue from small incision lenticule extraction: a novel patch graft in glaucoma drainage implant surgery. [Abstract](#)

Medicine 2019 Mar, Wang Y, Li X, Huang W, Liu J, Xu Y, Chen M, Wang Q

Corneal remodelling and topography following biological inlay implantation with combined crosslinking in a rabbit model. [Full text](#)

Scientific Reports 2019 Mar, Damgaard IB, Liu YC, Riau AK, Teo EPW, Tey ML, Nyein CL, Mehta JS

Lamellar keratoplasty using femto-second laser intrastromal lenticule for limbal dermoid: case report and literature review. [Full text](#)

Journal of International Medical Research 2018 Nov, Pant OP, Hao JL, Zhou DD, Wang F, Zhang BJ, Lu CW

Case series: use of stromal lenticule as patch craft. [Full text](#)

American Journal of Ophthalmology 2018 Sep, Song YJ, Kim S, Yoon GJ

A modified small-incision lenticule intrastromal keratoplasty (sLIKE) for the correction of high hyperopia: a description of a new surgical technique and comparison to lenticule intrastromal keratoplasty (LIKE). [Full text](#)

Medical Hypothesis, Discovery & Innovation Ophthalmology Journal 2018 Jul, Moshirfar M, Shah TJ, Masud M, Fanning T, Linn SH, Ronquillo Y, Hoopes PCS

An experimental study of femto-laser in assisting xenograft acellular cornea matrix lens transplantation. [Abstract](#)

Medical Science Monitor 2018 Jul, Zheng X, Zhang D, Li S, Zhang J, Zheng J, Du L, Gao J

Reshaping and customization of SMILE-derived biological lenticules for intrastromal implantation. [Full text](#)

Investigative Ophthalmology & Visual Science 2018 May, Damgaard IB, Riau AK, Liu YC, Tey ML, Yam GH, Mehta JS

Treatment of corneal ectasia by implantation of an allogenic corneal lenticule. [Abstract](#)

Journal of Refractive Surgery 2018 May, Li M, Zhao F, Li M, Knorz MC, Zhou X

Two-year outcome of a patient treated with PRK and autologous SMILE lenticule transplantation for flap-related complications following LASIK. [Abstract](#)

Journal of Refractive Surgery 2018 Apr, Zhao J, Zhao F, Huang J, Xu H, Chen Y, Zhou X

Biological lenticule implantation for correction of hyperopia: an ex vivo study in human corneas. [Abstract](#)

Journal of Refractive Surgery 2018 Apr, Damgaard IB, Ivarsen A, Hjortdal J

Keratophakia with autograft aided by a femtosecond laser: one-year follow-up. [Full text](#)

Journal of Cataract & Refractive Surgery 2018 Feb, Orlich C

Femtosecond laser-assisted stromal lenticule addition keratoplasty for the treatment of advanced keratoconus: a preliminary study.

[Abstract](#)

Journal of Refractive Surgery 2018 Jan, Mastropasqua L, Nubile M, Salgari N, Mastropasqua R

Stromal lenticule transplantation for management of corneal perforations; one year results. [Abstract](#)

Graefes Archive for Clinical Experimental Ophthalmology 2017 Jun, Abd Elaziz MS, Zaky AG, El SaebaySarhan AR

Preliminary evidence of successful near vision enhancement with a new technique: presbyopic allogenic refractive lenticule (PEARL) corneal inlay using a SMILE lenticule. [Abstract](#)

Journal of Refractive Surgery 2017 Apr, Jacob S, Kumar DA, Agarwal A, Aravind R, Saijijmol AI

Corneal lenticule allotransplantation after SMILE in rabbits. [Full text](#)

Cornea 2017 Feb, Zhao J, Yang S, Tian M, Sun L, Zhao Y, Zhang XY, Zhou XT

Using donor lenticules obtained through SMILE for an epikeratophakia technique combined with phototherapeutic keratectomy. [Abstract](#)

Journal of Refractive Surgery 2016 Dec, Zhao J, Sun L, Shen Y, Tian M, Yao P, Zhou X

Refractive lenticule transplantation for correction of iatrogenic hyperopia and high astigmatism after LASIK. [Abstract](#)

Journal of Refractive Surgery 2016 Nov, Lazaridis A, Reinstein DZ, Archer TJ, Schulze S, Sekundo W

Application of the SMILE-derived glued lenticule patch graft in microperforations and partial-thickness corneal defects. [Abstract](#)

Cornea 2016 Mar, Bhandari V, Ganesh S, Brar S, Pandey R

The safety and predictability of implanting autologous lenticule obtained by SMILE for hyperopia. [Abstract](#)

Journal of Refractive Surgery 2015 Jun, Sun L, Yao P, Li M, Shen Y, Zhao J, Zhou X

Tailored stromal expansion with a refractive lenticule for cross-linking the ultrathin cornea. [Abstract](#)

Journal of Cataract & Refractive Surgery 2015 May, Sachdev MS, Gupta D, Sachdev G, Sachdev R

SMILE with collagen cross-linking

Corneal safety and stability in cases of SMILE with collagen cross-linking (SMILE Xtra). [Full text](#)

Journal of Ophthalmology 2019 Apr, Osman IM, Helaly HA, Abou Shousha M, AbouSamra A, Ahmed I

Corneal remodelling and topography following biological inlay implantation with combined crosslinking in a rabbit model. [Full text](#)

Scientific Reports 2019 Mar, Damgaard IB, Liu YC, Riau AK, Teo EPW, Tey ML, Nyein CL, Mehta JS

In vivo confocal laser microscopy of morphologic changes after small incision lenticule extraction with accelerated cross-linking (SMILE Xtra) in patients with thin corneas and high myopia. [Abstract](#)

Graefes Archive for Clinical Experimental Ophthalmology 2018 Jan, Zhou Y, Liu M, Zhang T, Zheng H, Sun Y, Yang X, Weng S, Lin H, Liu Q

Femtosecond intrastromal lenticular implantation combined with accelerated collagen cross-linking for the treatment of keratoconus - initial clinical result in 6 eyes. [Abstract](#)

Cornea 2015 Oct, Ganesh S, Brar S

Clinical outcomes of small incision lenticule extraction with accelerated cross-linking (ReLEx SMILE Xtra) in patients with thin corneas and borderline topography. [Full text](#)

Journal of Ophthalmology 2015 Jun, Ganesh S, Brar S

SMILE with keratoplasty / keratotomy

Bilateral SMILE after penetrating keratoplasty.

Abstract

Journal of Refractive Surgery 2016 Aug, Kim BK, Mun SJ, Lee DG, Chung YT

Full-thickness astigmatic keratotomy combined with small incision lenticule extraction to treat high-level and mixed astigmatism. *Abstract*

Cornea 2015 Dec, Kim BK, Mun SJ, Lee DG, Kim JR, Kim HS, Chung YT

Small-incision lenticule extraction after deep anterior lamellar keratoplasty. *Abstract*

Journal of Refractive Surgery 2015 Sep, Mastropasqua L, Calienno R, Lanzini M, Nubile M

SMILE on flap

Report: SMILE as re-treatment for a thick LASIK flap. *Abstract*

Journal of Refractive Surgery 2016 Oct, Catalan-Lopez S, Portas-Ferradas AM, Cadarso-Suarez L, Rodriguez-Rodriguez A

Future development

“Based on the current literature, SMILE represents a viable surgical alternative to LASIK in the correction of hyperopia. Lenticule intrastromal keratoplasty and small-incision lenticule intrastromal keratoplasty may be able to correct severe hyperopia in patients who would not otherwise be candidates for refractive surgery.”

Moshirfar M et al, Current Opinion in Ophthalmology 2019 Apr

“Refractive and visual outcomes 3 months after SMILE for hyperopia were promising, given the high degree of hyperopia corrected and relatively reduced CDVA in this population. Undercorrection of more than 1.00 D in 5 eyes might be partly explained by latent hyperopia in these young patients.”

Reinstein DZ et al, Journal of Refractive Surgery 2019 Jan

Hyperopia correction

Hyperopic small-incision lenticule extraction.

[Abstract](#)

Current Opinion in Ophthalmology 2019 Jul, Moshirfar M, Bruner CD, Skanchy DF, Shah T

Small Incision Lenticule Extraction for hyperopia: 3-Month refractive and visual outcomes. [Abstract](#)

Journal of Refractive Surgery 2019 Jan, Reinstein DZ, Pradhan KR, Carp GI, Archer TJ, Day AC, Sekundo W, Dhungana P

Higher-order-aberrations following hyperopia treatment: small incision lenticule extraction, laser-assisted in situ keratomileusis and lenticule implantation. [Full text](#)

Translational Vision Science & Technology 2018 Mar, Liu YC, Wen J, Teo EPW, Williams GP, Lwin NC, Mehta JS

Hyperopic refractive correction by LASIK, SMILE or lenticule reimplantation in a non-human primate model. [Full text](#)

PLOS One 2018 Mar, Williams GP, Wu B, Liu YC, Teo E, Nyein CL, Peh G, Tan DT, Mehta JS

FLEx for spherocylindrical hyperopia using new profiles. [Abstract](#)

Journal of Refractive Surgery 2018 Jan, Sekundo W, Messerschmidt-Roth A, Reinstein DZ, Archer TJ, Blum M

SMILE for hyperopia: optical zone diameter and spherical aberration induction. [Abstract](#)

Journal of Refractive Surgery 2017 Jun, Reinstein D, Pradhan KR, Carp GI, Archer TJ, Gobbe M, Sekundo W, Khan R, Dhungana P

SMILE for hyperopia: optical zone centration.

[Abstract](#)

Journal of Refractive Surgery 2017 Mar, Reinstein D, Pradhan KR, Carp GI, Archer TJ, Gobbe M, Sekundo W, Khan R, Citron K, Dhungana P

Report: a pilot study of SMILE for hyperopia: corneal morphology and surface characteristics of concave lenticules in human donor eyes.

[Abstract](#)

Journal of Refractive Surgery 2016 Oct, Zhao J, Miao H, Han T, Shen Y, Zhao Y, Sun L, Zhou X

Improved lenticule shape for hyperopic femtosecond lenticule extraction (ReLEx® FLEx): a pilot study. [Abstract](#)

Lasers in Medical Science 2016 May, Sekundo W, Reinstein DZ, Blum M

Patient's examination or selection

"Epithelial thickness maps could clearly visualize different ET patterns. Parameters with the highest potential of diagnostic discrimination between eyes with KC and healthy eyes were, in descending order, R1, RTI/NS, and minET. Consequently, epithelial thickness irregularity and asymmetry seem to be the most promising diagnostic factor in terms of discriminating between keratoconic eyes and healthy eyes."

Pircher N et al, American Journal of Ophthalmology 2018 May

"From linear regression, more myopic RRE was associated with higher preoperative myopia, intraocular pressure (IOP), flattest curvature of anterior cornea (AC), and highest concavity deformation (HCD), and was associated with lower anterior elevation, anterior asphericity, steepest curvature of AC, and second applanation velocity. Postoperative outcomes of SMILE can be predicted by individual CTBPs."

Wang M et al, ARVO 2018 Sep

Overview

Small incision lenticule extraction (SMILE) technique: patient selection and perspectives.

[Full text](#)

Clinical Ophthalmology 2018 Sep, Titiyal JS, Kaur M, Shaikh F, Gagrani M, Brar AS, Rathi A

Keratoconus

Distinguishing keratoconic eyes and healthy eyes using ultrahigh-resolution OCT-based corneal epithelium thickness mapping. [Abstract](#)

American Journal of Ophthalmology 2018 May, Pircher N, Schwarzhans F, Holzer S, Lammer J, Schmidl D, Bata AM, Werkmeister RM, Seidel G, Garhöfer G, Gschließer A, Schmetterer L, Schmidinger G

Mean posterior corneal power and astigmatism in normal versus keratoconic eyes. [Full text](#)

Journal of Ophthalmic and Vision Research 2018 Apr, Feizi S, Delfazayebaher S, Javadi MA, Karimian F, Ownagh V, Sadeghpour F

Advanced anterior segment imaging in keratoconus: a review. [Abstract](#)

Clinical Experimental Ophthalmology 2018 Mar, Gokul A, Vellara HR, Patel DV (New Zealand)

Evaluation of the reliability and repeatability of Scheimpflug system measurement in keratoconus. [Abstract](#)

Cornea 2018 Jan, de Luis Eguileor B, Escudero Argaluz J, Pijoán Zubizarreta JI, Santamaria Carro A, Etxebarria Ecenarro J

The importance of diagnosing ectatic corneal disease. [Full text](#)

European Ophthalmic Review, 2017 Oct, Ambrósio R

Review: new perspectives on the detection and progression of keratoconus. [Abstract](#)

Journal of Cataract & Refractive Surgery 2017 Sep, Martínez-Abad A, Piñero DP

Fourier analysis algorithm for the posterior corneal keratometric data: clinical usefulness in keratoconus. [Abstract](#)

Ophthalmic and Physiological Optics 2017 Jul, Sideroudi H, Labiris G, Georgantzoglou K, Ntonti P, Siganos C, Kozobolis V

Corneal epithelium

Dynamic roles of the corneal epithelium in refractive surgery. [Abstract](#)

Current Ophthalmology Reports 2017 Sep, Dohlman TH, Brissette AR, Lai EC, Starr CE

Role of the corneal epithelium measurements in keratorefractive surgery. [Abstract](#)

Current Opinion in Ophthalmology 2017 Jul, Salomão MQ, Hofling-Lima AL, Lopes BT, Canedo ALC, Dawson DG, Carneiro-Freitas R, Ambrósio R Jr

Dry eye assessment

Comparative evaluation of clinical methods of tear film stability assessment: a randomized crossover trial. [Abstract](#)

JAMA Ophthalmology 2018 Mar, Wang MTM, Craig JP

Dry eye post-LASIK: major review and latest updates. [Full text](#)

Journal of Ophthalmology 2018 Feb, Cohen E, Spierer O

Assessment of meibomian glands and tear film in post-refractive surgery patients. [Abstract](#)

Clinical & Experimental Ophthalmology 2017 Dec, Jung JW, Jung Yong Kim JY, Chin HS, Suh YJ, Kim TI, Seo KY

Refractive surgery and dry eye disease (DED) - 2nd topic. [Full text](#)

CRST Europe 2017 Sep, Ambrósio R, Faria-Correia F

Cycloplegia

Effect of cycloplegia on corneal biometrics and refractive state. [Full text](#)

Journal of Ophthalmic and Vision Research 2018 Apr, Bagheri A, Feizi M, Shafii A, Faramarzi A, Tavakoli M, Yazdani S

Contrast sensitivity

Effects of HOAs on contrast sensitivity (CS) in normal eyes of a large myopic population.

[Full text](#)

International Journal of Ophthalmology 2017 Sep, Zhao PF, Li SM, Lu J, Song HM, Zhang J, Zhou YH, Wang NL

Corneal properties

Predicting refractive outcome of SMILE for myopia using corneal properties.

[Full text](#)

ARVO 2018 Sep, Wang M, Zhang Y, Wu W, Young JA, Hatch KM, Pineda II R, Elze T, Wang Y

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