

Laser vision correction Understanding your options

UNDERSTANDING YOUR VISION LASER VISION CORRECTION TREATMENT COMPARISON FINANCING FREQUENTLY ASKED QUESTIONS YOUR TREATMENT OPTIONS TREATMENT PROCEDURES SMILE BY THE NUMBERS



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Understanding your vision

Vision is the result of the eye refracting incoming light onto the back of the eye, called the retina. By normal vision the light rays are bend by the cornea, the front part of the eye exactly in one point directly on the retina, forming a clear image.

If the curvature of the cornea is not regular or the proportions of the eye are not exact, the light cannot be brought into sharp focus at the back of the eye. This causes a blurry, unfocused vision.

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Click for explanations of refractive disorders:



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Normal vision:

A perfectly curved cornea focuses light directly on the back of your eye, called the retina.



Modern eye tests can accurately diagnose the exact curvature of your cornea, and laser vision correction options are now available for almost every type of cornea shape.

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With normal vision (emmetropia) the objects

at each distance can be seen sharp.





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Myopia:

Myopia, or nearsightedness, is caused by a cornea that is too curved for the given length of the eye causing light rays to focus in front of the retina instead of on the retina. This causes distant objects, such as street signs or people across a room, to appear blurry. Near vision objects, such as reading a book or writing text messages on your smartphone, will still be focused without glasses or contacts.



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Hyperopia:

Hyperopia, or farsightedness, is caused by a cornea that is too flat for the given length of the eye, causing light rays to focus behind the retina instead of on the retina. This causes near vision objects, such as books and smart phones, to appear blurry. Distant vision objects and tasks will still be sharp without glasses and contacts.



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With farsightness the distant objects are sharp,

whereas the objects up close appear blurry.



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Astigmatism:

Astigmatism is caused by a cornea that is shaped more like a rugby ball, instead of round like a basketball. This condition creates many variations of distorted, hazy vision for both near vision and distant vision. Almost all people have some degree of astigmatism, and it often combines with myopia or hyperopia deteriorate.



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With astigmatism, the irregular shape of the cornea causes a distorted and blurry vision at any distance.



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What is laser vision correction?

Laser vision correction is the name for the set of eye treatments that uses a laser to reshape your cornea in order to create vision in focus. There are three major laser vision correction treatments available today:



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Photorefractive keratectomy

In this procedure, the thin outer layer of the cornea treatments is first gently removed. Then an advanced excimer laser is used to reshape the underlying cornea area. The result is a cornea that more accurately focuses light on the retina. A bandage contact lens is placed over the eye until the epithelium grows back.

- Similar vision results as LASIK and SMILE
- Minimal surgical risks
- Relatively painful
- Longer recovery time with some recovery discomfort



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Laser-assisted in situ keratomileusis

In the LASIK procedure a precise flap is created on the surface of the cornea. Then an advanced excimer laser is used to reshape the underlying cornea area. The flap is then repositioned back on the surface on the eye. The result is a cornea that more accurately focuses light on the retina.

Today, doctors are able to create the LASIK flap in two ways. The first is using a handheld surgical device called a microkeratome. The second is using a fast and highly precise femtosecond laser.

- Similar vision results to PRK and SMILE
- Thin flap
- Minimal surgical risks
- Short visual recovery time with little recovery discomfort



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Small incision lenticule extraction

SMILE supports the latest developments in laser vision correction for myopia (nearsightedness) with or without astigmatism, providing excellent visual outcomes in a minimally invasive procedure. In this procedure, the femtosecond laser is used to create a lenticule - a thin, contact lens-shaped layer just beneath the surface of the eye and then a small opening through which that layer is removed, correcting your vision.

- Minimally invasive
- Short recovery time
- Excellent vision results
- Gentle, comfortable patient experience
- Minimized surgical and dry eye risk



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Your treatment options

Every laser vision correction treatment uses a different method to create better vision. Each one also has a different impact on the eye, including possible dry eye symptoms, recovery time, structural integrity and risks of infection or inflammation. Seeing how each treatment works can help you understand the benefits and risks of each option.

Click to compare:



Because PRK gently removes the top surface of the cornea, a bandage contact lens is placed over the eye until the epithelium grows back. Patients often experience discomfort during their recovery period while the cornea heals. This is temporary and does not affect long-term visual results.

LASIK patients may experience transient dry eye syndrome after treatment due to the size, shape and location of the flap. However, LASIK patients often experience less discomfort than PRK patients during their recovery period.

Because SMILE does not involve removing the surface of the cornea or creating a flap, discomfort and dry eye symptoms may be reduced compared with LASIK and PRK.



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Your treatment options

Every laser vision correction treatment uses a different method to create better vision. Each one also has a different impact on the eye, including possible dry eye symptoms, recovery time, structural integrity and risks of infection or inflammation. Seeing how each treatment works can help you understand the benefits and risks of each option.

Click to compare:



Because PRK gently removes the top surface of the cornea, a bandage contact lens is placed over the eye until the epithelium grows back. Patients often experience discomfort during their recovery period while the cornea heals. This is temporary and does not affect long-term visual results.

Of the three laser vision procedures, LASIK has the highest occurrence of transient dry eye syndrome after treatment due to the size, shape, and location of the flap incision. However, LASIK patients often experience less discomfort than PRK patients during their recovery period.

Because SMILE does not involve removing the surface of the cornea or creating a flap, discomfort and dry eye symptoms may be reduced compared with LASIK and PRK.



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Your treatment options



results.



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PRK	LASIK	SMILE
Flapless	Low risk of corneal haze9	Flapless
Suitable for thinner corneas	Almost no pain ¹⁰	Odorless and almost no se
Low impact on biomechanical stability	Very fast visual recovery ^{11,12}	No flap complications
No flap complications	Flap creation	Very low dry eye incidence
Risk of dry eyes ^{1,2}	Risk of flap complications ^{13,14}	Rare night vision issues ²
Risk of night vision issues ³	Risk of dry eyes ^{15,16}	Potential for very low impact of biomechanics*25,26,27
Comparatively painful ⁵	Risk of night vision issues ¹⁷	Almost no pain
Delayed visual recovery ^{6,7}	Impacts corneal biomechanics ^{18,19}	Fast recovery overall ²⁸⁻
Comparatively higher risk of haze ⁸		Not for hyperopia ye



Disadvantage

*Based on mathematical model and available methods of measurement



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Treatment procedures





PRK

Watch an animated walk-through of the PRK procedure.

LASIK of the LASIK procedure.

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Watch an animated walk-through



SMILE

Watch an animated walk-through of the SMILE.



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SMILE by the numbers



Treated eyes worldwide with SMILE



High impact scientific publications

Numbers as of June 2020.

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Practicing surgeons in over 70 countries

30

170

Approximate number of seconds the laser is active on the cornea during your SMILE treatment

Years of optic excellence from ZEISS, the creators of SMILE









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Your questions about SMILE, answered

Click on the questions below for answers to the most frequently asked questions about SMILE.

Which one is better, SMILE or LASIK?

Does SMILE cost more than LASIK?

Why haven't I heard of SMILE before?

Why don't more practices offer SMILE?

Is it FDA-approved?

Will the results of my SMILE last forever?

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Your questions about SMILE, answered

Which one is better, SMILE or LASIK?

This is one of the most common questions we hear, and many patients want to know which treatment is "better." The fact is that both LASIK and SMILE are proven and consistent, so most patients will be very happy with either option. Generally speaking, SMILE is the less invasive laser vision correction option and has a small risk of post-surgical infection or transient dry eye syndrome. LASIK offers an ever so slightly quicker post-procedure visual recovery time. Based on your eye structure and lifestyle goals, your surgeon can recommend the right treatment for you!



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Your questions about SMILE, answered

Does SMILE cost more than LASIK?

SMILE and LASIK use different laser technologies to recreate the clarity of your vision, the costs of the two options are different. These costs account for the skill and experience of your surgeon, the costs and fees of acquiring and using the laser technologies, and the costs of the support staff and surgical follow-up.



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Your questions about SMILE, answered

Will SMILE hurt?

SMILE is a gentle vision correction solution. Patients consistently tell us it was very comfortable. Some patients do say they feel a tiny amount of pressure around their eye for a few seconds during the treatment, but are quick to clarify that it didn't hurt at all!



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Your questions about SMILE, answered

How soon will I be able to return to work after SMILE?

Patients often return to most of their daily activities, including going back to work, the day after their SMILE treatment. While LASIK patients are asked to avoid wearing makeup for one to two days after their LASIK procedure, SMILE patients can begin wearing makeup the next day. Patients can generally resume all daily activities four to seven days after their treatment.



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Your questions about SMILE, answered

Why haven't I heard of SMILE before?

Since SMILE was launched in 2011, it has been continuously growing with more than 2,000 doctors performing the treatment around the world. Furthermore, SMILE was officially approved by the FDA in 2016. More than 3,000,000 eyes have benefited from focused vision thanks to SMILE.

Which one is better, SMILE or LASIK?

Why haven't I heard of SMILE before?

than LASIK?

Why don't more practices offer SMILE?

Is it FDA-approved?

Will the results of my SMILE last forever?

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Your questions about SMILE, answered

Why don't more practices offer SMILE?

To offer SMILE, clinics have to invest into expensive new laser technology. Not all clinics have the funds available immediately to make this investment. Currently, about 20% of all laser centers around the world have made this investment.





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Your questions about SMILE, answered

Is SMILE safe?

Yes. SMILE supports the proven and minimal-invasive laser vision correction procedure that has created better vision for thousands of patients. As with any surgical treatment, there are possible risks and side effects. After a thorough eye exam and consultation, your surgeon will discuss your options with you and help you make the right decision for your vision.



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Your questions about SMILE, answered

How many procedures have been performed?

SMILE is the fastest-growing laser vision correction option in the world. Worldwide, more than 3 million eyes have been treated with SMILE by more than 2,000 surgeons.

Which one is better, SMILE or LASIK?

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Your questions about SMILE, answered

Is it FDA-approved?

Yes. The FDA approved SMILE for the United States in September 2016 after rigorous trials and testing showed it to be a consistent, effective way to improve vision and reduce dependence on glasses and contacts.

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Your questions about SMILE, answered

Will the results of my SMILE last forever?

Yes and no. Your SMILE treatment is permanent, but as with every part of your body, your eyes will continue to age and your vision will be affected as you get older. SMILE cannot prevent cataracts and presbyopia, but most SMILE patients enjoy many years of focused vision without glasses and contacts.



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Your questions about SMILE, answered

Can SMILE fix my astigmatism?

Of course, it is approved for astigmatism correction of up (or down) to -5 dpt.

Which one is better, SMILE or LASIK?

Why haven't I heard of SMILE before?

How soon will I be able to Does SMILE cost more Will SMILE hurt? than LASIK? return to work after SMILE? How many procedures have Is SMILE safe? offer SMILE? been performed? Will I require reading glasses Can SMILE fix after SMILE? last forever? my astigmatism?

Is it FDA-approved?

Why don't more practices Will the results of my SMILE

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Your questions about SMILE, answered

Will I require reading glasses after SMILE?

Most patients who receive SMILE tell us that they use their glasses and contacts very little, or not at all! The goal of SMILE is to reduce or eliminate your dependence on glasses. Based on the anatomy of your eye, your surgeon will be able to tell you more about the results you can expect from SMILE.

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Financing

Consider the yearly and long-term costs of your glasses and contacts Ask your doctor to help you understand all your vision correction options and if laser vision correction could be right for you. when thinking about investing in laser vision correction. Long-term laser vision correction may actually save you money, as well as provide you with many other lifestyle benefits with little to no need for glasses and contacts.

Glasses, contacts and laser vision correction at a glance:

	Glasses	Contacts	Laser Vision Corr
Initial Cost	Moderate	Low	High, but vari
Recurring Costs	\$\$\$\$	\$\$\$\$	\$
	 Eye exams (prescription change is the same) 	Eye exams	LVCL Eye example
	Change of frame	Replacement of contact lens	Eyedrops
Extra Costs	Broken frame	Lost lenses	
	Broken lens	 Eye infection 	
		Contact lens solution	

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PRK Clinical Evidence

Risk of dry eyes

¹Comparison of Tear Secretion and Tear Film Instability after Photorefr Keratectomy and Laser in situ Keratomileusis

Journal of Cataract Refractive Surgery 2004 Sep. Lee JB, Ryu CH, Kim J, Kim EK,

²Symptoms of Dry Eye and Recurrent Erosion Syndrome after Refractive Surgery

Journal of Cataract Refractive Surgery 2001 Apr. Hovanesian JA, Shah SS, Malor

Risk of night vision issues

³Contrast Sensitivity Measured by 2 Methods after PRK

Journal of Cataract Refractive Surgery 2000 June. Vetrugno M, Quaranta GM, N Mossa F, Cardia L.

Impacts corneal biomechanics

⁴Biomechanical and Optical Behavior of Human Corneas before and aft

Journal of Cataract Refractive Surgery 2014 June. Sánchez P, Moutsouris K, Pan

Comparatively painful

⁵Management of Post-PRK Pain

Survey of Ophthalmology 2013 Nov. Woreta FA1, Gupta A, Hochstetler B, Bower KS.

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Delayed visual recovery

ractive	⁶ Randomized Bilateral Comparison of LASIK and PRK for 2.50 diopters of Myopia
Kim HB.	Ophthalmology 1999 Mar. El-Maghraby A, Salah T, Waring GO 3rd, K
/e	⁷ Myopia Correction with Trans-PRK versus Fs-LASIK: One-Year Analysis
oney RK.	Journal of Cataract Refractive Surgery 2016 Nov. Luger MH, Ewering T S.
	Comparatively higher risk of haze
Maino A,	⁸ Risk Factors for Early-Onset Corneal Haze after Photorefractive in an Asian Population: Outcomes from the Singapore Armed Refractive Surgery Programme 2006 to 2013
ter PRK	Journal of Cataract Refractive Surgery 2016 May. Ang BC, Foo RC, Lim Nah GK, Thean LS, Tan CW, Zhao PS
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ve Keratectomy Forces Corneal

m EW, Tan MM,

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LASIK Clinical Evidence

Comparatively lesser haze risk

⁹Laser in situ Keratomileusis versus Laser-Assisted Subepithelial Kerate for the Correction of High Myopia

Journal of Cataract Refractive Surgery 2004 Jul. Kim JK, Kim SS, Lee HK, Lee IS, GJ, Kim EK, Han SH.

Almost no pain

¹⁰Comparison of Photorefractive Keratectomy with Excimer Laser in site Keratomileusis in Correcting Low Myopia (from -2.00 to -5.50 diopters) Randomized Study

Ophthalmology 1999 Feb. el Danasoury MA, el Maghraby A, Klyce SD, Mehrez

Faster visual recovery

¹¹Myopia Correction with Transepithelial Photorefractive Keratectomy v Femtosecond–Assisted Laser in situ Keratomileusis: One-Year Case-Mat Analysis

JCRS 2016 Nov. Luger MHA, Arba-Mosquera S.

¹²Comparison of Photorefractive Keratectomy with Excimer Laser in site Keratomileusis in Correcting Low Myopia (from -2.00 to -5.50 diopters) Randomized Study.

Ophthalmology 1999 Feb. el Danasoury MA, el Maghraby A, Klyce SD, Mehrez

Risk of flap complications

¹³Complications of LASIK Flaps Made by the IntraLase 15- and 30-kHz Femtosecond Lasers

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	Journal of Refractive Surgery 2009 Nov. Haft P, Yoo SH, Kymionis GD, Culbertson WW.				
ectomy	¹⁴ Flap Complications Associated with Lamellar Refractive Surg				
Seong	American Journal of Ophthalmology 1999 Feb. Lin RT, Maloney RK.				
	Risk of dry eyes				
	¹⁵ Dry Eye after Lasik for Myopia: Incidence and Risk Factors				
s). A	European Journal of Ophthalmology 2007 Jan-Feb. Shoja MR, Beshar				
	¹⁶ The Incidence and Risk Factors for Developing Dry Eye after				
r K.	American Journal of Ophthalmology 2006 Mar. De Paiva CS, Chen Z, MB, Manuel FK, Hassan SS, Wilhelmus KR, Pflugfelder SC.				
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tched	¹⁷ Night Vision Disturbances after Successful LASIK Surgery				
	British Journal of Ophthalmology 2007. Ce´sar Villa, Ramo´n Gutie´rrez Jime´nez, Jose´ Manuel Gonza´lez-Me´ijome.				
:u s). A	Impacts corneal biomechanics				
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	Cornea 2009 Aug. Kamiya K, Shimizu K, Ohmoto F.				
	¹⁹ Differences in the Corneal Biomechanical Changes after SMII				

Journal of Refractive Surgery 2014. Danyang Wang, Manli Liu, Quan Liu

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Myopic LASIK

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SMILE[®] Clinical Evidence

Lesser dry eyes incidence

²⁰Corneal Sensitivity after Small-Incision Lenticule Extraction and Laser situ Keratomileusis.

Journal of Cataract Refract Surgery 2015 Aug. Reinstein DZ, Archer TJ, Gobbe N Bartoli E.

²¹Dry Eye Disease after Refractive Surgery: Comparative Outcomes of S Incision Lenticule Extraction versus LASIK.

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

²²Dry Eye After Small Incision Lenticule Extraction and Femtosecond La Assisted LASIK: Meta-Analysis.

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

Lesser night vision issues

²³Corneal Spherical Aberration and Corneal Asphericity after Small Inci Lenticule Extraction and Femtosecond Laser-Assisted LASIK

Journal of Ophthalmology 2017 Sep. Hui Zhang, Yan Wang, and Hua Li.

²⁴Simulated Night Vision after Small-Incision Lenticule Extraction

Journal of Cataract Refractive Surgery 2016 Aug. Ang M, Farook M, Htoon HM, Mehta JS.

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YOUR TREATMENT OPTIONS

SMILE BY THE NUMBERS

Least impact on corneal biomechanics*

r in	²⁵ Mathematical Model to Compare the Relative Tensile Strengt Cornea after PRK, LASIK, and Small Incision Lenticule Extraction				
М,	Journal of Refractive Surgery 2013 Jul. Reinstein DZ1, Archer TJ, Randl				
Small	²⁶ Review of Corneal Biomechanical Properties Following LASIK Myopia and Myopic Astigmatism				
	Open Ophthalmology Journal 2018. Damgaard IB, Reffat M, Hjortdal				
audouin	²⁷ Differences in the Corneal Biomechanical Changes after SMII				
aser-	Journal of Refractive Surgery 2014 Oct. Wang D, Liu M, Chen Y, Zhang J, To CH, Liu Q.				
	Faster overall recovery				
ision	²⁸ Comparison of the Optical Quality between Small Incision Le Extraction and Femtosecond Laser LASIK				
	Journal of Ophthalmology 2016 Nov. Ying Jin, Yan Wang, Lulu Xu, To Rui Dou, Jiamei Zhang.				
	²⁹ Efficacy, Predictability, and Safety of Small Incision Lenticule (SMILE)				
l, Tan D,	Eye and Vision 2015. Chansue E, Tanehsakdi M, Swasdibutra S, McAli				

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g X, Xu Y, Wang

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Extraction

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UNDERSTANDING YOUR VISION

TREATMENT COMPARISON

TREATMENT PROCEDURES

LASER VISION CORRECTION

SMILE[®] Clinical Evidence

³⁰Comparison of Visual and Refractive Outcomes Following Femtosecond Laser- Assisted LASIK with SMILE in Patients with Myopia or Myopic Astigmatism

Journal of Refractive Surgery 2014 Sep. Ganesh S, Gupta R.

³¹Dry Eye and Corneal Sensitivity after Small Incision Lenticule Extraction and Femtosecond Laser-Assisted in situ Keratomileusis: a Meta-Analysis

International Journal of Ophthalmology 2017. Wen-Ting Cai, Qing-Yu Liu, Cheng-Da Ren, Qing-Quan Wei, Jun-Ling Liu, Qian-Yi Wang.

Enhancement – flap or surface ablation

³²CIRCLE Enhancement After Myopic SMILE

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.

³³Enhancement After Myopic Small Incision Lenticule Extraction (SMILE) **Using Surface Ablation**

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

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YOUR TREATMENT OPTIONS

Seeing beyond

