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Cataract & Refractive Surgery Today

Best Practices & Experience with SMILE

A panel of experienced users provide their thoughts on the one-step refractive surgical procedure.

John F. Doane, MD, FACS, Moderator

Jeffrey Augustine, OD

Y. Ralph Chu, MD

Gary Foster, MD

Rex Hamilton, MD, MS, FACS

Robert T. Lin, MD

Bruce A. Rivers, MD

Steve Schallhorn, MD

Bennett Walton, MD, MBA

William F. Wiley, MD

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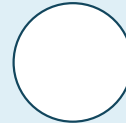
Y. Ralph Chu,
MD



Gary Foster, MD



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Robert T. Lin,
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MD



Steve
Schallhorn, MD



Bennett Walton,
MD, MBA



William F.
Wiley, MD

The ReLEx SMILE procedure, performed with the ZEISS VisuMax Femtosecond System, delivers excellent refractive outcomes with additional benefits compared to LASIK. In this minimally invasive surgery, the surgeon makes a small incision of 60 or 90 degrees and a lenticule inside the intact cornea, completing the entire procedure very efficiently on the VisuMax device. Nine eye surgeons and one optometrist sat down to discuss their experiences learning, performing, and managing SMILE at the 2020 American-European Congress of Ophthalmic Surgery held in Aspen this February.

—John F. Doane, MD, FACS

John F. Doane, MD, FACS: All of you have incorporated SMILE into your options for refractive surgery. Let's start by getting a picture of how SMILE fits into your practice today. What percentage of your corneal refractive patients have SMILE?

Y. Ralph Chu, MD: We do about 25% SMILE.

Robert T. Lin, MD: When patients qualify for both LASIK and SMILE, patients choose SMILE in about 90% of those cases.

Bruce A. Rivers, MD: From a practice perspective, we're doing about 36% SMILE, 34% PRK, and 29% LASIK. Individually, I do 46% SMILE, 39% LASIK, and 15% PRK.

Bennett Walton, MD, MBA: We probably do around 10% SMILE.

Dr. Doane: If patients qualify for SMILE or both LASIK and SMILE, they get SMILE about 95% of the time.

William F. Wiley, MD: My numbers are similar. About 90% of patients have SMILE if they qualify.

Gary Foster, MD: I do about 80 to 90% SMILE.

Dr. Doane: You've been using SMILE for some time. Did you experience a learning curve when you started? How many surgeries did you perform before you felt comfortable?

Dr. Foster: I did experience a learning curve, but I found it to be very quick. Early on, there are some subtle clues about what's going on with the lenticule that you miss in your first cases. At around four or five cases, you start to see the lenticule move under as you're dissecting. That was the biggest thing for me to learn. A lot of things are going on at once, and there is no need to see everything, but the lenticule movement is a significant change that we want to see, and it happens very quickly. I felt comfortable within four or five cases and completely ready after 20 cases.

Dr. Lin: When we started performing SMILE, we had already created over 50 flaps, as recommended by ZEISS. We were used to the low-pressure suction on the patient's eyes of about 50 mmHg, compared to 150 or 200 mmHg with other femtosecond technologies, and we were using it to make 80- μ m flaps.

When using a low-pressure suction system, which is much more comfortable for the patient and causes no 'blackout' of vision, more preoperative and intraoperative instructions by the surgeon are necessary to ensure patient cooperation. With SMILE, the challenge was to work in a pocket versus lifting a flap. Energy settings must be optimized, and it's very important to build on that skill of working in a pocket so we can avoid any stretching of the cornea cap and a difficult or prolonged dissection, which can cause stria or edema that can slow healing. I felt comfortable after a few cases, but in order to have reproducible excellence,

you have to diligently analyze your own video of the procedure and your early postoperative results. During the learning curve, we chose patients who had reasons to avoid a flap, such as those with a predisposition for dry eyes or engagement in certain occupations or sports with a higher risk of eye injury.

Dr. Rivers: I think the learning curve really depends on the surgeon's comfort and attitude. My attitude was to follow exactly what I was told to do, but if someone has a more cavalier outlook, there might be problems.

Probably the biggest challenge was to understand how the machine worked. I needed to obtain familiarity with the suction, as well as the tactile feel while in use of the machine. By the second operating day, I had a feel for the procedure and was more comfortable with its use. I was most comfortable performing SMILE after about 15 cases.

Dr. Wiley: Within the learning curve, I would separate the dissection from docking the laser. You will find that if you follow the recommended surgical technique very carefully, things go well. However, if you have not been using the VisuMax, docking can be a challenge because variables of facial anatomy—prominent noses, brows, and chin angles—affect docking. Coaching a patient through the centration process also takes practice.

As we worked through our own learning curve as surgeons, we downplayed 'SMILE vs. LASIK' and focused on 'laser eye surgery.' We told patients that they were great candidates for laser eye surgery, and we had a couple of ways we could do that. We explained that on the day of surgery, based on how the anatomy looked, we would do either flap laser eye surgery or pocket laser eye surgery. They're both great procedures. In that early learning curve, if we needed to convert from SMILE to LASIK, it was not disruptive. Patients weren't worried because they weren't sold on one thing and switched to another. They knew they'd get laser eye surgery and they'd have a great outcome. Now SMILE is building brand recognition, and some patients even request it. However, we still try not to over-hype SMILE so that we have some leeway if we need to make another choice.

Outcomes: SMILE vs. LASIK

Dr. Doane: Judging by the amount of SMILE cases you're all doing, you must be pleased with the outcomes, whether that's at 1 day, 1 week, 2 weeks, or 3 months. What results are you seeing?

Dr. Wiley: Using the newest settings with the astigmatism software, we see a lot of patients at 20/20 or sometimes 20/15. Patient to patient and eye to eye, visual acuity can vary. Sometimes we see a bubble pattern and know it's going to be a great dissection. Another patient might have a slightly different bubble pattern and a more challenging dissection. In those cases, we might achieve 20/25 or 20/30. It's no different than the

extreme things that can happen in LASIK.

I think day 1 SMILE results may be a hair shy of LASIK, but that's with a less invasive technique that produces less trauma or dry eye. We're not seeing the superficial punctate keratitis in cases where LASIK might have caused it. Patients seem to be more comfortable as well.

Jeffrey Augustine, OD: The longer the corneal lenticule dissection, the longer the visual recovery. We tried flushing versus not flushing after SMILE and didn't see a difference. That's supported by a recent paper, which showed that flushing with BSS after SMILE had no effect on outcomes.¹

Dr. Chu: We've found that with the latest software, SMILE and LASIK results are very similar. Dr. Lin taught me a technique that helps patients get better vision faster, and now, with a clean dissection, I'm expecting 20/20 or 20/25 on day 1. Some patients with tougher dissections can have slower healing, but generally speaking, recovery is good.

Dr. Walton: In the last 6 months, since we've been working at energy optimization, we've seen a big difference in terms of predicting day 1 vision. Every eye has been 20/25 or better. Those outcomes have given me a lot more confidence moving forward. In the past, when patients were familiar with LASIK and made a good fit, I would never try to change their minds. I just didn't want to invest that interpersonal capital into switching. Now that I see better vision day 1 with the new software, I'm feeling more and more comfortable recommending SMILE over LASIK for good candidates.

Dr. Lin: By optimizing the newly available energy settings and refining our techniques, we have improved our overall results, especially day 1. In a recent analysis of 178 eyes in our practice, 11% of the eyes were 20/15, 69% were 20/20, and 90% were 20/25 or better without any correction. Amazingly, when the patients were using both eyes, 33% were 20/15, 89% were 20/20, and 99% were 20/25 or better. The patients were thrilled!

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SMILE and LASIK, where we expect
20/25 or better for virtually all patients.

— REX HAMILTON, MD, MS, FACS

Rex Hamilton, MD, MS, FACS: I think we're closing the gap between SMILE and LASIK, where we expect 20/25 or better for virtually all patients.

Dr. Doane: In your experience, how does SMILE differ from LASIK in terms of biomechanical strength?

Steve Schallhorn, MD: It makes intuitive sense that biomechanical strength is better in SMILE eyes because the smaller incision cutoff with SMILE transects far fewer cornea anterior lamella, which represents the strongest part of the cornea. There is good modeling to back up this biomechanical advantage of SMILE over LASIK.

Dr. Hamilton: Yes. In one study, Dan Reinstein showed that after an equivalent ablation or lenticule thickness, LASIK eyes with a 110- μm flap retained 54% of their total stromal tensile strength, compared to 68% retention with PRK and 75% retention with SMILE using a 130- μm cap.² Those are dramatic numbers from a modeling standpoint, demonstrating the significant biomechanical advantages of SMILE.

Dr. Doane: If you're doing 300-degree, 120-micron vertical incision versus 60-degree, 120-micron vertical incision, that's going to be a huge difference. The lamellar flap itself has zero effect on biomechanical strength, but vertical side cuts through the corneal lamellae during LASIK flap creation decrease biomechanical strength.³

Dr. Doane: How do you refract to get the best results with SMILE?

Dr. Augustine: To do a meticulous refraction, we break it up into several different components. We look at the dry refraction, the autorefraction, and a cycloplegic refraction. On the day of surgery, we double-check the dry refraction, so there are five checks in total. We want to make sure that the patient fits the parameters for SMILE before we offer it as a choice. For surgery, we rely on both the subjective refraction and the dry refraction, checking to see if there is a big accommodative component there, and then splitting the difference, so we don't over-correct or under-correct. Another technique that I use is a duochrome test, which I find is spot-on within a quarter diopter separating the red from the green.

Dr. Lin: We also use red-green testing and look at a lot of different parameters, including the patient's current eyeglass prescription. Initially, our nomogram started with adding 10% to the manifest refraction, but now we add 13%. We also adjust for the patient's age. Someone who is 23 or younger will have an adjustment of 0.5 D. By making these adjustments, we've achieved an enhancement rate of 0.2% in our last 229 cases. Preoperatively, 96% had 20/20 or better best-corrected visual

acuity (BCVA), and postoperatively, 95% achieved 20/20 or better uncorrected vision at 1 month in this cohort. Amazingly, preoperatively, 4% of patients had BCVA of 20/15 or better, but 30% had 20/15 or better uncorrected vision after surgery.

Dr. Hamilton: My current nomogram adds 8% from the sphere, but I think the other thing we should look at is the standard deviation. When we look at our residual refractive error, the standard deviation is slightly smaller with SMILE compared to LASIK. The spread of the curve is tighter with SMILE. And I think that's a really important distinction to make. When the standard deviation is small, it's a good indication that a nomogram will be very effective.

Dr. Doane: A smaller standard deviation usually means that you can expect a lower enhancement rate. Dr. Lin, you mentioned a 0.2% enhancement rate. What enhancement rates do the rest of you have for SMILE, and how does it compare to your rate for LASIK?

Dr. Lin: We have 1% for LASIK and 0.2% for SMILE.

[[Speaker unknown]]: Ours is similar. In 200 to 300 SMILE cases, we've only enhanced a couple of patients. I would caution against using the enhancement rate as a metric, though, because everybody has different criteria for enhancement. But the tighter standard deviation and tighter predictability mean we're able to use a nomogram to hit the target we want.

My enhancement rate for SMILE is one third of my LASIK enhancement rate, and that's a relationship I've heard echoed over and over again. I think we can generally say that everybody seems to have a SMILE enhancement rate that's significantly lower than LASIK.

- JOHN F. DOANE, MD, FACS

Dr. Augustine: Our enhancement rate is about 2% for SMILE, but it's a little bit higher for LASIK because the LASIK population includes higher astigmatism. If we were treating the same population, the rate would be comparable.

Dr. Doane: My enhancement rate for SMILE is one third of my LASIK enhancement rate, and that's a relationship I've heard echoed over and over again. I think we can generally say that everybody seems to have a SMILE enhancement rate that's significantly lower than LASIK.

Dr. Doane: Finally, as we compare outcomes of SMILE and LASIK, how do the two differ in terms of postoperative dry eye?

Dr. Hamilton: Corneal neuralgia results from severing the corneal nerves. Obviously, a 60-degree incision severs many fewer nerves than a 300-degree incision. In a meta analysis of 1,101 eyes, SMILE caused less corneal staining and had a more rapid recovery of corneal sensation compared to LASIK.⁴

We see clinically that patients are much more comfortable with SMILE. The fact that the procedure creates the least dryness of all the laser vision correction options is a major point toward the marketability of SMILE in my experience. When I tell patients that one of the advantages is less dryness during computer time and

Obviously, a 60-degree incision severs many fewer nerves than a 300-degree incision. In a meta analysis of 1,101 eyes, SMILE caused less corneal staining and had a more rapid recovery of corneal sensation compared to LASIK.⁴ We see clinically that patients are much more comfortable with SMILE.

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screen time, that's very persuasive. It boosts word of mouth as well.

Dr. Schallhorn: I agree with Dr. Hamilton. That's a great study that shows less change in sensitivity in early postoperative period with SMILE.⁴ And that will manifest itself in a more normal blink rate and natural wetting of the cornea. Perhaps that explains the division that we're seeing in symptomatology in early postop.

I think there's an inherent, well-documented advantage to SMILE cutting fewer corneal nerves. We use 'corneal neuralgia' as a catch-all term to describe pain associated with the cornea. It's a broad category. For example, we note that corneal neuralgia occurs in the early postoperative period with LASIK and especially PRK. Central or localized corneal discomfort can occur after any corneal procedure, but long-term corneal neuralgia after refractive surgery is very rare. I've never seen it in any patient I've treated.

Educating Patients About SMILE

Dr. Doane: After adopting SMILE, how did you change the way you discuss refractive surgery options with your patients? How do you explain SMILE to them?

Dr. Walton: Our practice had always been very LASIK heavy with PRK as a backup. The conversation took a very linear path, with an occasional diversion if PRK was a better fit. Now we talk about SMILE as well, and it's changed the dynamic. There really is an art to going through appropriate education without inducing any perceived negativity through comparison. It can be a hard thing to do.

For us, it boils down to simply stating the benefits of each option and where those benefits overlap. Most patients are good candidates for either LASIK or SMILE, and some are PRK candidates as well. It's easy to listen to the patient's interests, and if we hear something such as an activity or sport for which SMILE might give them greater peace of mind, like boxing or mixed martial arts, we recommend SMILE. Flap and cap dislocations are both thankfully very rare, and it can help the discussion if we're giving the patient some extra peace of mind.

Dr. Foster: We're new enough to SMILE that my staff still can't predict when I'm going to recommend it, although it's quickly becoming clear because that's already happening 80 to 90% of the time. They just don't know where the line is yet between the two, but that will come with time.

When I see patients, my staff has already spoken to them about both LASIK and SMILE, and I'm able to make a quick decision about which direction we should go. I tell patients, 'We could do either LASIK or SMILE for you. I prefer SMILE because it allows the cornea to remain stronger, and we believe that there's less chance for dry eye, and both of those are great things. SMILE is what I would choose for myself in this situation.'

Dr. Lin: For us, LASIK recognition factors heavily into how we discuss SMILE. We've been doing LASIK for 20-plus years. Our

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patients come in because their friends and family had LASIK with us. They only know about LASIK. I tell them LASIK is amazing, and I've performed over 60,000 LASIK procedures. I then show them the differences between LASIK and SMILE using the ZEISS visual aid. They see the smaller incision with less effect on the corneal nerves and no flap. I add that we have been performing these same procedures on the cornea for over 70 years, and SMILE is the third generation of these procedures. After our discussion, almost all patients want SMILE.

Dr. Augustine: SMILE has required more communication from us in terms of educating patients and getting expectations in order. We work with so many second-generation LASIK referrals where parents and older siblings have had LASIK. The whole family already knows what LASIK is. A new procedure requires more explanation about both the science and the reason we're recommending it.

That said, our internal optometrists are highly confident about converting patients to SMILE. It's very easy. We quickly go through a flipbook with patients that explains the SMILE procedure and its benefits, as well as the potential alternatives. I explain that these are their options for cornea laser surgery. PRK has been around for decades, and it's a great procedure that we reserve for thin corneas and high prescriptions. LASIK is a two-step laser procedure where the surgeon creates a flap and does the laser correction below. I had LASIK 20 years ago, and it's still a very common procedure. I also explain that we offer the current technology, called SMILE, and after looking at their par-

ticular case, I think it is the best option.

That's it. I choose it. After a very clear, concise review that positions SMILE as the 'current technology,' patients are happy to take the recommendation. I'm teaching other optometrists to have this conversation as well. And once patients have the surgery, they tell their friends. We now have many patients who come in looking for SMILE. It has been a big practice builder.

Dr. Lin: When I recommend SMILE to a patient, I often explain how the risk of postoperative dry eye symptoms after LASIK factors into the choice. Since LASIK affects more corneal nerves, corneal sensation is reduced more than in SMILE. With less corneal sensation, there is less blinking. The corneal surface is not replenished as much, and there is decreased tear production. I find that for about 10% of LASIK patients, these symptoms are significant for up to 6 to 12 months, even with tear film optimization treatments. That is why I only recommend SMILE for my relatives who qualify for both procedures. Before astigmatism treatment was approved for SMILE, many patients that had LASIK in one eye and SMILE in the other eye reported that their SMILE eye felt more comfortable during, immediately after, and the first few months after their procedure.

I also like to set expectations for their vision after surgery. I tell them that all SMILE and LASIK patients find their vision is about 80% the next day, 90% at 2 weeks, and 100% at 6 months. Until they reach 100%, they will need to be more careful about certain things, including night driving. After surgery, patients are happy because they know the imperfect vision is temporary and will get better. They give us five stars in their reviews because we have set proper expectations.

Dr. Rivers: I think you have to know your population. In the military, I had PRK—not by choice, but because the war was ramping up, and they were just trying to get everybody through. We didn't have an option. A lot of my patients are worried about the flap with LASIK. I tell them that I've only seen three flap dislocations in the past 10 years, but they still have concerns because they don't know where they will be in a few months, and they want to minimize the risk. I don't make a distinction in terms of outcomes—their outcomes will be great no matter what they choose—but SMILE has no flap. These folks often choose SMILE.

Preparation for Referring Optometrists

Dr. Doane: What role do your referring optometrists play in this process? How do you get the conversation started with optometrists that have never seen, recommended, or comanaged SMILE?

Dr. Chu: Our practice works with a large group of optometrists. We teach them about SMILE and help them educate their patients. They see a large population of patients who wear contact lenses in front of a computer all day, and

SMILE represents a big opportunity for them to re-engage in medical-surgical care for those patients. That's particularly beneficial with all the business challenges facing optometry practices now.

We've emphasized the practice advantages to our optometrists to get them engaged in this pipeline to surgical treatment. We do small and large courses and programs—a standard approach that's been very effective. That gets the procedure in front of them. It has also been very effective to do small seminars with ODs and invite them to watch a live surgery.

Dr. Hamilton: Inviting ODs to observe SMILE has been effective for us as well. We've even had them watch their patients and colleagues have the procedure. Seeing the speed and gentle nature of the SMILE procedure in person is dramatic.

Dr. Foster: We bring in one OD at a time so we can talk one on one during the procedure. They're blown away by how fast SMILE is and by patients saying that they don't feel anything. After surgery, we look at both eyes in the slit lamp. They look at the eye 5 minutes after I touched it, and they can't believe how clear it is. In one eye, they might see a few little bubbles. I say, 'I want you to take a look at this eye tomorrow morning. The bubbles will be gone.' When our optometrists watch the surgery, see the eyes immediately afterward, and then follow through on

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the case 1 day postop, that seals it for them.

Dr. Augustine: When ODs see their first SMILE patients the day after surgery, that cements their decision to get involved. And their patients are very happy. They leave the surgery center, seeing other patients wearing shields after LASIK. They have no shields and no tape on their faces, and they can wear makeup and return to normal activities the next day. Their satisfaction encourages optometrists to embrace SMILE.

Dr. Wiley: The easy recovery is especially important to me when we're comanaging from a distance. I can be a little anxious with LASIK because if a flap slip happens on day 1, that patient has to ride up to 2 hours to come back to the practice. SMILE has no flap, so I'm more confident. If we could have SMILE for all patients, I would sleep easier at night, knowing that there will not be a problem on day 1. We sometimes use brimonidine (Lumify, Bausch + Lomb) at the time of SMILE for patients with smaller pupils—which we couldn't do with a LASIK flap—so patients might even walk out with brighter eyes than they had before surgery. There's no shield, no pain, no red-eye injection, and no flap. Their family members are amazed, and so are ODs who have seen many post-LASIK eyes.

Dr. Doane: Beyond educating ODs, are there any other steps you need to take to prepare them for SMILE?

Dr. Augustine: Some external ODs who refer patients for refractive surgery do not have the preoperative diagnostics in their practices to determine which laser vision correction procedure is best for their patients. It's best to keep the surgical procedure of choice neutral before we see patients, because they may not be candidates for SMILE.

When patients come in, a diagnostic evaluation is performed to determine what procedure is best for them, and then we refer them back to their primary optometrist. I communicate the preoperative diagnostic information with the comanaging doctor and point out the parameters of SMILE, LASIK, or PRK with my referral for which procedure is best.

Preoperative Planning for SMILE

Dr. Doane: You're all doing a lot of SMILE. Which patients are candidates for the procedure, and when do you recommend another approach?

Dr. Rivers: I would perform SMILE on any patient who qualifies for LASIK and fits the indications (sphere: -1.00 D to -10.00 D; cylinder: -0.75 D to -3.00 D; MRSE up to -10.00 D). If the cornea is too thin, then PRK is the safer procedure.

Dr. Schallhorn: I agree. I wouldn't do SMILE on a patient who would not qualify for LASIK. Assuming patients qualify for LASIK and meet the refractive indications for SMILE, I usually recommend SMILE, particularly if an occupation or activity

creates some concern about dry eye or the patient voices concern about a flap.

Dr. Augustine: Our surgeons do about 90% SMILE, but the most common reason we recommend LASIK is that a patient exceeds 3.00 D of cylinder. I slightly disagree with the qualification for LASIK because I recommend SMILE to patients who are not candidates for LASIK if there are tissue concerns or abnormal corneas. As we discussed, SMILE patients maintain far more total stromal tensile strength than patients who have LASIK,² so I recommend SMILE to maintain the cornea.

Dr. Doane: *Once you've identified a candidate and the patient is on board, how do you approach preoperative planning and preparation with SMILE? Is it different from LASIK? Does SMILE interfere with your surgery day?*

Dr. Chu: I don't think there's a huge shift in preoperative planning compared to LASIK. The workup is the same standard workup. On surgery day, I find that SMILE is a much smoother, more efficient procedure than LASIK because it's done with one laser. It's much faster.

Dr. Wiley: Yes, there's really no downside as far as planning or efficiency. It's the same LASIK mindset. Planning is the same. On surgery day, there is a little more talking to patients beforehand, letting them know what to expect during the procedure. They shouldn't move or make sudden eye motions, for example. I introduce the person assisting me. Those things take a few moments, but then the procedure goes very smoothly.

Dr. Foster: I think reducing patients' anxiety on surgery day is paramount. I explain what they're going to see and feel during the procedure, so when it happens, they'll know it's normal. I will gently put a cone on the eye. They will see a white ring and green dots that slowly fade away over 26 seconds. The cone will come off, they will see a few shadows for another 2 minutes, and then it will be complete.

I also take patients from the exam room to show them the laser. I explain to them, 'This is the laser we're going to use for your procedure. If you were having LASIK, it would require two lasers. This procedure has no smells, no sounds, and just one step.' All that preparation reduces their fears and anxiety.

Dr. Doane: *Do you do anything differently than you do with LASIK in terms of oral or topical anesthesia?*

Dr. Wiley: Yes, we have done a few things differently. We've increased oral anesthesia beyond our typical dose any time we think that a patient is particularly nervous and may have trouble staying still during surgery. Our normal 10 mg dose of diazepam for SMILE might go to 15 mg or sometimes 20 mg. In general, we want our SMILE patients slightly more sedated than LASIK.

We are attuned to patients who have a higher baseline anxiety level, and we make sure we address that prior to the procedure. Topically, we now use a one-third strength preparation diluted with BSS. One or two drops of that have been very sufficient to cover any feeling, so it's less traumatic.

SMILE Staffing and Surgery Day

Dr. Doane: *What about your surgical staff? Have you needed to do any additional training for SMILE? Does this correlate to their excimer laser training?*

Dr. Walton: Once the laser technician knows how to program your laser, you're ready to move ahead with the SMILE. The system is easy to use. It utilizes a simple set of numbers with few variables. Having no calibration is huge. With an excimer laser, good results depend on the quality of the calibration. We have to put a lot of trust in it. If there's something in the mirrors or there's an artifact, it can show up on calibration, but if not, it affects your whole day of LASIK. With SMILE, you can feel even more confident.

Dr. Wiley: I think it's a matter of getting to know the laser itself, from the standpoints of both the technician and the surgeon. It just takes some experience, and then you're good to go. I love your comments about the calibration tool, which is such a critical component of the excimer laser. The amount of tissue removed with each pulse is compounded over hundreds or

With traditional LASIK, we had one staff member assigned to the excimer laser and one at the femtosecond laser. Having one fewer technician with SMILE is spectacular. It's much easier to bring that person up to speed on the VisuMax compared to our other lasers.

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perhaps thousands of pulses. I think that perhaps the absence of that factor explains some of SMILE's predictability.

Dr. Doane: SMILE is also using a single laser, so there's no femtosecond laser first, excimer laser second, and transition time between the two.

Dr. Foster: With traditional LASIK, we had one staff member assigned to the excimer laser and one at the femtosecond laser. Having one fewer technician with SMILE is spectacular. It's much easier to bring that person up to speed on the VisuMax compared to our other lasers.

Dr. Doane: How does surgery day for SMILE compare to LASIK?

Dr. Rivers: It's much faster. Our staff get excited because they like it for our patients, and we don't have to move patients. Now that we do more SMILE than anything else, it makes my day go by much faster.

Dr. Lin: My experience is similar. I really enjoy seeing my

It's a world of difference—a completely different procedure from when SMILE began. We can now correct astigmatism, so we've moved beyond the limited scope of SMILE to treat those patients as well. And most importantly, the energy settings promote much faster healing and recovery, which in turn means patients have a more pleasant postoperative period.

- WILLIAM F. WILEY, MD

surgical schedule come out with a lot of SMILE cases because I know it's going to be a very efficient day.

Dr. Chu: We see better vision, faster recovery, and the ability to treat more patients with SMILE. With the laser's new parameters, we have been able to drop to lower ranges of correction. Now we're very comfortable down to -2.00 D in our practice.

Dr. Wiley: It's a world of difference—a completely different procedure from when SMILE began. We can now correct astigmatism, so we've moved beyond the limited scope of SMILE to treat those patients as well. And most importantly, the energy settings promote much faster healing and recovery, which in turn means patients have a more pleasant postoperative period.

Postoperative Care and Comanagement

Dr. Doane: What are your postoperative instructions for SMILE?

Dr. Foster: They're quite similar to LASIK. We're not as concerned about trauma in that first week, so we don't have to emphasize that risk quite as much.

Dr. Chu: It's less and less disruptive to patients' lives. There are no shields, and patients can wear makeup right away. Everybody can pretty much return to their normal activities. We do restrict swimming for 2 weeks to help avert infection.

On the pharmaceutical side, I prescribe an antibiotic QID and a steroid QID the first week, as well as BID the second week. If I find that the outcomes are not optimal at day 1 postop—for example, 20/30 to 20/50—then sometimes I use sodium chloride (Muro 128, Bausch + Lomb) at night for the first week to boost the healing process.

Because SMILE doesn't have the risks associated with a LASIK flap, I'm comfortable performing surgery on Saturdays and not seeing the patient until Monday. It lets me safely offer the convenience of Saturday surgery to my patients.

Dr. Doane: What's the time frame for follow-up visits? When do you transfer care for SMILE patients back to the referring optometrist?

Dr. Walton: I see patients immediately after surgery, and then either the referring optometrist or I see them at day 1 and week 1. After that, I'm comfortable waiting several months for a visit.

As we're deciding when to return patients to their optometrist, we have to consider the optometrist's comfort level. Optometrists who have not seen SMILE patients postoperatively will find that eyes look different from what they've seen with LASIK. Instead of a prominent incision edge, they see an obvious

interface after SMILE.

As we discussed, it really helps for our comanaging optometrists to observe SMILE surgery and take day 1 postop visits with us. We show them what the cornea looks like, how to identify a superior incision, and where they might see some bubbles. The improvement in incision size and risk can give them peace of mind, and they can know what to expect and how signs like bubbles will diminish. Then they feel comfortable with postoperative care. We can transfer care to them right after I have examined the patient postop.

Dr. Lin: I see patients on postop day 1 and usually at 1 week, and then I send them back to the primary optometrist. I want to make sure that the patient is doing very well before making that handoff.

Dr. Foster: Traditionally, I see patients before they leave the room and make sure everything looks good, and then they come back on day 1. At that point, they can return to the referring doctor.

Dr. Doane: We've talked about the very low enhancement rates for SMILE, but on the rare occasion you need to enhance, what's your approach?

Dr. Wiley: I prefer to do a modified circle technique where I turn the cap into a flap, lift, and treat. I've had good success converting the cap to a flap. I don't need to worry about the epithelium or remodeling, and the outcomes have been very predictable. The exception is if the patient originally chose SMILE to avoid a flap. In those cases, we do PRK.

Dr. Hamilton: I do PRK. The results are very predictable.

Dr. Walton: It's our preference to do the modified circle, but we will do PRK if we have already removed a lot of tissue because we don't want to weaken the cornea with a flap.

Developing a SMILE Nomogram

Dr. Doane: Where does a nomogram fit into the process for SMILE? Steve, you've been involved in this for many years—can you explain how it improves outcomes?

Dr. Schallhorn: We're familiar with using algorithms that determine what the laser will deliver internally for a given correction. The nomogram is an adjustment that we make to fine-tune our outcomes. The only way to determine if a nomogram would be helpful is to diligently obtain accurate preop and postop refractions and acuity measurements in a reasonable sample of patients. I would caution that if you have poor data or do not analyze it carefully, you could create a nomogram that produces worse results.

You can use good data to calculate whether a nomogram

would be of value. In many cases, particularly in high-end practice referrals, that is the case. For SMILE, a nomogram generally requires an increase in the treatment plan.

Dr. Doane: Which numbers from a SMILE procedure do you use in a nomogram? Are you using Datagraph or other refractive surgery outcome tracking software?

Dr. Wiley: We worked with ZEISS to tabulate 50 cases, and then they analyzed that for us and generated the nomogram. In general, it seems that we're adding between 5 to 10% to the sphere and reducing the cylinder a nominal 2%. What's interesting is that there seems to be some reverse coupling of astigmatism: the more astigmatism we need to treat, the more we have to add to the sphere.

Dr. Lin: I was adding between 5 to 10% to the sphere, but with a new nomogram, we increased to 10% and then to 13%. We had ZEISS develop a nomogram for us at first, but then we decided to purchase the same program, Datagraph-med, ourselves in order to more efficiently update the nomogram and analyze data. I would recommend that surgeons starting SMILE should add 5 to 10% to the sphere.

Dr. Rivers: We haven't used a nomogram at all in almost 3 years of doing SMILE. We use a subjective manifest refraction. We have two refractive optometrists that I trust inherently. We also typically get an iDesign scan (Johnson & Johnson Vision) to fine-tune the refraction.

Dr. Augustine: There are a lot of variables involved in achieving a great outcome. We talked about red-green refraction, which I think is important, as well as accommodation differences. Dr. Wiley evaluates at the time of surgery, makes the nomogram adjustments, and does the final treatment. In the end, the approach is very conservative because if the patient requires an enhancement procedure, we'd prefer a myopic eye.

[[Speaker unknown:]] There are some finer points to this calculation as well. First, the plan depends not only on how you refract, but also where you refract. If you refract in a 4-meter lane, you're not doing the extra quarter, which could affect outcomes. Second, along with refraction, we have a target. In 25-year-old patients, I target a little bit of hyperopia. We have some wiggle room to make that adjustment.

Dr. Doane: What would you tell colleagues who are considering performing SMILE?

Dr. Schallhorn: Wherever possible, surgery is moving toward smaller incisions. SMILE has that advantage. The incision is smaller than LASIK, and patients get all the benefits we've discussed from that difference. I think that inherent advantage is what will make SMILE the dominant refractive procedure in the

future. Added to that, the VisuMax is the best flap maker in its class, with the soft docking station, the curved interface, and the patient comfort we seek. This device allows us to optimize LASIK flap as well as offer SMILE. ■

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