

# Astigmatism Management: Inside the Mind of the Cataract Refractive Surgeon



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**Today's cataract surgery patients often desire as much freedom from spectacles as possible. If our goal is to provide optimal postop outcomes for patients in this new era, astigmatism management needs to be part of the cataract surgeon's procedural mindset for every patient, at every stage.**

**Robin Vann, MD:** I'm pleased to have an incredible panel of experts here to discuss a topic we're all passionate about as cataract surgeons—astigmatism management. This is a phrase used frequently in our specialty, but without a consistent definition. As such, depending on experience or perspectives, this will mean very different things to different people. Often the term "astigmatism management" is used in conjunction with specific techniques or technologies being discussed. With our specialty increasingly shifting a focus toward "refractive outcomes," discussions around the latest techniques or technologies for managing astigmatism are certainly warranted, but often overlook the most important variable in the equation—the surgeon's mindset. What does "astigmatism management" mean to cataract refractive surgeons? How do they view its role in their surgical procedures? How might their perspective differ from "traditional" views of cataract surgery?

Although all of the experts here have unique experiences, preferences, and techniques for managing astigmatism at the time of cataract surgery, their fundamental passion, understanding, and respect for this topic is the shared denominator we wanted to explore in this discussion. Fundamental changes in our specialty are not driven by technology; change starts with the surgeon. The mindset we share on this topic—viewing astigmatism management and cataract surgery as inseparable functions—is one we arrived at from different routes. Many residency programs today are now embracing this view, but the majority of cataract surgeons in practice did not have this type of initial training and are having to evolve their mindset and approach to astigmatism in practice.

This discussion is intended to put specific technologies and brands aside in order to dive deeper into the thought-leaders' mindset on astigmatism management. In doing so, we hope to help others who may be looking to better understand astigmatism management's position and importance in the "outcomes era" of cataract surgery.

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Astigmatism management is the foundational bridge for transitioning from cataract surgery to cataract refractive surgery.

### The Astigmatism Management Mindset

Define “astigmatism management” as it relates to cataract surgery and why it is important.

**Dr. Vann:** It is important for several reasons. Due to the rise in popularity and the success of refractive surgery, patients think that any major eye surgery is going to give them greater freedom from glasses, and many patients already have that expectation when they come to see physicians. We need to find ways to help patients achieve clearer and sharper vision without glasses at the end of surgery, or we are going to disappoint our patients. In the old days of cataract surgery, the goal was just to remove the cloudy lens and restore clear sight for the patient. Providing optimal vision with less need for glasses or no need for glasses after surgery was never a goal. As LASIK started to become a very popular procedure, patients assumed that ophthalmologists could also achieve spectacle independence with cataract surgery.

However, there is no way to achieve spectacle independence if surgeons are only addressing whether a patient will be nearsighted or farsighted after surgery without considering astigmatism. These are the 2 orders of magnitude that we need to pay attention to when we are caring for patients with cataracts.

**Bonnie An Henderson, MD:** The words “astigmatism management” have become synonymous with refractive outcomes for routine cataract surgery. A decade ago, cataract surgery just consisted of removing a cloudy lens and replacing it with a clear one. Patients always needed to wear glasses for either just near vision or near and distance vision. That was the norm, and it was accepted by both health care providers and patients. The biggest change over the past decade has been that for many patients and surgeons, the purpose of cataract surgery is no longer just to remove the cloudy lens; it is also to try

to provide patients with some independence from glasses, which can help them be more active during their senior years. Because of patients’ growing desire to be free of spectacles post-surgery, we have to address not only refractive error but astigmatism as well. Every cataract surgeon should be considering astigmatism management for every single one of his or her cataract surgeries to deliver true refractive outcomes.

**John Berdahl, MD:** Astigmatism management means identifying patients who have astigmatism prior to cataract surgery and who would likely have clinically meaningful astigmatism after surgery. Once you have identified those patients, astigmatism management is doing the appropriate pre-operative testing, the appropriate surgical planning, and the correct surgery with the correct intraoperative tools, and then having a strategy to treat any residual astigmatism after surgery.

**John Hovanesian, MD:** Managing astigmatism is essential for patients to experience the highest level of satisfaction during and after cataract surgery. We conducted a study about a year ago that assessed patients 2 months after their final cataract procedure, and we looked at what factors correlate with the highest level of satisfaction, which is what we are hoping to achieve.<sup>1</sup> We found that the correlation was highest with astigmatism correction. When patients had their astigmatism corrected within 0.5 D of sphere, there was an 80% chance of achieving the highest level of satisfaction. That dropped to about 56% for patients who had more than 0.5 D of astigmatism after surgery. In other words, if all factors are taken into consideration, that one factor correlated most strongly with patients rating their happiness at the highest level. For me, the take-home message from this is that you have to think about astigmatism correction in every patient approaching cataract surgery,

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whether or not they choose to pay extra to correct it by using a toric lens or laser or manual astigmatic keratotomy.

**When a thought-leader like you says or thinks, “I am passionate about astigmatism management,” what does that mean exactly? Where does that mindset come from? Why doesn’t everyone have that philosophy as it relates to cataract surgery?**

**Dr. Vann:** If the surgeon is passionate about astigmatism management, that can change patients’ mindset about their astigmatism. Some of these cases empower you to show patients that you can make their lives better and they may not even realize it. There is satisfaction in being able to do that from a short outpatient procedure. It doesn’t make your surgery any more dangerous or difficult, so why wouldn’t you want to do that for patients? You can change their vision for life. It’s very powerful. We went into medicine to improve people’s lives, and

this is one of the ways that we can do that for people without them even realizing it. When I talk to other physicians privately, the choice of whether or not to manage astigmatism in every patient often comes down to remembering to think about it when they are assessing the patient at the time of cataract consultation. On many occasions, they just don’t take the time to add that step to the consultation and planning of the procedure. Unfortunately, that is the mindset of a lot of surgeons. I’ve had to convince our residents and fellows who rotate through my service that this can and should be one of the fundamental components to developing a plan for cataract surgery.

**Dr. Henderson:** I think about it in multiple layers. I always operate on the steep axis, which means that I’m always thinking about astigmatism for every single cataract patient, regardless of the type of lens he or she chooses. I do that because a lot of patients have some

amount of astigmatism. Some patients only have a small amount, and some have a large amount. If you don’t pay attention to the astigmatism that is already pre-existing on the cornea and you make an incision on the flat axis, you are inducing more flattening and therefore inducing more refractive astigmatism error at the end of the case. Unless you are thinking about it, you may inadvertently cause patients to have worse uncorrected vision than they would like or than you would like. For every patient, I always look at the corneal astigmatism, and I think about where my incision is going to be made. I think about the magnitude of the astigmatism, and that always comes into play when we are talking about lens options and corneal incisions to decrease the amount of astigmatism.

**Dr. Berdahl:** All patients have a right to understand how they could use their eyes after cataract surgery. When I am describing the treatment options to a patient, the first thing I need to do is understand his or her postoperative goals. If the goal is to have good vision while wearing glasses after surgery, then the astigmatism can be managed with glasses. If the goal is to be independent of glasses after surgery, then I need to try to remove that astigmatism.

**Dr. Hovanesian:** Many surgeons who do not focus on astigmatism correction feel like that’s OK. If you don’t see that you have a problem, you don’t have the opportunity to correct it.

## **Journey to Current Approach to Astigmatism Management**

**How did you become aware of the importance of astigmatism management?**

**Dr. Vann:** When I was aiming for a certain prescription after surgery, I started to realize that the formulas don’t take astigmatism into account. If you don’t start paying attention to astigmatism, you can get a patient to zero sphere, but he or she can still have a lot of residual astigmatism after surgery, resulting in blur and distorted vision. Patients like this will still need to wear glasses after surgery. It defeats the purpose of aiming for this goal if the patient is still going to end up wearing glasses. Depending on the amount of astigmatism and where it is located, the patient can have very poor vision at all ranges. It’s not just blurred for distance or blurred for near. Their vision will be blurred at every point of focus.

**Dr. Henderson:** I became aware of it when I made the transition from an academic practice to a private practice. During the first half of my career, I was at an academic institution, and the patients were not as demanding. Many of them had very severe cataracts. They either did not have previous health care or they just had lower expectations. In that institution, the focus was on the actual specifics of the cataract surgery. My main role in the academic center was teaching cataract surgery to residents, who were just trying to get through the case safely

without breaking the posterior capsule. For them, little nuances like astigmatism management were not high on their radar. At the time, I didn't care much about astigmatism management, but when I transitioned to a private practice, the patients' demands were much greater. Those patients expected a perfect outcome. They want their eyes to look white and quiet after surgery, and they don't want to wear glasses. For that reason, I became more acutely aware of postoperative refractive error. Second, I started learning a lot from more experienced senior ophthalmologists. **Jim Gills, MD**, is a mentor of mine in regard to astigmatism management. He has performed tens of thousands of cases and has always been very interested in astigmatism. He and I collaborated on a textbook for astigmatism management, and from writing that textbook together, I learned a lot about astigmatism and how to combat it in multiple ways.

#### **Has there been a specific case or patient who changed your mindset?**

**Dr. Vann:** I wish it was just one case. As surgeons, we always remember our bad cases and rarely remember our good ones. I have an example that not only gave me a sense of how important it is to address astigmatism, but also highlighted the fact that I am always learning and trying to become better. One of my patients was the relative of a colleague, and this patient traveled a great distance to come see me. I looked at the patient's astigmatism before surgery, and

I assumed that my incision would have a small effect and the patient would have very little residual astigmatism. I ended up worsening the astigmatism and leaving the patient with poor vision. The patient ended up having to wear glasses for that eye. This case taught me that it is not just how much astigmatism a patient has but where it is located and how the incision affects the astigmatism. I have started digging deeper into how I look at someone with astigmatism.

**Dr. Hovanesian:** Not that long ago, I had a patient with a high degree of astigmatism (about 2.5 D). He came to me for cataract surgery, and postoperatively, he was sobbing because he was so happy with his vision. Years ago, he had gone to LASIK consultations and was told that his astigmatism couldn't be corrected. On the day after cataract surgery, he had uncorrected vision of 20/20, and this was life-changing for him. For many patients with lesser amounts of astigmatism, it's not quite the same experience.

**Dr. Berdahl:** For me, there was no specific case. I have always thought that astigmatism mattered. I am a relatively young surgeon, and I have practiced all of my career in an era of toric lenses. I have felt from the very beginning that we should understand how much astigmatism a patient has and that it is part of our duty as physicians to let patients know their options.

**“ Many surgeons who do not focus on astigmatism correction feel like that's OK. If you don't see that you have a problem, you don't have the opportunity to correct it. ”**



—John Hovanesian, MD

#### **As it pertains to cataract surgery, how were you initially trained to think about or approach astigmatism management (if at all), and how would you train a resident today?**

**Dr. Vann:** During my training in the late 1990s, I was not trained at all in astigmatism management. Although some surgeons were doing it and were talking about nomograms for taking care of astigmatism, it was not something they wanted residents to do. To be honest, I don't think the faculty members were addressing it either. They didn't feel comfortable teaching us something that they weren't doing themselves. When I graduated in 1998 and started at Duke, I became a more cataract-focused surgeon. Now, my practice is exclusively focused on cataract surgery. I made the decision to start addressing astigmatism in my practice to try to get patients better quality vision without glasses. I make sure

that residents who rotate with me learn astigmatism management. Beginning residents are in the operating room as well as the clinic with me, and as we see patients together, I share my viewpoint on taking care of the whole patient. I am always looking at astigmatism. Whether a patient is interested in me taking care of his or her astigmatism or not, I am looking at it. I try to think about how to approach it, and I share my strategy with residents. The introduction of toric lens implants amplified the interest both from residents and from my perspective because it expanded my range of ability to address astigmatism. It also elevated my level of sophistication of astigmatism treatment. When residents have their own cases later in their residencies, they tell me that they are excited to implement what they have learned about astigmatism management. At this point, I can fine-tune their thinking because it drives

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—Robin Vann, MD



it home much more when they are leading the surgery instead of observing me doing the surgery. Now, every resident that comes through our program and rotates with me considers astigmatism management as integral to cataract surgery. In our minds, the 2 are inseparable.

**Dr. Berdahl:** I was trained at Duke University and Minnesota Eye Consultants, both of which do a good job understanding the refractive needs associated with cataract surgery, so I was lucky in that regard. Today, as I train our fellows, we look at the astigmatism in every single patient. We let patients know that they have astigmatism and that we can fix it either at the time of surgery or afterward with glasses.

**Dr. Hovanesian:** During my residency, I wasn't trained to think about astigmatism. I finished my residency training in 1996, and it

wasn't commonplace to correct astigmatism. We didn't have toric lenses, and only a few surgeons around the country were performing limbal relaxing incisions. In private practice, I learned very quickly from my forward-thinking colleagues that this was a great opportunity to build my practice and to make patients thrilled with their results. I also learned that astigmatic keratotomy is a very easy procedure either with a laser or with a diamond blade. It is so easy for an accomplished cataract surgeon to adopt astigmatism management that everyone should do it.

**Dr. Henderson:** I didn't receive any training on astigmatism management as a resident. We barely even discussed astigmatism. We learned about it for approximately a week when we started residency in relation to prescribing glasses, but not in regard to cataract

surgery. I would train residents very similarly to the way that I perform surgery today. I would make sure that they understand that astigmatism is an important factor for all patients. They must think about where they are making their incision, and they have to think about the architecture of their incision as well. They also have to think about what the postoperative outcome will be if they don't correct the astigmatism, and if they do correct the astigmatism, they need to consider how they are going to correct it. Many factors should come into play when they really start thinking about outcomes.

## **Incorporating Astigmatism Management Into a Modern Practice**

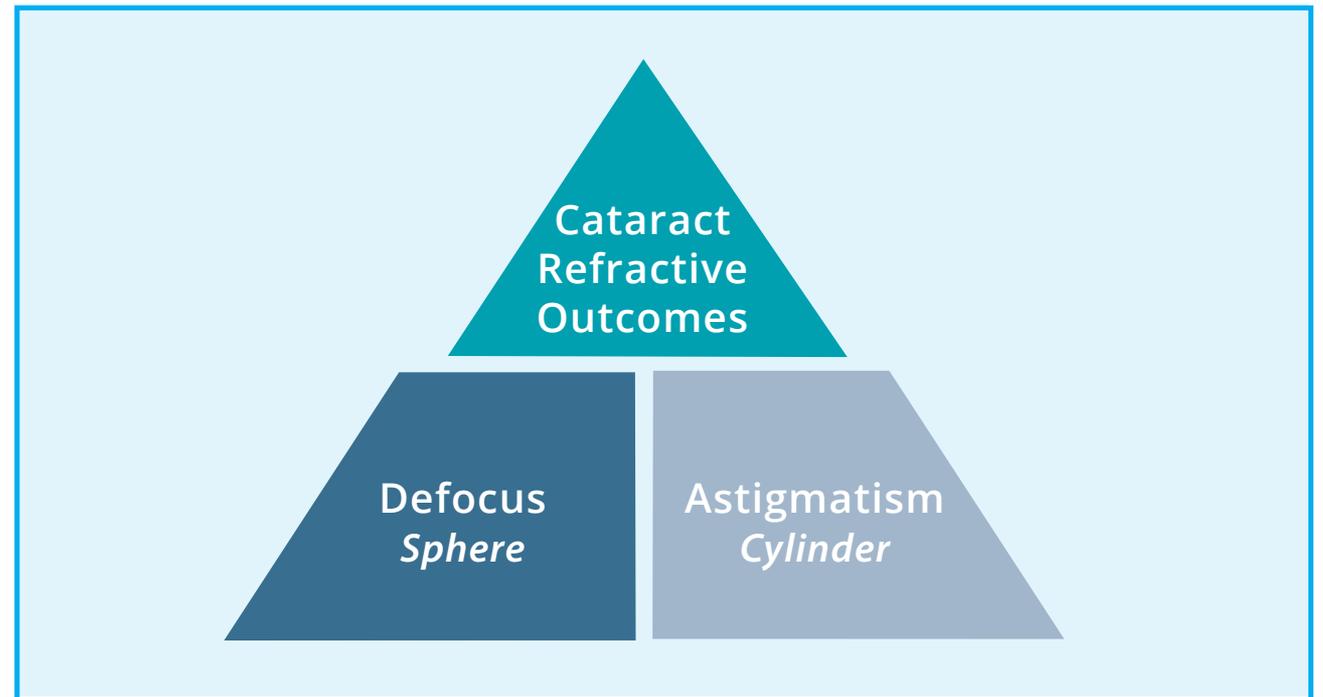
### **How have you incorporated astigmatism management into your practice?**

**Dr. Vann:** Every practice and every surgeon has to decide for him- or herself how to incorporate astigmatism management into the scope of practice services. For me, it has been a continual evolution. I have evolved to the point that now I am always thinking about astigmatism management for every case. I may not always be able to treat it surgically, but I am always thinking about it. For example, being in a tertiary referral center, I have some tough cases referred to me where they have limited central visual potential after cataract surgery. If all I have to do is move my incision from 180 degrees to 160 degrees to reduce

the astigmatism, why shouldn't I do it? My standard of care has evolved to the point that I am always thinking about astigmatism as part of my surgical plan. Whether patients elect to consider options is completely up to them. Several years ago, I treated a gentleman who had cataract surgery elsewhere about 3 years before I saw him. He had 2 or 3 D of astigmatism, and the surgeon who did his cataract surgery on his first eye didn't offer a toric lens implant, nor did he reduce his astigmatism. When he came to me for the second eye, which had almost 2 D of astigmatism, I told him that a toric lens implant would be best for him, and he asked if he would still have to wear glasses for the astigmatism in his other eye. I said, "Yes, but if you're caught in an emergency without glasses, at least you'll have one eye with which you can see well." Then I offered to do arcuate incisions, and he agreed. He ended up 20/20 in that eye. About a month or 2 postop, he asked if I could do the same thing on the first eye that the other surgeon operated on. We pushed it off for a couple of years, but I ended up doing an arcuate incision in his other eye because he realized how much better his vision was by reducing his astigmatism. He wasn't thinking about that and neither was his previous surgeon. I helped change that mindset, and he ended up being able to see very well at distance without glasses after surgery.

**Dr. Henderson:** Preoperatively, I do topography on a patient to look at the corneal regularity as well as the astigmatism. I also always do autokeratometry, manual keratometry, and noncontact biometry, so I do 4 different measures of corneal astigmatism. Those are done preoperatively for every single patient. Intraoperatively, I manage the astigmatism in a variety of ways. Depending on the amount of astigmatism, the patient may not need any intraocular correction. I may just operate on the steep axis for a small amount of astigmatism. I may do corneal incisions in order to decrease the amount of corneal astigmatism. Or I may choose to implant a toric intraocular lens. Ultimately, if patients have high levels of astigmatism, I augment 2 different modalities, such as a toric IOL combined with corneal incisions during surgery. Postoperatively, if they still have any residual astigmatism, I may enhance it with either laser refractive surgery or manual incisional astigmatism correction.

**Dr. Berdahl:** I wasn't trained in manual astigmatic keratotomy (AK), so I never felt very comfortable with that. However, I felt comfortable with low-power toric lenses. Then, with the advent of the femtosecond laser, the more artful manual AKs became more reproducible AKs, so I started performing AKs with the femtosecond laser. The other incredibly important tool for us is intraoperative aberrometry. This is critical because it provides information that is not easily



The cataract refractive mindset is built on a foundation that addresses defocus and astigmatism in every patient.

obtainable such as the posterior corneal curvature in its wavefront. It also includes the surgically induced astigmatism because the incision has already been made, and I feel that more variability comes from surgically induced astigmatism than most surgeons realize. So, the 2 big technological advances that have helped me better manage astigmatism in my career have been femtosecond AKs and aberrometry; however, the most important tool to correct astigmatism is the toric lens, which has been available for my entire career.

**Dr. Hovanesian:** On the initial cataract consult, my staff measures keratometry, so we have an idea of the level of corneal astigmatism the patient has. This allows me to discuss astigmatism correction with patients during the initial conversation. I explain that we are already performing steps of the procedure,

and the insurance company is already paying for the surgery center and the anesthesia and my time. It doesn't take much more to take the patient's vision to a higher level by correcting astigmatism. I educate patients about astigmatism management from the beginning. In my practice, about 80% of patients elect to have their astigmatism corrected. All cataract surgeries are refractive procedures because we target a certain visual outcome, but about 80% in my practice are also astigmatism correcting. If we are planning surgery, we rely on topography and keratometry as measured by an optical biometer, and I use those numbers to generate my plan for astigmatism correction.

**How are you approaching patients and educating them about astigmatism management?**

**Dr. Vann:** Currently, when a patient comes to me for

cataract evaluation, we take measurements of the cornea early on in the process, usually as part of his or her preparation for cataract surgery. Once patients are dilated and ready to see me, they have already gone through a tablet-based tutorial program that discusses cataract surgery in general and options related to cataract surgery, including astigmatism management. When I first meet with them, we discuss their need for cataract surgery, and I explain all of their options. I start by explaining the importance of quality of vision and how astigmatism can affect quality of vision. If patients have a great deal of astigmatism, I will lean toward one modality over another modality, but I tell them that I am going to be addressing their astigmatism as part of the cataract procedure.

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**Dr. Berdahl:** I am approaching patient education very simply and not technology focused. We simply say, "How do you want to use your eyes after cataract surgery? Would you prefer to wear glasses for everything you do? Would you prefer to not have to wear glasses much for distance but still use reading glasses? Or would you prefer to not have to use glasses much at all?" Based on their answer, we will help guide them through their options and determine whether the cost of astigmatism correction is worth it to them.

**Dr. Henderson:** Fortunately, the majority of patients understands or at least has heard of astigmatism, so I am not starting from scratch. I explain that their corneas are not perfectly round and spherical and that they have an area in their cornea that is steep and an area that is flat. In order to correct their vision as well as possible, the IOL or the corneal incisions can help decrease some of the steepness. Therefore, the overall quality of the image without glasses will be better if the astigmatism is corrected during surgery.

**Are there specific tips or pearls with regard to astigmatism management that you were slow to adopt and wish you had sooner?**

**Dr. Vann:** My appreciation of surgically induced astigmatism took longer than I wanted it to. Now, I try to

keep track of my surgically induced astigmatism. It was an eye-opening experience when **Doug Koch, MD**, introduced to us the very real issue of posterior corneal astigmatism and how it can influence our outcomes. I am trying to pay more attention to that. Because I have focused on those 2 things, particularly in the past 2 to 3 years, I am now realizing that having an intraoperative aberrometer to accurately measure those things at the time of the surgery for a particular patient is something I am looking forward to incorporating into my management. I wish I had joined this bandwagon 4 years ago. This allows us to fine-tune things for each individual patient. From an education perspective, I wish I'd had a more consistent set of patient education materials earlier, so that patients can be educated about cataracts before they meet the doctor.

**Dr. Henderson:** Although uncommon, I recommend operating on the steep axis, and I think it's a good idea to follow the astigmatism on every patient. Therefore, if someone has 0.5 D of astigmatism, we can minimize that 0.5 D by operating on the steep axis. Operating on the flat axis may inadvertently double that amount.

**Dr. Berdahl:** As physicians, we should be giving patients all of their options.

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—John Berdahl, MD

Don't assume that patients may not be interested in one of the astigmatism correction options. Have a plan to get them all the way into the end zone. That means either the ability to go in and rotate a lens or do a laser enhancement.

**Dr. Hovanesian:** Most importantly, assess your own results to refine your technique and your nomogram based on the unique way you do surgery. My practice uses intraoperative aberrometry because it not only enhances my likelihood of reaching the target, but it also very elegantly collects data when using the postop data input to tell us what our outcomes are. That helps me to keep refining my nomogram. There are many tools online that will provide the same kind of information. During the initial cataract consult, I evaluate the ocular surface. If there is a non-uniform wetting on the cornea, usually from dry eye, it is going to greatly influence the astigmatism measurements and the surgical results. Treat

patients aggressively prior to their preoperative measurements so that there is a more reliable result.

## Summary

**Dr. Vann:** As you can see, each of us has had unique experiences to shape our approach to astigmatism. Despite our different experiences, we all feel that addressing astigmatism during cataract surgery planning is a necessary step in becoming a successful cataract refractive surgeon. We hope that sharing our stories about transitioning from cataract surgeons to cataract refractive surgeons will help our colleagues to take this step as well to provide better outcomes for patients.

## Reference

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