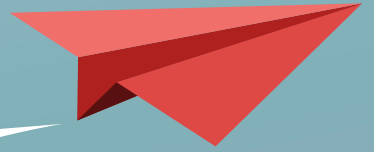


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EUROTIMES



SUCCESS WITH
**Toric and
Presbyopia-
Correcting IOLs**
IN TODAY'S PRACTICE



Education
FORUM

Assessing Baseline Trends for Treatment of Astigmatic and Presbyopic Patients

A review of the 2022 ESCRS Clinical Trends Survey data

PROF. DR. RUDY NUIJTS

The ESCRS Clinical Trends Survey is performed annually, online and in-person in conjunction with the ESCRS Congress. 2022 was the seventh consecutive year that the survey has been conducted. There were 146 questions and 1,715 delegates responded.¹

A seven-year data trend for presbyopia-correcting (PC-) and toric IOLs (Figure 1) shows that from 2016 to 2022, there has been an 8% increase in the procedures performed with toric IOLs. For PC-IOLs in the same time period, the percentage increased from 7% to 11%. Respondents indicated that if cost were not an issue, 36% of cataract patients with clinically significant astigmatism would receive a toric IOL implantation.

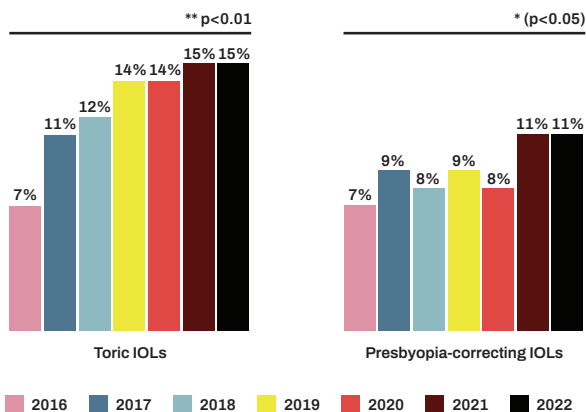


Figure 1. Seven-year data trend showing percentage of current cataract procedures involving presbyopia-correcting or toric IOLs in qualified patients.¹

Comparing presbyopia-correcting IOL technologies in the years 2020 and 2022 (Figure 2), the use of bifocal IOLs was cut in half, from 8% to 4%. Use of extended depth of focus (EDOF) lenses was very similar in the two years, 32% vs 33%. Enhanced monofocal IOLs weren't available in 2020 and are at 8% in 2022, while the use of trifocal IOLs went down slightly, from 53% to 50%.

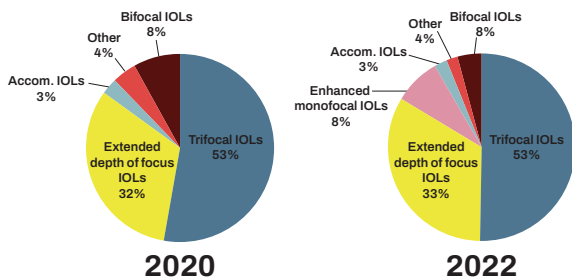


Figure 2. Types of presbyopia-correcting IOLs being used in the majority of presbyopia correction patients, comparing 2020 to 2022.¹

The three major concerns regarding implanting a PC-IOL remain. These are loss of contrast visual acuity, nighttime quality of vision, and the cost for the patient.

Other Survey Results: From Astigmatism to Rotational Error

When managing astigmatism in a monofocal cataract patient with different levels of cylinder, for cases of 1.75D or higher, the majority of respondents said they would choose a toric IOL. But for a lower level of astigmatism, around 1.25D, use of on-axis incision and toric IOLs was similar. The ESCRS has started a research project to determine the threshold level of astigmatism that would call for a toric IOL.

Respondents indicated that if cost were not an issue, 36% of cataract patients with clinically significant astigmatism would receive a toric IOL implantation.

When it comes to postoperative rotational error, 30% of survey respondents said only 0 to 3 degrees is acceptable, while 45% said 4 to 5 degrees is acceptable and 25% of respondents believe that greater than 5 degrees is acceptable, indicating a further need of education on this topic.

Peer Reviewed Publication

A 6-year assessment of practice patterns among society delegates from 2016-2021 has recently been published in the Journal of Cataract and Refractive Surgery. The paper includes data trends and cross analytics on relevant therapeutic areas in anterior segment care, making the ESCRS survey results available to a wider ophthalmic community.²



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The Top 10 Pearls for Success with Toric Intraocular Lenses

FILOMENA RIBEIRO, MD, PHD, FEBO

I have 10 points I emphasize for successful use of toric intraocular lenses (IOLs).

1. Relevance of Astigmatism Correction

Astigmatic refractive error has not only personal repercussions, but also social and economic ones. Overall, surgical correction is preferable to spectacles. Toric IOLs are the most stable and predictable method to correct astigmatism in cataract surgery, and several studies have shown they are also cost effective.¹⁻⁴

Even small amounts of residual astigmatism, such as 0.5D, will have repercussions on visual acuity and on patient satisfaction. The 2022 ESCRS Clinical Trends Survey showed that for astigmatism less than 1D, surgeons still rely on on-axis incision to repair the astigmatism. But for astigmatism more than 1D, toric IOLs are the preferred method.

2. Astigmatism Prevalence

It is also important to assess the prevalence of the astigmatism and relate it to the cost. The ESCRS Clinical Trends Survey showed an increase in toric IOL implantations over the past years, but in 2022 toric lenses only accounted for 15% of cataract cases. If cost were not an issue estimates on usage of toric IOLs are consistently above 30% of cases (Figure 1).

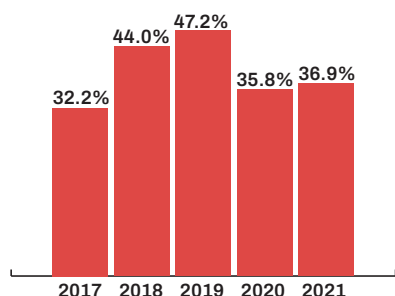


Figure 1. Percentage of patients who would qualify for a toric IOL if cost were not an issue⁵

3. The Toric IOL Decision

For small amounts of astigmatism in a cataract surgery patient, which represents 30% of cases, we can make a decision of whether or not to correct, but for astigmatism of more than 1D, we need to address the astigmatism. In these 32% of cases, we need to consider the measurement error, the posterior astigmatism influence, and the surgically-induced astigmatism. Correction is definitely indicated for higher astigmatism, which is 11% of cases. In these high astigmats, we need to ensure we are getting a good alignment of the IOL.⁶

4. Causes of Error

There are several causes of error, and they are different for low versus high astigmatism. For low astigmatism, the posterior astigmatism is very relevant; looking at the difference between the total astigmatism and the astigmatism of the

inferior surface of the cornea. For astigmatism of more than 1D, the biggest difference is in magnitude and could be more than 0.5D in 11% of the cases. For small astigmatism, what changes more is the axis and we see that in 40% of the cases, this axis will be more than 10 degrees different.⁷

Another cause of error is the tilt of the IOL, which is about six degrees when correlated with preoperative evaluations. So for most cases, it may not mean a huge error, but if we consider high-powered IOLs, we can have an error of up to 0.5D. The only calculator for toric IOLs that allows the input of tilt pre-op data is the Panacea IOL and Toric Calculator.

Further, IOLs also need good rotational stability, which has greatly improved for toric IOLs with better lens design and materials. Combined with texture processing to the surface of haptics this provides a greater rotational stability than previously possible.

5. Optimizing Toric IOLs

Several very relevant steps need to be addressed to optimize results, as shown in figure 2. We need to attend to each of them, beginning with the preoperative evaluation, making appropriate calculations that lead to proper marking and alignment, and through postoperative evaluation and optimization, each step is important.

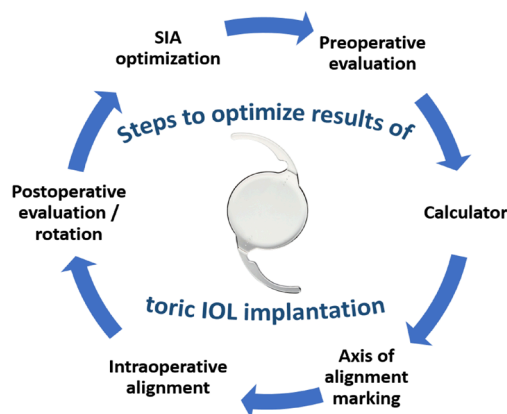


Figure 2. Steps to optimize results of toric IOL implantation.

6. Preoperative Evaluation

During the preoperative evaluation it is always necessary to assess the ocular surface. If we detect dry eye, it is important to treat preoperatively, which will lead to many more cases with outcomes below 0.5D of residual error in astigmatism. Tomography is useful, as it allows us to assess the posterior surface of the cornea, and also to assess the regularity of the astigmatism and the homogeneity over the entire cornea.

7. Calculation Formula

There are two methods we can use for the calculation formula and considering the posterior surface of the cornea.

We can measure the total astigmatism of the cornea, or we can use nomograms and formulas to estimate the real value. The estimated values perform better than the real values. There may still be issues in the measurement of the posterior cornea. We rely a lot on the True Ks, and the Barrett formula allows us to input both types of data, however there is not much difference in the results. Most of our devices now have a nomogram or formula, to consider the posterior surface of the cornea. It's important to note that we perform better using "with-the-rule" astigmatism compared with the results that we have with "against-the-rule" astigmatism.

There are several causes of error, and they are different for low versus high astigmatism.

8. Cornea Axis Marking

Another important consideration to address is the cornea axis marking, and alignment. Manual marking works very well, but we need to address the cyclical rotational error for these cases. Digital marking provides better instruments for good alignment and a good overlap of the capsulorhexis for more stability. Another innovative trend is femto marking, either intrastromal or in the capsulotomy.

9. Surgical Alignment

To minimize rotation during surgery, all the viscoelastic behind the IOL needs to be removed. Pushing a little will create more adhesion to the posterior surface or the capsule. Again, it's important to have a good overlay of the capsulorhexis and not to over-inflate the bag at the end of the surgery. Lastly, always check for wound leakage.

10. Surgically Induced Astigmatism

Surgically induced astigmatism is also a cause of error, especially in patients with a small amount of astigmatism. Ideal is a small incision, and we need to use our surgically-induced astigmatism with a centroid value. These incisions can be performed with femtosecond laser, but we don't see statistical significance between manual and femto incisions. The

ESCRS survey shows that most surgeons are already calculating their own personal surgically-induced astigmatism.



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Addressing Common Concerns and Misunderstandings with Refractive IOL Procedures

UNIV.-PROF. DR. MED. THOMAS KOHNEN AND PROF. OLIVER FINDL, MD, MBA, FEBO

Implanting presbyopia-correcting IOLs in patients with glaucoma.

When considering glaucoma patients for presbyopia-correcting IOLs we first have to define glaucoma. It's important to distinguish, severe glaucoma with visual field defects from a little bit of ocular hypertension. And while today we have many options to control intraocular pressure we need to discuss all these details with our patients.

However, in a patient with ocular hypertension and a full visual field, who has normal optic discs, or in a patient with very early glaucoma with essentially no restriction of their visual field but perhaps some contrast sensitivity issues, presbyopia-correcting IOLs can be considered. However, we need to remember that these patients have a high life expectancy and we don't know how the glaucoma will progress over the years. So, what we really want to avoid is

a lens that will compromise contrast sensitivity and choose the type of presbyopia-correcting IOL (PC-IOL) accordingly. Enhanced monofocals, as well as EDOF lenses, and multifocal lenses can be used. While diffractive IOLs are commonly implanted, non-diffractive EDOF lenses have a lower chance of a contrast sensitivity loss and would be preferable.

Overall, this is an important and nuanced topic, where more discussion is needed.

Implanting presbyopia-correcting IOLs in patients with retinal pathology or disease.

Should a PC-IOL be implanted in patients with AMD and/or drusen, or in a patient who is a badly controlled diabetic, who is at risk to develop diabetic macular edema? Retinal pathology is a broad spectrum, so we have to ask ourselves, what PC-IOLs could benefit patients with retinal pathology, and what are the limitations? The patient's age matters and cataract patients with severe retinal pathology or disease are not suitable candidates for PC-IOLs. When choosing a lens for patients with milder pathology everything should be done to maximize visual quality. Having an IOL that extends the depth of focus may be helpful, however trifocal IOLs are not a good choice. EDOF IOLs may be suitable, because they cover a very wide focus range. They can be very similar to monofocal plus, to something that really is a diffractive EDOF with results similar to a trifocal. It should be understood that there is a variety of EDOF lenses, from non-diffractive to diffractive, totally different optical systems, and from several companies.

In conclusion we would be hesitant, or advise against implantation of PC-IOLs in patients with retinal pathology.

Impact of ocular surface disease on outcomes with refractive IOL patients.

The 2022 ESCRS Clinical Trends survey showed that an estimated 22% of cataract surgery patients have significant ocular surface disease (OSD) prior to surgery.¹ It's tricky as a lot of people are asymptomatic but still have surface disease, so the number one thing is diagnostics. It's important to look at the tear film. When we detect severe ocular surface disease it is always a contraindication for cataract surgery. OSD can have a severe impact on preoperative biometry diagnostics, which in turn impacts postoperative visual quality due to refractive error. In severe cases cataract surgery should be delayed to address OSD, and OSD must then be managed postoperatively as well.

So the jury is still somewhat out on this one. While we know OSD does have the potential to impact outcomes with refractive IOL (RIOL) patients it depends on the patient and the severity of disease.

It's important to inform patients before surgery that they may have visual disturbances at night, and that this can vary with different types of IOLs.

Is night vision dysphotopsia is still a common concern in most PC-IOL patients?

It's important to inform patients before surgery that they may have visual disturbances at night, and that this can vary with different types of IOLs (Figure 1). With a trifocal, halos should be expected, maybe less expected with an EDOF lens, but how do you match the patient to the IOL, or vice versa? My first recommendation is to manage patient expectations. If a patient does a lot of night driving, a trifocal would likely not be the best choice, but a non-diffractive EDOF might work, and could improve presbyopia. However, in patients without nighttime issues, trifocal IOLs are a good choice and in our experience lead to happy patients. With a monofocal plus lens, you would expect essentially no dysphotopsia, while with EDOF, it depends on the design. The crucial part is to properly communicate this to the patient so they know what to expect.

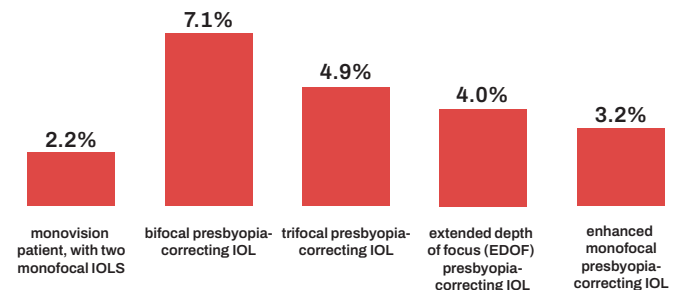


Figure 1. Average percentage of patients with different IOL types, with no residual refractive error and a healthy ocular surface, who have functionally significant visual disturbances at night.

We should also educate our patients on neuroadaptation, how common it is, how long it takes and that this may change over time and get better.

Night vision dysphotopsia is no longer a common concern for most PC-IOL patients, but we still need to match the right lens to our patients' lifestyles and educate them accordingly.

Should monofocal plus be the new standard monofocal IOL?

The ESCRS Clinical Trends survey showed that in patients implanted with enhanced monofocal IOLs for monovision, 53% are very satisfied with distance vision, and 56% and 52% are somewhat satisfied with near, and intermediate vision, respectively.¹

If the monofocal plus lenses have better visual outcomes than standard monofocal IOLs and no drawback or tradeoffs in visual quality, then they should replace the standard IOLs. On the other hand, healthcare systems need to adapt, to ensure these newer types of lenses are reimbursed. This will take time but seems likely if lens cost for a monofocal and a monofocal plus lens are similar. Some aspheric IOLs have shown results similar to monofocal plus lenses.

There are a lot of things to be considered and discussed here, but if monofocal plus lenses were to become the new standard monofocal IOL it would probably benefit patients and society as a whole.

Should doctors be “selling” elective refractive IOLs to patients?

Doctors should definitely not be selling elective refractive IOLs to patients, however patient education is becoming increasingly important. The 2022 ESCRS Clinical Trends survey showed that 55% of patients are not well educated, or know nothing at all, about refractive IOL options (Figure 2).¹ Patients want to know what their options are, so they can make an informed decision about their care. We shouldn’t be selling, we should be educating and as experts offer a strong recommendation on the best suited IOL technology for each individual patient.

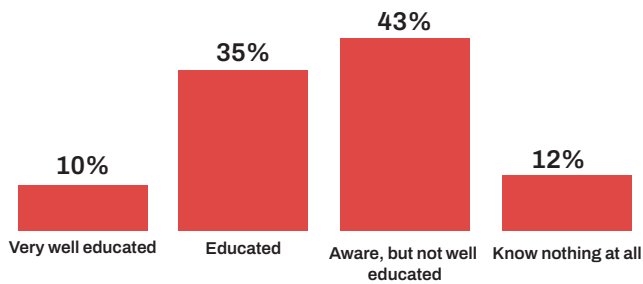


Figure 2. Level of education of patients on refractive IOL options at their initial consultation.

So, while surgeons should not be “selling” any particular elective refractive IOLs to patients, it is important to educate them about available options for informed consent and patient satisfaction.



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Keys to Matching Presbyopia Patients’ Needs with Advanced Technology IOLs

GERD AUFFARTH, MD, PhD, FEBO

With so much advancement in intraocular lens (IOL) technology it can be difficult to decide what lens is good for what patient, and to determine the profile of a specific patient.

It’s important to balance visual quality, depth of field, and dysphotopsia. These are related to each other and you can’t get all of them at the highest level. There will always be some tradeoff.

Matching patient needs with specific IOLs

There are a lot of factors involved in selecting the right patients, including medical conditions, refractive status, hobbies, profession, and personality. Our patients have higher demands than they used to, because we tell them we have choices and can do more now than we used to be able to. This puts us under pressure, but we are in a privileged situation to have such advanced technology.

We are no longer selecting what patient is right for a premium IOL as we did when we had only bifocal lenses, refractive, or diffractive. We now choose the premium IOL that fits the patient’s lifestyle, and their medical, optical, and physical needs.

Extremely satisfied patients

Data from the 2022 ESCRS Clinical Trends Survey shows

people are extremely satisfied with their vision one year after implantation for near, intermediate, and distance.¹

The graph in Figure 1 shows results for monofocal, enhanced monofocal, EDOF, trifocal, and presbyopia-correcting IOLs. In general people are happier with distance than with intermediate and near vision. Trifocal lenses do very well in near, and in intermediate the trifocal and EDOF lenses perform similarly. But of course not 100% of patients are extremely satisfied.

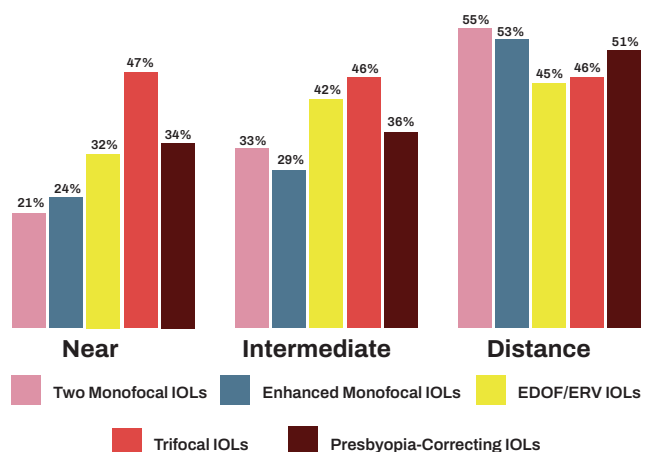


Figure 1. Patients who are extremely satisfied with their vision 1 year after implantation based on lens technology used.¹

Visual aberrations at night

Chances of having functionally significant visual aberrations at night depend on how deep the depth of focus is, and how much light to put in different foci. Trifocal and bifocal lenses have a higher chance compared to monofocal or enhanced monofocal lenses (Figure 2). So refractive and diffractive lenses are the main technologies used today.

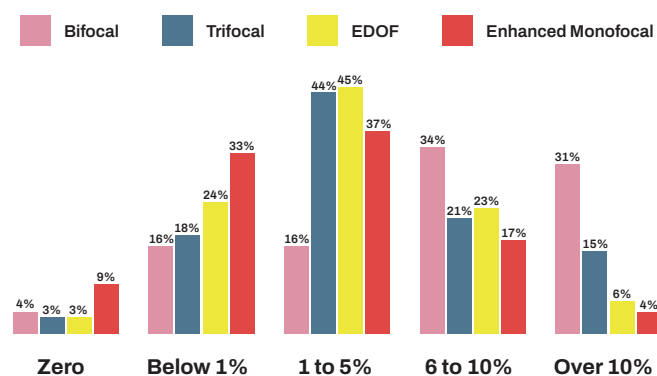


Figure 2. Chances of having functionally significant visual aberrations at night.¹

Enhanced monofocals

Some enhanced monofocals work with a higher order sphere, which is on the center of the lens, creating a certain depth of focus. The patient risk and dysphotopsia profile are the same as a monofocal lens. Enhanced monofocals are a good fit even for drivers and pilots, as well as other active patients that benefit from a slightly extended depth of focus. The focus here is distance vision with some intermediate activities.

It's important to balance visual quality, depth of field, and dysphotopsia.

Extended range of vision

The more depth of focus there is, the more problems exist in terms of dysphotopsia and night vision. Non-diffractive, EDOF technology has two surface elements that are stretched and move the focal area in a way that creates more depth of focus. Studies have shown that if monovision is used, results can be very competitive to trifocal lenses, and even visual acuity in the near of 0.2 logMAR can be achieved, which is more than sufficient for reading a normal newspaper.^{2,3}

These types of EDOF lenses are very similar to trifocal or multifocal, but patients have to accept that spectacle independence will be reduced for most activities, but not 100% for near vision. These lenses are good for patients with an active lifestyle, who are very involved in intermediate visual function, and also people who are afraid of visual disturbances.

The alternative would be diffractive EDOF lenses. Compared to a bifocal lens the EDOF lens creates much better optical quality and also a better depth of focus.⁴ Diffractive

EDOF lenses have a very similar patient profile, but patients must be accepting of some dysphotopsia at night. People who don't drive much at night or don't have a concern with such limitation could be a good match.

Hybrid lenses

A hybrid lens is a combination of a multifocal and an EDOF lens. The filter applied and the material used create a strong and stable defocus curve, with a very strong near performance. These lenses are for patients that most want to have good near visual acuity. Some hybrid lenses utilize longitudinal chromatic aberration in order to reduce glare and halo. Trifocal and EDOF technology are combined in these optics, for a lens for a patient who desires spectacle independence.

Other emerging technology

A small aperture IOL can be used in a monovision approach in combination with a monofocal IOL. It's pupil independent, and provides a pinhole effect that gives a decent depth of focus, and has really no side effects. This lens is suitable for patients who want to have no dysphotopsia, or who have some anterior segment pathology.

Conclusion

Advanced presbyopia-correcting IOLs are ideal for patients that seek spectacle independence and who want to perform near and intermediate visual tasks. The key to IOL selection is to understand what the patient really wants and to set realistic expectations for them.



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Voting with the Experts

Achieving best outcomes with PC-IOLs

BURKHARD DICK, MD, PHD, FEBOS-CR

A panel of six experts, including Thomas Kohnen, Rudy Nuijts, Oliver Findl, Filomena Ribeiro, Gerd Auffarth and myself was asked to rank the following 6 factors from least to most important, with regard to achieving the best outcomes using presbyopia-correcting intraocular lenses (PC-IOLs): 1. Preoperative measurements; 2. Choice of PC-IOL type; 3. Patient education; 4. Intraoperative procedures; 5. A dedicated and well-trained team; and 6. The individually optimized A-constant (Figure 1).

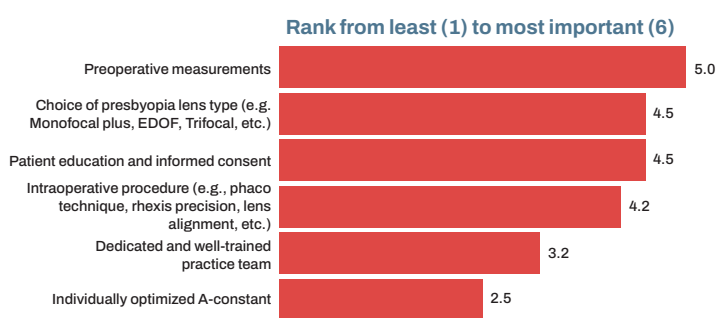


Figure 1. The average ranking given by the panel of experts when asked the level of importance of various factors.

Our experts ranked *preoperative measurements* as the most important factor, with an average ranking of 5 of the possible 6. Although it received the highest average of the factors, only Drs. Ribeiro, Auffarth, and Kohnen actually ranked it as most important. Drs. Nuijts, Findl and myself gave it a 5, 4 and 3 ranking respectively. However, overall the experts were in agreement on the importance of preoperative measurements to achieving best outcomes with PC-IOLs.

Often the reason patients are dissatisfied with their outcome is a mismatch between the expectations that were set, and what can be delivered.

For the *choice of PC-IOL* there was an average ranking of 4.5, with Dr. Auffarth giving this category a 6, followed by Drs. Nuijts and Kohnen with a ranking of 5, Drs. Findl and Ribeiro followed with a 4, and I gave it a 3 on the ranking scale. Again, the panel was in overall agreement on the importance of PC-IOL choice for achieving best outcomes in presbyopia correction cataract surgery.

Patient education and informed consent also received a 4.5 average ranking, but at this point we realized that Dr. Auffarth had now ranked all three categories as most important! Drs. Findl and Nuijts also gave this one a 6, but Dr. Kohnen ranked it very

low, just at 2, with Dr. Ribeiro placing it at 3 and myself at 4. To elaborate on his low ranking, Dr. Kohnen said that while this is an important step, it can be done during the patient workup, relying on a well-trained practice team. This makes it less important to him as the surgeon since it will not be done by him personally.

Intraoperative procedures received a 4.2 ranking, which I personally find most important and ranked it a 6, with Dr. Nuijts giving it only a 2. The others were spread across the middle, with Dr. Findl giving it a 3, Dr. Kohnen a 4, and Drs. Ribeiro and Auffarth a ranking of 5. Dr. Nuijts clarified that most surgeons performing this surgery are very well qualified, so any unpredictability that comes from an outcome is usually not due to the surgeon. Often the reason patients are dissatisfied with their outcome is a mismatch between the expectations that were set, and what can be delivered with current technology.

The *dedicated and well-trained practice team* received a 3.2 ranking from the experts, with Drs. Findl and Ribeiro saying it is least important, Dr. Auffarth and myself ranked it highest with a 5, and the others spread out in-between, with Dr. Kohnen giving it a 3 and Dr. Nuijts a 4. Dr. Auffarth explained that there are individual patients where the practice team is extremely important. In general, the better the team is, the less work the surgeon has, and the better the patient satisfaction is. Concerning his low ranking of this factor Dr. Findl pointed out that the surgeon is the one who will make the decisions and do the surgery, although some things can be delegated. Dr. Ribeiro made the important point that while a dedicated and well-trained practice team is a plus in a low volume practice it is possible for the surgeon to do all this without a team, but it will take more chair time.

The least important factor in the rankings is the *individually optimized A-constant*, which received a 2.5 from the experts. Dr. Auffarth ranked it a 6, but the others were all on the low end of the scale. Dr. Kohnen noted that while biometry is important, it is well managed today. Dr. Nuijts added that patients dissatisfied due to an A-constant are extremely rare. So this factor is not very important anymore.

Summary

Many factors contribute to successful outcomes in the use of presbyopia-correcting IOLs. While the panel of experts didn't always agree on the importance of each factor, they did indicate that the three most important of those discussed here are preoperative measurement, matching the right IOL to patient needs, and patient education and informed consent.



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