Micro Monovision
and
Refractive Path Counseling

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Updated April 12, 2016

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Micro monovision is a cataract surgical refractive strategy used to achieve extended depth of field using 0.50 diopter discrepancies in refractive outcomes between the two eyes.

Refractive path counseling empowers the patient to specify one of three basic refractive paths; distance, middle, and near. When used in combination, micro monovision and refractive path counseling have the potential to greatly enhance patient satisfaction with cataract surgery.

This instruction manual teaches providers and staff the 3 steps necessary to combine these techniques. The discussion assumes a thorough understanding of refraction.

Introduction

Not everyone is built the same. Prior to cataract surgery the patient has lived inside a refractive world that bears no relationship to their predispositions and avocations. Our cataract surgical patients have long ago accepted the fact that they live with large or small amounts of hyperopia, myopia, astigmatism, and anisometropia.

Many cataract surgeons aim for plano or very slight myopia in almost all patients. This generic approach simplifies preoperative counseling, allows surgeons to see patients quickly, and provides a predictable result that is easy to demonstrate postoperatively to the patient and staff using the eye chart.

This strategy serves the needs of the provider and is acceptable to the insurance industry. However it does not maximize the product for the patient.

We can do better the moment we recognize that everyone is different. Some people are skiers and tennis players. Others play the piano, carve wood, paint, read. By the time they develop cataracts, patients pretty much know themselves and are happy to tell you who they are, if you ask. Being truly interested in the refractive world of your patient is the essential first step in a refractive design program. It puts you in the right mindset. If you don't know or care where your patients are coming from and where they want go, you will never be able to customize their vision and will never even perceive a need to do so. This process has to start with the team providing the care. Patients cannot be expected to envision something that is so foreign to their experience as refractive design.

Refractive design may initially involve a leap of faith on your part. However, if you are willing to make this leap, your patients will teach you the rest. Listen to your patients. As soon as they know that customized refractive design is possible, they will tell you to do this. And they will appreciate with every waking moment the fact that you cared enough to give them something better than you were required to.

Micro Monovision
and
Refractive Design Counseling

Step I. Determine the refractive path for the first eye

Get a basic sketch of what the patient wants. Start with the gross distinctions between distance, intermediate, and near vision. More choices than this will confuse patients. I begin with a questionnaire that is filled out at the beginning of the preop appointment. This questionnaire is in the Appendix at the end of this paper and is also posted on my website, www.chriskuntzmd.com. Many of my patients come in with this already filled out. Please feel free to edit and use this questionnaire in your own practice. You can also find other questionnaires on the web, or design your own questionnaire.

Please turn to the Appendix and read the refractive questionnaire before reading on.

The spherical goal for the first eye should be determined from the refractive questionnaire, your own insights into the patient's personality, and the patient's preoperative refractive data. If the chosen refractive path is similar to the patient's preexisting refractive error, the odds of making the patient happy are high. If their chosen refractive path is different (for example, a bilateral low hyperope choosing the near path), then more counseling is required to make sure the patient understands the consequences of their decision.

From the patient's point of view, there are three choices. More choices will confuse the patient. However, I break the middle path three sub paths, based on my interview with the patient. With this in mind, we can consider 5 generic refractive packages.

Below is a reference chart showing theoretical ideals for 5 basic refractive paths.

Once you have identified one of these five paths, one very safe strategy for the first eye is to aim for the middle of the two refractive goals. This strategy recognizes that there is some variability in the actual postoperative result. If you aim for the middle of the two refractive goals with the first eye, you will still be on track even if your outcome is a quarter diopter myopic or hyperopic from your aim.

Refractive Path	**Refractive Goals**	**First eye aim**
Distance	-0.25, -0.75	-0.50
Middle with Distance bias	-0.62, -1.12	-0.87
Middle	-1.00, -1.50	-1.25
Middle with Near bias	-1.37, -1.87	-1.62
Near	-1.75, -2.25	-2.00

Step 2: Determine the refractive state of the first eye at 1 week postoperatively

The actual spherical equivalent of the first eye at 1 week postoperatively becomes the center point for decisions involving the second eye. A quick and accurate way to get the data necessary is to perform a spherical refinement of the autorefraction. You just want to know the spherical outcome. For data from my practice supporting the stability of spherical refraction at 1 week, please see the Appendix.

Step 3: Use trial lenses over the first eye to demonstrate what can be achieved with the second eye

Use the pseudophakic eye to demonstrate the impact of extending the depth of field in (with a +0.50 diopter trial lens) and out (with a -0.50 Diopter trial lens). Utilize whatever reading materials or test materials are appropriate to the task. Patients are often much more confident and excited about their decisions for the second eye than they were making decisions about the first eye. By this time they understand the value and potential of refractive design and are often intensely interested in participating in the choices for the second eye. The first eye has already taught them the importance of refractive design, and the choices for the second eye are based on actual observations with trial lenses.

Choose the refractive aim for the second eye based on the patient's responses to this test. The second eye aim should be within about 0.60 diopters of the actual postoperative result for the first eye.

Case Presentation and Discussion

Teri M is a 72 year old right handed, right eye dominant, healthy female.. She is a low hyperope. Her lid, corneal and posterior segment exam are unremarkable. She has nuclear sclerotic and cortical cataracts.

She states in her refractive questionnaire that she is involved with her church, has four grandchildren who live locally, and she enjoys knitting them sweaters and sitting on the floor playing games with them. She drives them to their after school appointments. She plays the violin in a chamber group. Her preoperative refraction:

+0.50	- 0.50	x	175	20/50
pl	-0.25	x	012	20/40

She wants the right eye taken care of first. She chooses the near path. We discuss her refractive goals. I devote a little extra attention to this discussion because she is choosing to change her refractive world. I demonstrate to her that, with the near path, she would need pretty strong glasses to see the sermon on Sundays, and to drive the grandkids around. I point out to her that with the exception of reading music to play the violin, her near refractive goals are not as demanding as, for example, an avid reader. She considers this and refines her goal to the middle path.

When I choose my lens for the first eye, I am already considering the second eye. Because she is an emmetrope, I know it is possible that she will miss distance after the first eye and may want it back with the second eye. I would like to be in the position to give her at least soft distance with the second eye if she chooses. However, I also know that her important activities are in the soft near range.

My Ascan gives me the following choices:

20.0	+0.05
20.5	-0.29
21.0	-0.63
21.5	-0.97
22.0	-1.31

I find myself a little stuck between -0.63 and -0.97 as a refractive goal. I need a tie breaker. So I ask the patient to imagine two situations. If she absolutely needed glasses to drive car, or absolutely needed glasses to read, which would she choose? She answers glasses to read would be preferable. This allows me to settle on the 21.0 lens with a refractive goal of -0.63.

At the 1 week postoperative appointment I get the following refraction:

- 0.50 – 0.50 x 180 20/20 spherical equivalent -0.75 D

She tells me that she can see well to play with the grandkids. She can't read music with the violin. Driving is ok but not perfect during the day, and gets fuzzy at night.

I use +/- 0.50 Diopter trial lenses to demonstrate her two possibilities for extending depth of field. She is able to read J2 with the +0.50 diopter lens, and able to see almost the whole 20/20 line at distance with the -0.50 Diopter lens. These are entirely different worlds. She likes both, but in the end chooses the distance option understanding that this means wearing glasses to read music.

Reviewing my Ascan, my lens options for the second eye are:

+0.02
-0.32
-0.66

I choose -0.32 Diopter. This gives me an anticipated anisometropia of 0.43 Diopters.

5 weeks postoperatively; her final refraction after both eyes is:

Rx	spherical equivalent
-0.75 -0.25 x 177	-0.87
-pl -0.50 x 009	-0.25

She states that she can do everything without glasses except read a book and read music while playing the violin. In good light, she is comfortable working on the computer. She can cook, take care of daily tasks, play with the grandchildren, talk to her friends, and drive without difficulty. She keeps a pair of driving glasses in the glove compartment that she rarely uses. For up close, she has +1.25 Diopter over-the-counter glasses, but again rarely uses them.

Looking at her numbers; her spherical anisometropia is 0.62 Diopters. Assessment of her astigmatism, however, shows some extra detail. Astigmatism can be understood as an additional form of monovision. Considering each dimension of the eye independently by breaking out the astigmatism, she actually has four refractions:

Right eye:
-0.75 D
-1.00 D

Left eye:
Plano
-0.50 D

She has dimensional focal points at plano, -0.50 D, -0.75 D, and -1.00 D. This explains why she can comfortably perform all tasks except reading.

When she puts on her generic +1.25 diopter glasses, this shifts the above numbers by 1.25 diopters to:

-2.00 D
-2.25 D
-1.25
-1.75

This explains why she prefers such low powered readers. When she uses her +1.25 readers, her refractions become -1.25, -1.75, -2.00, and -2.25 Diopter. This is an extremely nice spread for near and computer work.

This case demonstrates a number of important issues.

1. Counseling is useful for establishing first eye refractive choices.
2. Actual outcomes differ from theoretical ones.
3. The patient choice at the 1-week appointment is very significant. There is typically a diopter of difference in potential second eye choices- enough to take the patient to entirely different worlds postoperatively.
4. It is best if the first eye refractive goal leaves some room for extending the depth of field in or out, to maximize the range of patient choices at the 1-week appointment. Therefore, even when choosing the distance path, it is often desirable to soften the distance choice for the first eye. With the near path, the near choice can also be softened for the first eye, in the area of -1.75, to allow for a wide range of choices for the second eye.
5. Ocular dominance is not a consideration with micro monovision. Note that when the patient made the choice to add distance to the left eye caused her right, dominant eye to become the relatively near eye. This does not cause problems. Ocular dominance does not restrict choices at such low levels of anisometropia.
6. When anisometropia and astigmatism are small, over the counter readers work acceptably- even outstandingly- for patients who chose the distance path. The principles of micro monovision also apply effectively to near vision with generic readers.

Clinical Considerations

1. Time. Refractive counseling takes time. Some patients find these decisions easier to make than others do. Time can be minimized by getting information to patients early (by mail or web), and keeping choices simple. The amount of time this takes can be very small

for the surgeon, if the choices are well-explained elsewhere- in written documents, or by staff.

2. Not everyone is an optimal candidate. Although micro monovision is safe for just about any patient, it is ideal for patients with potential for good vision in both eyes. Patients with macular degeneration or glaucoma, optic neuropathy, retinal vascular occlusion, high astigmatism, etc are not harmed by micro monovision, but they are also not particularly helped by it. Even with these exclusion criteria, most patients still benefit from micro monovision.

Getting Started

Implementing a program like this does not have to be done all at once. A very easy way to get started is to keep doing things exactly the same, but seek opportunities at the 7 day postoperative appointment for the first eye to give patients choices for the second eye. When you find a patient with a first eye refractive outcome in the low myopic range at 1 week, pull out the +/- 0.50 Diopter lens and show the patient both choices. This allows you to test this system and get used to the practical application whenever opportunities present themselves and you have a few moments of time.

Conclusion

Refractive path counseling and micro monovision provide a system for increasing patient happiness after cataract surgery by personalizing refractive goals. Having a system in place reduces the amount of counseling time to acceptable levels and allows the surgeon to delegate key tasks.

Appendix

1. Refractive Questionnaire
2. Histogram: Postoperative Refractive Stability

Refractive Questionnaire

1. What is or was your profession? _____

2. What are your most important activities or hobbies?

_____

_____

3. How often do you wear glasses? ☐ All of the time ☐ Some of the time ☐ Never

4. What do you need glasses for? ☐ Everything ☐ Nothing ☐ Driving ☐ Reading

5. Have you ever worn contact lenses? Yes No

6. Have you ever used monovision or bifocal contact lenses? Yes No

7. Do you want to wear glasses after cataract surgery? Yes No

8. Do you drive? Yes No

9. Do you have astigmatism? Yes No

10. Have you had refractive surgery (LASIK, PRK, RK)? Yes No

12. Check the statement that best fits you:

☐ People say I am easygoing
☐ People say I am very particular
☐ People say I am pretty middle of the road

13. If you could only do <u>one thing</u> without glasses after cataract surgery, what would it be?

☐ Drive, play tennis, or ski

☐ Work on a computer and do general household tasks

☐ Read fine print and perform detailed tasks at near

Notes:

Design Your Vision with Cataract Surgery

Your lifestyle and personal goals influence your decisions during cataract surgery. Please review the following steps and indicate your preference for each step. We will discuss and refine these choices during your preop.

Some of your options are covered by your insurance. Elective choices that are your financial responsibility are noted with a **($)** sign. These initial choices are not commitments on your part, but will assist in counseling.

Step 1: Choose your refractive strategy (check one)

☐ **Single focus correction:** The single focus lens is the standard lens that is covered by your insurance. It performs optimally at a distance chosen by you. If you choose single focus correction, you can decide in Step 2 whether the Distance, Middle, or Near Path suits your needs the best.

☐ **Distance and near correction with Multifocal Lens ($):** About 35% of patients are potential candidates for multifocal lens distance and near correction. If you are interested in exploring this we will let you know if you are a good candidate. In the event that you are not a candidate for multifocal technology, please indicate your preferred monofocal path in Step 2 below.

Step 2: Choose your path (check one)

☐ **Distance**: Choose the Distance Path if you are most interested in sports or outdoor activities such as hiking, or want to prioritize your vision for driving with as little correction as possible. You will need to wear glasses to read.

☐ **Middle:** The Middle Path is ideal for social activities and household tasks. You may be able to do some reading without glasses, but may find that you have to hold things at arms length to see well. You may be able to use a computer and smartphone without glasses. Glasses may be helpful for driving, but may not always be necessary. The middle path provides the best correction for daily general-purpose vision.

☐ **Near:** The Near Path is best for reading or computer use and crafts. You will need glasses to drive or watch a movie.

Step 3: Consider astigmatic correction (check one)

Astigmatism is due to a difference in curvature of the cornea between the vertical and horizontal dimensions. Refinement of astigmatism has the potential to significantly enhance your vision after cataract surgery. We will measure your corneal shape and estimate the benefit of astigmatic correction for you below.

Right Eye:	☐ Low	☐ Moderate	☐ High
Left Eye:	☐ Low	☐ Moderate	☐ High

☐ **Yes ($)** **Please discuss astigmatic refinement with me**

☐ **No** **I don't want astigmatic correction**

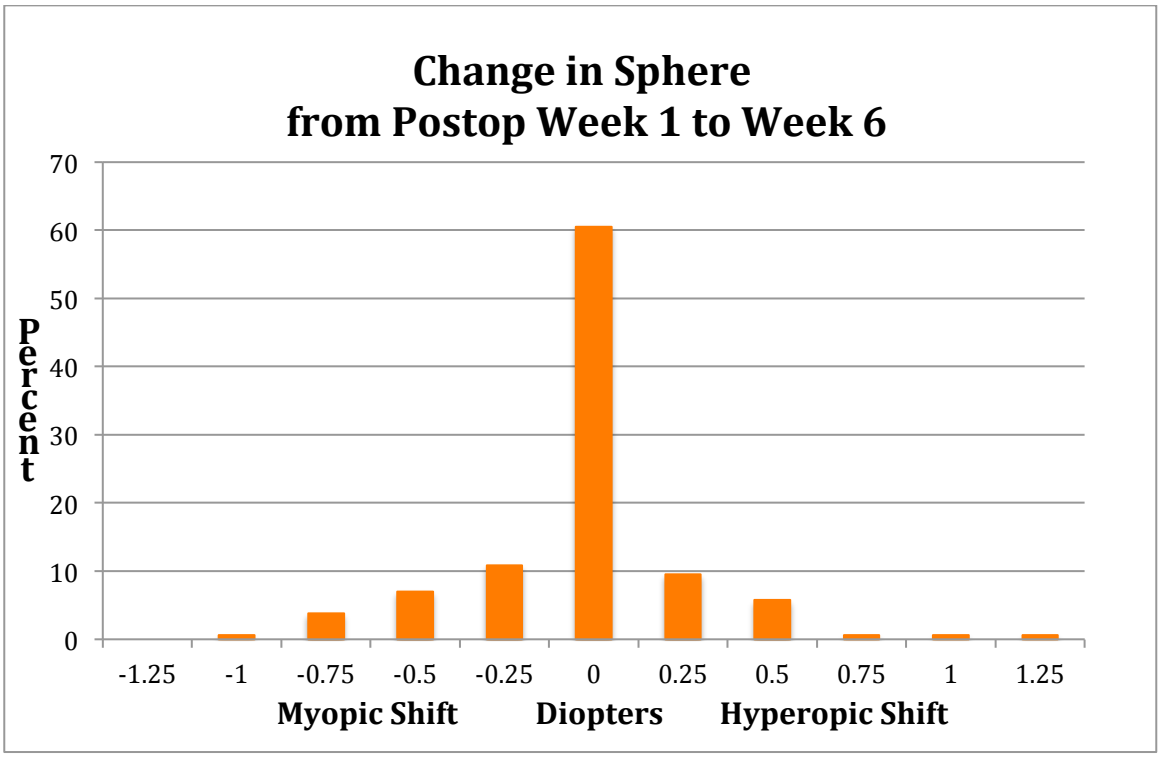
Step 4: Choose femtosecond or manual cataract surgery

The optical precision of cataract surgery can be enhanced with the femtosecond laser. The femtosecond laser assists in refining the corneal shape, creating a perfectly round and centered opening in which your new lens will be placed, and preparing your cataract for removal.

☐ **Yes ($)** **I would like to upgrade to the femtosecond laser for my cataract surgery**

☐ **No** **I want standard manual cataract surgery**

Refractive Stability



The histogram above was obtained from chart review of approximately 150 patients. It compares the postoperative week 1 auto refraction with the 5 week postoperative manifest refraction. Myopic shift is to the left, hyperopic shift to the right.

The histogram demonstrates that the week 1 postoperative autorefraction is highly, although not completely, predictive of the final refraction.