

VALUE, COST and TECHNOLOGY

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INTRODUCTION

Value and cost are important components of the quality of medical care. As this nation's health care system evolves, decisions to purchase new technology will favor those technologies that provide value to the physician and technician, patient and payer, by meeting expectations and yielding positive return. This publication captures key insights from four of the nation's most innovative ophthalmic surgeons regarding the deployment of Optical Path Difference technology incorporated in the Marco OPD-Scan III.

Financial costs incurred in purchasing new technology include: fixed cost of the equipment itself, variable costs implicit in the learning curve, maintenance and upkeep, the sunk and residual costs as the technology becomes obsolete and the opportunity cost of foregoing alternative purchases. These are economic metrics.

Value is a subjective concept. But its benefits are tangible, objective and measurable as demonstrated by concepts such as Quality Assessment of Life Years (QALY). Optical Path Difference (OPD) technology provides value to the ophthalmic practice's three principal stakeholders: the physician (and staff), the patient, and payer.

The objective of this monograph is to share the experience and insights of four expert commentators regarding the value of OPD in helping them

better serve the needs and meet the expectations of their patients by offering increasingly sophisticated treatment options.

THEME I: REFRACTIVE CATARACT SURGERY

All four surgeons agree that no single unit of ophthalmic equipment provides as much actionable data to the physician and offers as much opportunity for patient education as the Marco OPD-Scan III.

Each physician employs its versatility to customize digital maps to the individual patient's situation. Dr. Farrell "Toby" Tyson, Cape Coral, Florida, features the OPD III as the gateway to his practice. In less than a minute, the device provides an accurate auto-refraction with keratometry, corneal topography, total, axial and internal OPD, light and dark pupillometry, Placido image and corneal spherical aberration.

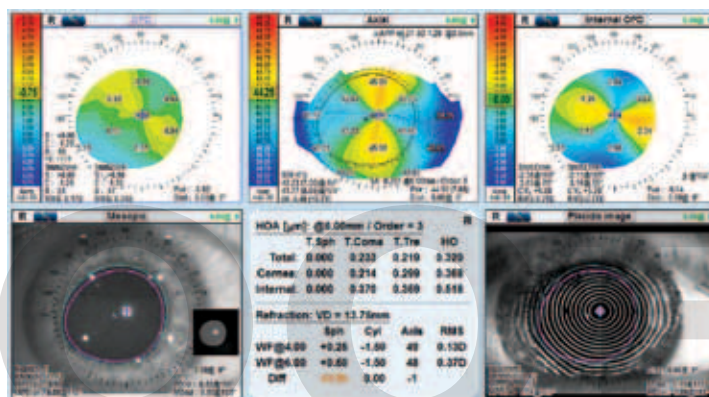


Figure 1: An OPD-Scan III Screen showing the details related to the patient's optical system.

A glance at the exam lane's screen gives him insight into the condition of the patient's ocular system. "I can immediately focus on appropriate

Based on Physician Interviews with:

Cynthia Matossian, MD, FACS
Matossian Eye Associates, PA

James J. Salz, MD
Clinical Professor, Ophthalmology
University of Southern California,
Los Angeles, CA

Jonathan D. Solomon, MD
Director, Refractive/Cataract Surgery
Solomon Eye Physicians & Surgeons, MD

Farrell "Toby" Tyson, MD, FACS
Tyson Eye/Cape Coral Eye Center, FL

treatment options and recognize things that could cause problems post-operatively.” The color-coded corneal topography map demonstrates the condition of the cornea. “Is there astigmatism that I need to worry about? Is it regular or irregular? If there is little astigmatism, the patient may be a candidate for a multifocal lens. If there is significant astigmatism, the patient might do better with a toric lens. The bowtie image on the screen helps me direct the discussion quickly.”

Another key data output is the RMS (Root Mean Square) value. The OPD evaluates the entire visual system. Eyes that have RMS values above 0.4 alert the physician to look for additional problems that may be affecting the patient’s best vision. It is a very efficient screening tool to distinguish the “healthy” eye from one that might be harboring pathology. Dr. Cynthia Matossian of Pennington, NJ consistently uses this data when considering whether a patient may be a candidate for a multifocal lens.

Dr. Jonathan Solomon of Bowie, MD offers his patients advanced cataract and refractive therapeutic options. His practice employs many different devices. “Different devices do different things. The OPD III is the main piece of equipment and is relied upon most heavily in recommending the proper choice of surgical intervention. In offices where we don’t have it, I miss it.” He points out that, even when performed with technical excellence, cataract surgery doesn’t always meet the expectations of all patients. If high order aberrations following cataract or refractive surgery cause difficulty driving at night, both patient and surgeon will be disappointed. Wave-front analysis provided by the OPD III alerts the surgeon to pre-operative high order aberrations that cannot be rectified by today’s premium intraocular lenses and laser techniques. Importantly, the digital maps seen on the screen are used to graphically show the patient the limitations of outcome

that are not related to the surgeon’s skill but to the eye’s anatomy.

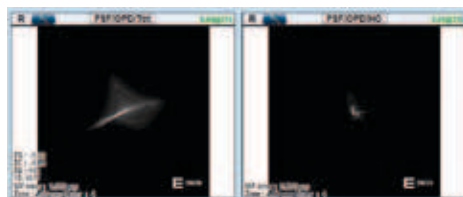


Figure 2: Point Spread Function shows the appearance of a point source as imaged by the patient’s uncorrected (left) optical system, and with spherocylindrical correction (right).

Dr. Cynthia Matossian highlights consequences of high order aberration to the patient by using the point-spread function of the OPD III. Although the patient might expect to see a perfect sphere of light following surgery, anatomical imperfections will produce the arcs, starbursts and tails implicit in these aberrations.

Dr. Tyson underscores the importance of the OPD III’s determination of angle kappa. “If it’s small, a multifocal lens implant can do well. If it’s large, the optical axis doesn’t line up with the center of the implant. Coma is induced and contrast sensitivity is lost. These patients can have problems.” If the angle kappa is not determined pre-operatively, the central button of the multifocal implant may not line up with the visual axis and its rings may not be concentric with the pupil.” If symptoms are severe, explantation and lens exchange may be necessary.

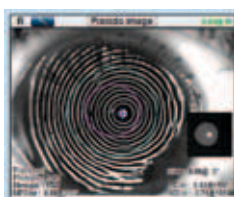


Figure 3: Placido disc maps include Angle Kappa measurements for both photopic and mesopic pupils. This patient’s Angle Kappa of .68 mm is a contra-indication for multifocal IOLs.

THEME II: MANAGING THE ASTIGMATIC PATIENT

OPD technology is a powerful tool

in evaluating a patient with pre- and post-operative astigmatism. The OPD III utilizes Axial and Internal OPD measurements to identify both corneal and lenticular astigmatism. Demonstrating the Axial and Internal OPD maps on an exam lane screen, Dr. Matossian helped a patient who required only OTC reading glasses understand why it was in her best interest to consider a toric intraocular lens and its attendant cost. “The patient’s refraction showed 0.75 diopters of cylinder but the axial map showed a beautiful bowtie pattern of 2.00 diopters of astigmatism.” Removing the cataract would eliminate the lenticular astigmatism thus exposing

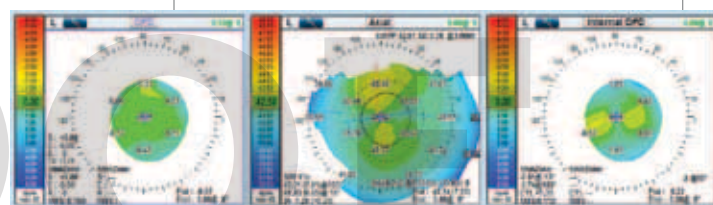


Figure 4: This series of maps shows the contributions of the corneal and lenticular astigmatism, which cancel each other, and calls for a toric IOL.

the unrecognized corneal astigmatism that was absent in the reading glasses.

The OPD III’s Internal OPD map can identify patients with lenticular astigmatism. In the past, I suspect that some post-operative astigmatic “surprises” were the result of lacking technology that could determine the true anatomical causes of the pre-



operative refraction's astigmatic error.

Dr. Jim Salz of Los Angeles, CA reports that, "people don't understand astigmatism. It's my least favorite word in ophthalmology. Patients think they have a disease. The best way to teach someone about astigmatism is to show them what it is.

Dr. Matossian uses multiple devices to provide insight when selecting a toric intraocular lens for an appropriate patient. "I'm looking for correlation between all sources of measurement. The least important is the (spectacle) correction the patient is wearing. If there is correlation among the measurements, I am comfortable. If there isn't, I consider other possibilities like OSD (ocular surface disease), or is the patient a contact lens wearer whose corneas haven't stabilized?" The OPD's corneal topography, axial OPD and internal OPD maps, and Placido disk graphics are very helpful in identifying those yellow flags that might cause trouble after surgery.

She also uses the retro-illumination function of the OPD III to assess the post-operative eye. "That is kind of the report card that we look at. Of course, the visual outcome and clarity of vision, all those things are also part of the report card. But the goal is to align the toric implant with the pre-operative axis."

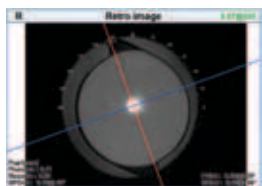


Figure 5: Retro-illumination photo indicating the axis alignment of the toric implant post-operatively.

Like many state-of-the-art cataract surgeons, Dr. Solomon employs intraoperative aberrometry when available. He notes that not all surgical facilities are equipped with this innovation and sometimes the patient's pathology prevents its use. He has found the data produced by the OPD III complements and supports his surgical decision-making whether or not the instrument is available. Evaluating the high resolution photopic image, he

states that "using iris landmarks, you can rotate the (toric) lens very easily to the correct position." Checking the patient after surgery, he confirms the positioning of the toric lens by using the OPD III's retro-illumination imaging capability.

THEME III: OPD AND REFRACTIVE SURGERY

Dr. Jim Salz is a pioneer of laser refractive surgery. He has forgotten more about the subject than most practitioners remember. He unequivocally states, "I am a big fan of OPD technology. I think there are several advantages in terms of how to use it in refractive surgery." He observes that poor corneal topography gets good surgeons into trouble with LASIK. "If you don't have good topography or you don't interpret the topography correctly and you operate on somebody that is an early forme-fruste keratoconus, there is a high risk that they're going to develop ectasia. Better topography means fewer lawsuits."

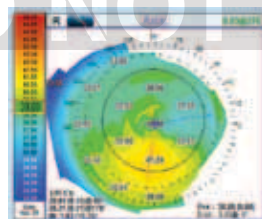


Figure 6: Topography showing forme fruste keratoconus in a patient correctable to 20/20.

He is an advocate of the significance of pupil size relative to post-operative complaints with night vision, halos and glare. He routinely measures photopic and mesopic pupil sizes with the OPD pupillometer and finds excellent correlation with instruments that require completely dark environments. Consulting on a patient unhappy with her surgical result, he found that the ablation was expertly performed and resulted in uncorrected 20/15 vision. "This patient was miserable at night. I was able to show her the spherical aberration and coma induced by her 7.5 mm pupil and LASIK procedure. Although I didn't have her preoperative measurements, I could relate her measurements to averages of patients

who haven't had refractive surgery.

The patient now understands the issue and functions better using brimonidine drops when needed. Newer laser technologies will be able to fix these patients."

In his understated way, Dr. Salz has the last word on the OPD III's ease of use. "As far as being user-friendly, there are machines that I wouldn't attempt to use and others that I'm not as proficient on as my technicians. But I can actually do OPDs myself. If I can do it, it's got to be pretty easy."

THEME IV: OPD AND CO-MORBIDITIES

In order to get the consistent biometric measurements that modern cataract and refractive surgery requires, the condition of the ocular surface must be investigated and treated if necessary.

The four surgeons rely on the built-in Placido disk to help identify patients with pre-existing corneal abnormalities that can effect the quality of the post-operative outcome. Dr. Jim Salz states that, "in Los Angeles, there are many patients with dry eyes and these need to be identified prior to any intervention. The Placido disk images are valuable in educating patients about that." Discussion of the Placido disk findings helps patients understand the need to correct the surface problem to insure accurate biometric measurements. Patients not educated pre-operatively might erroneously assume that the surgical intervention caused their dry eye symptoms.

Dr. Tyson employs the OPD III at each post-operative visit. "If the topography of the cornea is changing, there may still be some corneal edema that will affect the ultimate (visual) outcome. Multifocal intraocular lenses are very contrast sensitive. Loss of contrast sensitivity caused by edema may cause reading problems. Halos at night will be worse. Checking the topography at each visit lets me know if the eye is stable."

Dr. Solomon uses the OPD's corneal topographic maps to look for focal



corneal nodular changes and to follow patients after pterygium excision. Even glaucoma-risk patients benefit because “by retroillumination, transillumination defects of the iris can be noted and documented.”

THEME V: CATARACT SURGERY IN THE REFRACTIVE PATIENT

All four doctors routinely see aging patients who had refractive surgery in the past and are now developing cataracts. They advise against over-promising and under-performing in these cases. The multiple tools of the OPD III gives important information to obtain best

outcomes.

Dr. Matossian finds the OPD III's ability to provide average pupil power helpful when planning cataract surgery in the patient who has had prior LASIK surgery. “I enter the data into the ASCRS's website post-LASIK myopic calculator to help me determine IOL power. But, I tell the patient that there is a possibility of refractive unpredictability no matter how accurately their measurements are obtained. This can require additional surgery.

I manage expectations from the beginning.” She stresses that average pupil power readings should not be used in the post-hyperopic LASIK patient.

Dr. Solomon tells of a patient who had undergone LASIK surgery in the past although he had a pre-existing exodeviation. Because of his deviant line of sight, an off-axis ablation resulted. When he presented with cataracts, “he had more than 4 diopters of corneal cylinder. We were going to have to calculate an IOL power based on less-than-perfect calculations, an off-axis ablation and address the problem with astigmatism. We used wave-front information, line of sight data and corneal power calculations to plan surgery.”

CONCLUSION:

The delivery of ophthalmic care is dramatically evolving. Patient, payers and regulators increasingly demand value manifest in outcomes that are demonstrable and measurable.

I have been using Marco's OPD equipment since 2006. The advances incorporated in the latest OPD III exhibit the criteria of transformative technology: speed, ease of use, compact size, and efficiencies producing lower costs. More importantly, it produces information in real-time that provides benefit and utility to patient and surgeon to ensure desired results and expectations.

These four innovative surgeons and

I agree that it has become indispensable to our practices. 