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How to program the Excimer laser?
Pacific Vision Institute LASIK results

How do you know what to program into the Excimer laser?

Issues:

1. The nature of laser physics is such that each laser is unique. Two lasers of same model, same software, and identically maintained will perform slightly differently.
2. The environment where the laser is setup is different for every location. Things such as temperature, humidity, and air pressure greatly affect the quality of the beam.
3. Each surgeon technique is different and affects the outcome.

When you get a new laser, the laser manufacturer provides you with a default formula (called the "nomogram") of how to adjust a particular patient's refraction to what is going to be entered into the laser. However, considering all the issues listed above, the question still remains: How do you know what to program into the laser? The answer is: **You DON'T!** The default nomogram is only a rough approximation and will never give you a perfect outcome.


The only way to have a precise control, and enter the best possible values into the laser is by continuously adjusting and developing your own nomogram based on all the past results. This process is called "regression analysis". Regression analysis is a statistical engine that can crunch your previous results and come up with a precise set of numbers for your next patient. The analysis is based on 3 parameters:

➤ previous patients' original prescription (called refraction),
➤ what was entered into the laser, and
➤ the achieved outcomes.

One MUST enter ALL the previous data, without skipping or fudging any of it. If any data is omitted or changed the resulting formula is useless and will not yield the best outcomes. Therefore, surgical centers are forced to enter all the previous outcomes into the regression engine.

The process requires involvement of an experienced statistician. Since surgical centers do not employ such people, this work is outsourced to a 3rd party. The most popular regression engine service utilized by the greatest number of surgeons is maintained by a company called "Surgivision". Surgivision can compare results of an individual surgeon to the rest of the world, because the company has results from all the surgeons (and the results are real as described above). Hence, Surgivision is the only 3rd party, independent result validator out there.

The nomogram for each surgeon on each laser needs to be continuously adjusted. Depending on the surgical volume, monthly to even daily analysis may be necessary.
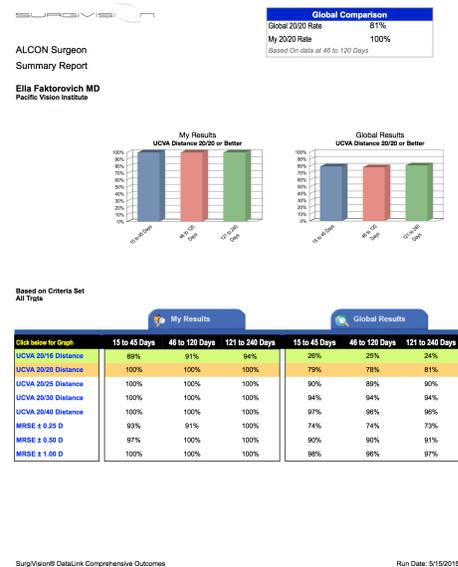
Laser Beam Quality:

As mentioned above, the surrounding environment will affect the quality of the beam. Change in room temperature, humidity, and pressure change the quality of the laser beam. These parameters are <u>ALWAYS</u> changing throughout the day, unless there are controls introduced into your procedure room to keep these values within a certain threshold. Therefore, the most predictable outcomes will be achieved in rooms equipped with temperature, humidity, and pressure controls.

Of course, the model of the excimer laser combined with how well it is maintained will have a big effect on the outcomes.

Excimer lasers use nitrogen gas inside the laser cavity. The gas typically comes from a separate nitrogen bottle. There were always issues associated with this. The quality of gas changes from bottle to bottle. The quality even changes within the same bottle when it is full vs half empty. Change in gas quality changes the laser beam quality. Also, these systems use hosing to connect gas bottles to laser cavities, and thus are prone to leaks. Oxygen seeps into the laser and degrades the beam quality. There is only one excimer laser that does not have any of these issues: EX500. This laser has its own nitrogen generator attached directly to the laser cavity. The quality of gas never changes.

Two sum up, outside of the surgeon and clinical staff team, there are 2 main components to achieving best possible outcomes:

1. Setting up and maintaining the most stable surrounding environment and laser settings to prevent outcome variability due to environment fluctuations.
2. Usage and vigilance of regression analysis