Nanosecond laser cataract surgery update

by Liz Hillman EyeWorld Staff Writer

**AT A GLANCE**

- The technology is seen by some as providing true laser cataract surgery, emulsifying the lens with laser energy instead of ultrasound.
- The nanosecond laser attaches to a phaco system at the vitrectomy port and is well-integrated with current surgical flow.
- Some studies have found nanosecond laser cataract surgery can result in better endothelial cell preservation.

**Proponents find the technology to be safe, affordable, and well-suited for the normal surgical workflow**

While headlines about laser cataract surgery are usually focused on the femtosecond laser, another type of technology—the nanosecond laser—was discussed at the 2016 European Society of Cataract and Refractive Surgeons (ESCRS) meeting in Copenhagen, Denmark.

“We are in an environment where more and more colleagues invest in femtosecond laser for surgery. I find it a very expensive marketing tool because I’m still not convinced it’s a real advantage for the patient. It’s not really laser cataract surgery; it’s laser-assisted cataract surgery,” said Jérôme Vryghem, MD, Brussels Eye Doctors, Brussels, Belgium, explaining that the femtosecond laser might be able to make the capsulorhexis, incisions, and fragment the lens, but the nanosecond laser actually emulsifies the lens.

Dr. Vryghem, who presented his research on nanosecond laser cataract surgery during an ESCRS free paper session, found the Cetus nanosecond laser (A.R.C. Laser, Nuremberg, Germany) to be a more affordable technology that is able to emulsify the lens for aspiration with less energy dispersion in the eye, compared to ultrasound. It can add to the surgical time, he acknowledged, but less than femtosecond laser surgery.

“I thought it was a good idea to invest in this tool; at least you’re really doing laser cataract surgery,” he said.

The Cetus nanosecond laser, according to A.R.C. Laser’s website, is 100% photofragmentation without any ultrasound. The system has single-use handpieces and attaches to a surgeon’s current phaco machine through the vitrectomy port. The Cetus handpiece incorporates aspiration, irrigation, and laser, allowing the surgeon to use it just like a phaco.
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Handpiece. It has a max energy of 10 mJ, a wavelength of 1,064 nm, a pulse energy of 3 mJ to 10 mJ, and a pulse length of 5 nanoseconds.

There were several paper presentations at ESCRS focused on the nanosecond laser, including the one by Dr. Vryghem. His study involved 141 patients who had nanosecond laser cataract surgery and received a trifocal IOL. Dr. Vryghem said postop day 1, the eyes seemed calm and these patients appeared to have faster visual recovery; average endothelial cell loss was 6.9%.

Gangolf Sauder, MD, Mannheim, Germany, presented on a randomized prospective study that compared nanosecond laser cataract surgery to traditional phacoemulsification surgery. Dr. Sauder said there was similar endothelial cell loss in both groups, but the nanosecond laser group had 2.7% endothelial cell loss at 1 year postop compared to 7% in the phaco group.

Anja Liekfeld, MD, Berlin, Germany, described her results of using nanosecond laser in 100 consecutive cataract patients and said at the meeting she had to convert to phacoemulsification in three patients. This, she clarified later, was because the surgery was beginning to take too long with the nanosecond laser and she felt converting to phaco to speed it up was safer for the patient. Dr. Liekfeld said her results did not show a correlation between endothelial cell loss, which was an average of 2.2%, compared to energy used.

Overall, Dr. Liekfeld said in her presentation that they found nanosecond laser cataract surgery “at least as good and as safe as the gold standard.”

Two studies published earlier this year suggest nanosecond laser cataract surgery results in lower endothelial cell loss and faster corneal thickness recovery compared to phacoemulsification surgery.

Tanev et al. performed cataract surgery in the eyes of 41 patients where one eye received nanosecond laser cataract surgery, and the contralateral eye received ultrasound phacoemulsification. Endothelial cell density was compared before and after cataract surgery. The researchers found better endothelial cell preservation in the eye operated on with the nanosecond laser.

A separate study that evaluated femto phaco surgery compared to nanosecond and femtosecond laser cataract surgery—considered “all laser” cataract surgery—found the increase in central corneal thickness was lower in the latter group. Eyes that underwent “all laser” cataract surgery also showed less endothelial cell loss.

Ivan Tanev, PhD, assistant professor, Department of Ophthalmology, Medical University of Sofia, Sofia, Bulgaria, said in the last 2 years he has increased his use of nanosecond laser to 70% to 80% of his cataract procedures. Dr. Tanev has attached the Cetus to the Millennium Microsurgical System (Bausch + Lomb, Bridgewater, New Jersey), Stellaris PC (Bausch + Lomb), VISALIS 500 (Carl Zeiss Meditec, Jena, Germany), and Oertli (Berneck, Switzerland) and Geuder (Heidelberg, Germany) surgery platforms.

“Virtually any cataract up to 4+ nuclear sclerosis can be done with the system,” he said. “The system fits a wide variety of cases, for example, some compromised corneas [like] Fuchs’ dystrophy cases, limbal deficiency corneas. I’m not a femto surgeon, but it looks like the nanosecond laser perfectly matches the needs of a low energy [emitting] device to finish the femto pre-cut cataract.”

Dr. Tanev said he thinks the complication rate of cataract surgery with nanosecond lasers is lower than that with standard ultrasound phacoemulsification, but, he added, “it is crucial to understand how the nanolaser works and what to expect from it.”

“The surgical gestures and habits look like in the normal phaco [system],” Dr. Tanev said. “Of course, you should follow some learning curve and adapt [your] personal surgical habits to nanosecond laser surgery.”

For example, Dr. Vryghem had been told it was impossible to rupture the capsule with the nanosecond laser system, but he found this not to be the case.

“I was possibly too aggressive and I ruptured some capsules, about eight since I got the machine in August [2015], but five of these were in the beginning. The last capsule rupture I had was [more than] 6 months ago,” he said.

Overall, Dr. Vryghem said the nanosecond laser is an “affordable marketing tool” to differentiate one’s practice, but do surgeons really need it? No, he said. Dr. Vryghem said he doesn’t try too hard to sell his patients on opting for nanolaser technology but might advise them more on it if they are at risk for further endothelial cell loss.

“If the patients have the choice to go for nanosecond laser cataract surgery or not, only one patient in five chooses it. I [tell patients], you can do it, but you don’t make a mistake if you do ultrasound,” he said.

Still, he said he’s pleased with the edge the technology gives his practice.

“It’s much less costly, the disposables are less costly, and at least I’m doing the real laser cataract surgery,” he said, adding that it also takes up less space than femtosecond lasers, weighing 12 kg.

continued on page 56
Highlights from ESCRS 2016  •  December 2016

During the ESCRS paper session, Dr. Sauder was asked, if the technology has been around for awhile, why it “hasn’t made big waves?”

“Is that just conservatism or is there another explanation on your part?” an attendee from the audience asked.

“I don’t know—maybe I didn’t do many waves or enough waves,” Dr. Sauder responded. “I can only speak for me and my clinic, and in our clinic, it has made big waves. I’ve been using this technology since 2001,” he said, adding that it was 4 years ago when he decided he could start offering the technology to premium cataract surgery patients.

Dr. Vryghem expects interest in the technology to increase once it is available for commercial use.

“The tool has been limited to some selected European centers, and it is not available for commercial use until 2017,” he said. “We want to build up experience so that once it is launched and open to the market, we can give good advice about how to handle the tool and avoid the capsule ruptures I had, for example. We want to build up more data on the real advantages of nanosecond laser cataract surgery.”

Editors’ note: Dr. Sauder has no financial interests related to his comments.

Perspective from an early adopter

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John Kanellopoulos, MD, clinical professor of ophthalmology, New York University School of Medicine, New York, and medical director, LaserVision Clinical and Research Eye Institute, Athens, Greece, was first introduced to nanosecond laser cataract surgery in 1997 when it was then known as the Dodick Photolysis System (A.R.C. Laser), a system that used Nd:YAG laser light energy.

Dr. Kanellopoulos was involved in the first clinical trials of the technology to receive the CE mark in the European Union and later approval from the U.S. Food and Drug Administration in the early 2000s.

Now, Dr. Kanellopoulos said he regularly performs nanosecond laser cataract surgery.

With the evolution of the device—the Cetus uses single-use probes with advanced ergonomics and laser delivery—nanosecond laser cataract surgery is actually his preference for softer cataracts or for patients with significant posterior subcapsular cataracts, ranging 1–2 on a 1–4 scale of nuclear sclerosis.

“I would strongly recommend a surgeon who has access to this technology to use it, under the appropriate tutorage, as I think a significant percentage of surgeons would be surprised with some of the intrinsic advantages of [it],” Dr. Kanellopoulos said. “Its ability to remove cataracts without any energy in the form of heat delivered into the cornea or the anterior chamber; its use of a small fraction of energy compared to even the best phacoemulsification devices available globally today; with regard to softer lenses, its ability of better purchase of the soft cataract material; and its better surgical outcome in a patient where a complicated cataract procedure matters the most.

“I think the future will determine whether this procedure will be a significant alternative to phacoemulsification and/or FLACS in the global cataract surgery armamentarium,” he added.

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References

Editors’ note: Drs. Vryghem and Tanev have no financial interests related to their comments.

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