

The Future Has Never Been Clearer

How NGENUITY® has revolutionized anterior surgery

Juan Álvarez de Toledo Elizalde, Vice President of the Barraquer Ophthalmology Center, is an anterior focused surgeon with expertise in corneal surgery.



Meet Juan Álvarez de Toledo Elizalde

I spend most of my time with cataract, refractive, intraocular lens, and exchange patients, but I also perform several types of corneal transplants, including Descemet membrane endothelial keratoplasty (DMEK) ducts and penetrating keratoplasty (PKP) patients. I also cover refractive surgery and reconstructive surgery of the anterior segment of the eye. Our busy center has five operating theaters – all of which have both Leika and Zeiss microscopes operating with the new NGENUITY® upgrade. We also have a Rescan (without the 3D system).

Visualization systems have evolved massively over the last five years. Latency used to be the major problem, especially when doing fast movements at low magnification (techniques like suturing in PKP were challenging). Today, this problem has completely disappeared – the latency is so short that it has no meaning for surgical procedures (1).

Previously, when doing cataract surgery inside the eye, the resolution of visualization systems was not as good as with an optical microscope. Today, digital visualization through a screen is more commonplace than direct optics – especially when you need to see intraocular details at high magnification (2). A good example of where digital visualization shows its strengths is when performing posterior capsulorhexis in children; here, you are performing precise procedures on very small structures, and iris suturing requires sight of details that you can only get at high magnification. The optical microscope loses resolution as it loses light when you integrate magnification – but a digital system with a screen is the exact opposite.

I should also note that my colleagues in glaucoma prefer to use the digital system when performing a non-perforating penetrating sclerectomy because high magnification is much better in the circumstances with excellent resolution.

Put simply, the digital visualization set up is definitely the future – having all the information you need on a screen is ideal; there is no need to rely on other people to tell you the details, as you have instant access.

Moving with the times

One major reason I made the switch from analogue to NGENUITY® was to evolve my surgery alongside the benefits of evolving technology. Modern surgery has become more precise – and that means we need to be able to see as well as possible (3, 4). When you need to work in detail at high magnification for delicate procedures, such as DMEK, we need to evaluate the tools we have at hand – and optical systems cannot compete (5-9).

Put another way, improving your visualization tools allows you to improve your surgery (7, 10-12). We should always want to improve what we can do for the patient, and better visuals allow us to do or see things that weren't possible or visible before. But as surgeons, aren't we actually striving for perfection? The motivation behind my journey into this technology was a desire to improve my precision, improve the results – and, ultimately, perfect the surgery.

A better drive – with the whole team

If I had to sum up the difference between analogue and NGENUITY®, I'd say it lies in the quality of the overall product and what it enables. To use an analogy, let's compare a car with a diesel engine to a Tesla. You cannot escape the fact that some diesel cars are extremely good! And yet, you cannot distill a Tesla car into the engine alone. There is an entire concept at play – form and function are brought together with a specific objective in mind: To provide a higher quality product and an improved overall experience. And that's how I feel about NGENUITY®.

One less obvious advantage I have seen whilst using NGENUITY® involves other people. Because everyone can see the surgery on the screen, the entire operating theater becomes absolutely immersed in the surgery – everyone pays close attention. The staff are more involved in the surgery, which importantly brings more synchronicity into the operating team; the nurse sees the same view as me and can anticipate what is needed. I also find it invaluable when teaching; students see the surgery the same way I see it and that helps them learn faster.

In short, having everyone paying the same level of attention to the same visuals is brilliant – for the patient, for the surgical team, and for me.

Make a choice – before it's made for you. If I was always given the option of analogue or digital, I would choose digital visualization



every time. Unfortunately, right now, some scenarios do not present a choice! For example, the size of the operating theater may limit me to analogue microscopes on some occasions. When I'm forced to use an analogue microscope, it does make me consider my perception of safety and risk; for example, when working in Africa, I may need to use a microscope of lower quality, and so I may not see everything as clearly as I would like. Ultimately, I know that safety lies in my own hands (5-9).

I suspect surgical tools will follow the automotive industry – the old technology will eventually be phased out completely (only to be found in museums!) and we will only ever use digital visualization for surgery. Before it becomes the only choice, I can offer a single piece of advice to any surgeon who is thinking of adopting NGENUITY®: Do not be afraid! Sometimes, when we start using a new device, we're fearful of change and of what might happen. But if you just sit back, watch, relax, and do the surgeries – it's only a matter of time before it becomes the only way to drive. One notable difference is where you have your hands and head placed; the movements of your arms will change a little – and you will be in a slightly different position. But the quality of the image nowadays is worth it – especially now that the latency has virtually disappeared (3). The first patient I saw with a digital visualization system required a limbal allograft, and it took me two hours. It

was not an easy case, but it was a successful surgery. And I only had to complete a couple of surgical sessions before I felt completely comfortable with the new set up.

Play has no limits

Looking to the future, technology will continue to evolve and digital visualization can only continue to improve. By interviewing surgeons and taking feedback on board, companies will find innovative solutions – and make new surgical feats possible.

And I'll let you into a secret. With this constant evolution of technology, I encourage all my residents to spend time on any gaming console – I've had every generation of PlayStation console throughout my career! I believe modern games consoles allow you to gain special skills and become familiar with all sorts of interfaces that helps prepare you for the next generation of surgical system. Just look at the technology in your operating room – you need screens, you need your ears, you need your feet, and, of course, you need your hands. Playing complex games that require super fast reactions is great training for the fast-paced environment of the operating room. And I believe laser surgeries of the not-too-distant future will likely use a game console-like setup – you will have access to a great deal of potentially useful information and you will have to process the signals just like a video game to find the best surgical outcome... Game on!

Please refer to NGENUITY® User Manual for list of indication, contraindications and warnings

Opinion based on surgeon's impressions and experience after NGENUITY® use

1. D Ta Kim, D Chow. "Graefes Arch Clin Exp Ophthalmol, 260, 471 (2022). PMID: 34477929.
2. MG Tieger et al., Int Ophthalmol Clin, 60, 1 (2020). PMID: 31855891.
3. NGENUITY® 3D Visualization System Operator's Manual
4. Alcon data on File, TDOC-0055082, Assessment of Visual Attributes for NGENUITY System 1.0
5. JS Agranat, JB Miller, Int Ophthalmol Clin, 60, 17 (2020). PMID: 31855892.
6. KE Talcott et al., Ophthalmol Retina, 3, 244 (2019). PMID: 31014702.
7. A Kumar et al., Indian J Ophthalmol, 66, 1816 (2018). PMID: 30451186.
8. Z Zhang et al., Current Eye Research, 2019 44, 102 (2019). PMID: 30265818.
9. N Moura-Coelho et al., European Ophthalmic Review, 13, 31 (2019). DOI: 10.17925/EO R.2019.13.1.31
10. RM Palácios et al., "An experimental and clinical study on the initial experiences of Brazilian vitreoretinal surgeons with heads-up surgery," Graefes Arch Clin Exp Ophthalmol, 257, 473 (2019). PMID: 30645695.
11. T Zhang et al., Curr Eye Res, 44, 1080 (2019). PMID: 31021174.
12. RM Palácios et al., Curr Eye Res, 45, 1265 (2020). PMID: 32111126.