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Continuous Innovations in Retina

A roundtable discussion focusing on the unique ways that Alcon remains committed to moving the field forward.

Panelists: John Kitchens, MD, moderator; Maria Berrocal, MD; R.V. Paul Chan, MD; and Arshad M. Khanani, MD, MA

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Alcon was founded in 1945 by Robert Alexander and William Connor (hence the name “Alcon”). One of the first innovations they brought to market was the eye dropper technology, which we still use today. Other early Alcon innovations included developing material specifically for implantation in the eye, now known as the AcrySof technology. Retina developments advanced from 1997 with the launch of the ACCURUS Surgical System, followed by the launch of Alcon’s small gauge systems in 25-gauge and 23-gauge. GRIESHABER was integrated into the mix in 1997, and a disposable instrumentation line followed. Ten years later, the CONSTELLATION Vision System was launched in 2008, which remains the market leader for vitrectomy around the world. Additional portfolio advancements in illumination, laser, ultra high-speed cutting, and 27-gauge have evolved since the launch of the CONSTELLATION platform.

In 2016, the company introduced the NGENUITY, the VEKTOR Laser Probe, and the Advanced ULTRAVIT beveled cutter with 10,000 cuts per minute (cpm). The discussion among the expert panelists that follows reveals how Alcon is truly an innovator in ophthalmic industry, with a focus on retinal products.

—John Kitchens, MD

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Continuous Innovations in Retina

A roundtable discussion focusing on the unique ways that Alcon remains committed to moving the field forward.

John Kitchens, MD: How—or when—did you start using Alcon’s products? What is the one most meaningful product from Alcon that really changed the game for you?

R. V. Paul Chan, MD: I trained with Alcon systems as a fellow, and during that time we were at a point where most surgeons were using 20-gauge instruments. Then we saw the transition to minimally invasive surgery (MIVS; Alcon). This was interesting because, as we evolved in our practice, we went from 20-, to 23- and 25-gauge (25+ GRIESHABER Advanced DSP tips), and now to 27+ instrumentation. Adding to that change in size are the changes in the design of the cutter and the design of the cannula evolving during the past 10 years. This evolution has resonated with me in how we have improved our surgical options.

As a pediatric retina surgeon, I have really enjoyed using the 25+ short instruments. This is partially because of the stability of the cutter. I like the control we have with the infusion. I like the smaller MVR Blade. When I am dealing with pediatric cases, I feel like I have more control and more predictability when I have the short instruments. Because I was trained on 20-gauge, sewing in the infusion was something I was used to doing on most cases. Today, most trainees are learning strictly MIVS without ever having a need for suturing in the infusion. So when we use the 25+ gauge short instrument, I have also found this to be a good training opportunity for our fellows.

Instrumentation is continuing to evolve and improve,¹⁻³ and it has made a tremendous difference in how I approach these cases.

Arshad M. Khanani MD, MA: I used Alcon platforms during residency and fellowship. We used mainly 20-gauge at that time, but I was witness to the transition from 20-gauge to small-gauge surgery. This technology reduced complications like postoperative inflammation, increased patient comfort, and improved surgical efficiency.³⁻⁵ Cutter speeds also improved with time.

Our goal as physicians is to benefit our patients by decreasing the duration of surgery and by optimizing surgical outcomes. This is possible due to continual innovation by Alcon. The introduction of digitally assisted vitreoretinal surgery (NGENUITY; Alcon) has been a game changer in terms of surgical visualization. In my opinion, Alcon continues to be a leader in the retinal space.

Maria Berrocal, MD: In the early 1990s, the Alcon vitrectomy machine was called the Ocutome, and our Alcon rep would come to New York every few weeks to show us new instrumentation. Perfluorocarbon liquids were being developed by

Dr. Chang at that time, and Alcon was instrumental in helping with that project. Those innovations changed our lives and the way we managed a number of diseases, particularly complex retinal detachments.

We later evolved to the ACCURUS Surgical System (Alcon), and its 2,500 cuts-per-minute was a dramatic change and improved the way I treated my diabetic patients. When the original 25-gauge became available, it was too flexible, and it was not as efficient as we had hoped—fortunately that technology improved.

I was at a meeting in Germany around 2009, and I remember Professor Yasuo Tano disagreeing with the moderator who was arguing against micro-incisional surgery. Professor Tano said, “Look, the technology is not optimal yet, but it will get there. We have to dream an idea, and then the technology will eventually catch up.”

That is exactly what has happened.

I particularly like the 27+. Some people believe it is just a smaller tool and try to do the same things they would with a 20- or 23-gauge, but that is not the case. Once I started using the new probe, I developed new ways of treating my diabetic patients. New technologies offer great opportunities to innovate and develop different treatment modalities.

Alcon’s customer service cannot be overstated. The best example of that intangible value was a few years ago when I was performing surgery on December 23, and our surgery center was closing the next day for the holidays. The ACCURUS stopped working, and I still had five cases left, all of which were retinal detachments. Everyone was scheduled to be on vacation, and Alcon was closed. We called our rep, and several of them rented a pickup truck and brought in an ACCURUS from another hospital, all within an hour. That is frankly priceless.

UNSURPASSED CUSTOMER SERVICE

Dr. Chan: I know of several institutions that do not have a reliable second vitrectomy machine. Sometimes, there may be no second unit at all. Dr. Berrocal makes an important point. The ability to count on a team to come in and replace a device and to problem solve with you and your team makes it a more appealing process.

The evolution and improvements in products—going smaller, going faster—is not just because they can, but it is because of the improvements Alcon is bringing to market that actually make a difference in how we approach retinal surgery and ultimately patient care. There is a purpose to the change.

Dr. Khanani: I have always been able to reach an Alcon representative by phone to problem solve with me. Like Dr. Chan, I do not have spare devices sitting around, so when errors happen or a machine does something strange, I need to know the service call is going to be answered.

Another thing I like about Alcon's retinal portfolio is the vast product range. This allows surgeons to customize their surgical approach to best treat their patients.

Dr. Kitchens: The customer service point is too often overlooked when it comes to vitreoretinal equipment. Alcon has led the industry in product development and the support they offer for their equipment. Having the largest sales force dedicated to vitreoretinal surgery allows Alcon to lead the way in customer service as well.

I have a little bit of a different perspective because I have tried almost every device in our surgery center. I am still impressed by just how incredibly robust the ACCURUS is (and I say 'is' because it is still being used in many venues). That technology may be almost 20 years old, but it has evolved from 1,500 to 2,500 cuts per minute, it allows us to do 25-gauge surgery, and it has added a xenon light source. I like that it is a relatively open platform. If you prefer a laser probe or a light pipe from another manufacturer, Alcon does not prevent you from using that equipment. That is unique in today's industry.

Having had a chance to work with the other systems, I think one critical thing that we overlook is the ease of setup. Our technicians consistently prefer the CONSTELLATION Vision System (Alcon) because it is easy to set up and troubleshoot (Figure 1). There are not a lot of stopcocks to hook up; you can activate the switch from fluid to air with the foot switch. It is those little details that make the surgical experience easier.



Figure 1. The CONSTELLATION Vision System.

For me, the NGENUITY system changed my perspective completely and ushered the CONSTELLATION into our operating room.

Dr. Chan: Alcon's global footprint is another positive. With the international work that I do, I interface a lot with people who are very familiar with Alcon's products, like the ACCURUS and the CONSTELLATION.⁶ I applaud the company's commitment to international education in cataract and vitreoretinal surgery. It is amazing to me how committed Alcon is to teaching physicians, globally, how to do vitreoretinal surgery.

Dr. Kitchens: A majority of the fellowship programs in the United States use an Alcon product. Dr. Berrocal, since the CONSTELLATION was introduced in 2008, what innovations have impressed you?

Dr. Berrocal: The CONSTELLATION created a massive, dramatic shift in the way we do everything, particularly how little we need to rely on operating room staff. I love that I can control everything. If a scrub nurse is doing something other than watching the surgery, I can just shift through the foot pedal to access all the functions.

I also like the ability to sequentially go from aspirating to cutting to reflux. It allows you to quickly engage tissue, cut it, and release it.

When 25-gauge first came out, it was too flexible, and the light was suboptimal. But Alcon went back to the developers and improved that immensely. Now, the 27+ is stiffer,⁷⁻⁹ and the light is great. I have been using the 10,000 cuts per minute (cpm) vitrectomy probe (Advanced ULTRAVIT), and I notice almost no difference between using that and using a 25-gauge, as far as efficiency in removing vitreous.

I also appreciate that when I suggest how something might be improved, Alcon is willing to listen and put resources into improving their technology.

Dr. Khanani: For me, the one standout innovation has been the ease of upgrading to fast cut rates and being able to control everything myself, like Dr. Berrocal noted. It is little things like knowing when the bottle is running out instead of having to rely on someone to look at the bottle and see.

I also like the ease of upgrades. New cutters will talk to our "old" machine. Software is seamlessly upgraded, which makes it easy on our technicians.

Dr. Kitchens: From the pediatric perspective, what has been the biggest change to the CONSTELLATION?

Dr. Chan: Instrumentation. Theoretically, most of us can get from A to B to C without all the bells and whistles, right? Intraocular pressure (IOP) control, drawing up gas from the CONSTELLATION itself—all of this potentially makes

surgery safer, more efficient, and more predictable. I also like the increased stability and control I have with the valved cannula.

Dr. Kitchens: The CONSTELLATION, although the oldest of all these next-generation machines, is still considered to be the gold standard. Other devices can match the speed or the illumination, but I have yet to see any machine that does everything from top to bottom as well as the CONSTELLATION.

Some naysayers thought the CONSTELLATION was over engineered when it was introduced in 2008, but it is that over engineering that keeps this machine so relevant. To imagine a machine that came out nearly 9 years ago now being able to do 27+ surgery with 10,000 cpm is absolutely unbelievable. We will be using this machine 10 years from now.

The dual-pneumatic cutter allows the CONSTELLATION to do things other devices cannot. A spring-return cutter cannot have the consistency of cut, the lack of variability, or the consistency among the cutter that it has produced. We have seen that as we have tried other machines. Cutter differences are not really that great at lower cut speeds, but at higher cut speeds, that dual pneumatic makes a big difference as far as your efficiency and reliability.

Much like the consistency of their forceps, the Alcon cutter gives the same performance from pack to pack. My experience with other cutters is that one cutter may perform differently from the next based on the quality of the spring and the design tolerances.

NGENUITY

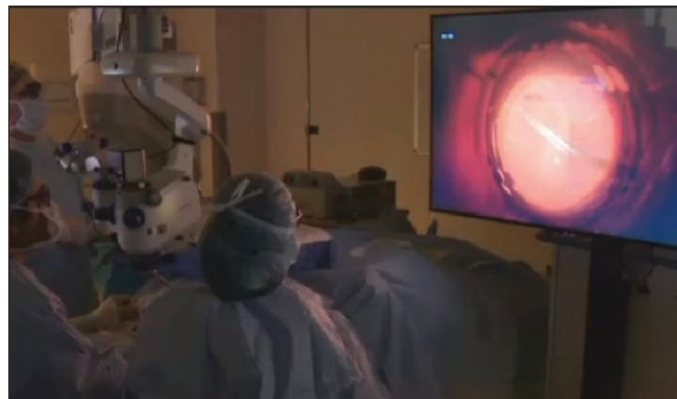
Dr. Kitchens: How has NGENUITY changed the visualization paradigm?

Dr. Khanani: I think using NGENUITY (Figure 2) helps the surgical team visualize the procedure in real time, which helps the flow in the OR by making things more efficient. When I first used the NGENUITY system, I did six cases, and there was not much of a learning curve and the adaptive focus was good. At high magnification, I was able to visualize tissue better than a microscope.

Dr. Chan: I have not used the NGENUITY with patients, but I have used it in the Alcon wet lab. There is so much untapped potential, not just for surgery, but for training, mentoring, and education. With the NGENUITY, I would be able to see exactly what my fellow and staff are seeing in the OR while I am operating in Chicago or potentially see exactly what another surgeon is doing while they are operating in an OR halfway across the world. Telementoring for vitreoretinal surgery could become a real application of the NGENUITY system.

I am very excited to see where we can take this technology. It is also very important to make sure that any new applications for its use are safe and validated.

Dr. Berrocal: The potential is huge with the NGENUITY, especially for training. I was surprised when I used it because I



Courtesy of George Williams, MD

Figure 2. Surgery utilizing the NGENUITY system.

thought I would have to convert at some point. I had six cases that day, and two were very difficult diabetic detachments. Some cases were macular holes, and I was a little nervous. But, I was able to perform each surgery with hardly any learning curve. I actually had an enhanced depth of field in macular work, which was surprising and impressive. I could see the membranes better, and it was much easier to remove and peel them. This was particularly valuable for me because I do a lot of the membrane peels with the vitrectomy probe. In that sense, I think the NGENUITY gives you an enhanced view vis-a-vis the microscope, which is an important asset.

Dr. Kitchens: I thought the NGENUITY would be all about surgical video, but I found it to be a tremendous training device. Like Dr. Berrocal, I also realized I was getting a better view and a better depth perspective while doing macular work. In fact, when I went up to my second room to use the microscope, it was a totally different view. Things were not in focus as often as they were with the NGENUITY.

It is remarkable that you have more things in focus and you still have that 3D capacity to judge depth. My partner, Blake Isernhagen, MD, showed me great video (Figure 3) of a macular hole-related detachment that he is peeling on, and he never has to refocus the scope under high magnification. That is a surgical game changer. I can perform better procedures. I can do less re-grabs, I can be more accurate with my peeling, and I provide better care for my patients.

With the staff seeing the same view I am, it improves our quality in the operating room. I have my staff invert me. I know Alcon's going to have a software upgrade that is going to allow for pedal inversion through the CONSTELLATION. But I do not think I need it because now my scrub tech sees exactly what I am doing, and she knows exactly when to invert me. It is actually better than foot pedal inversion; it is automatic inversion, courtesy of her. She also knows when I need to do a little better white balancing, or when I need to turn up my gain to provide a better view.

NGENUITY helps with bi-manual surgery because the visualization is so much better. We are also operating with lower light

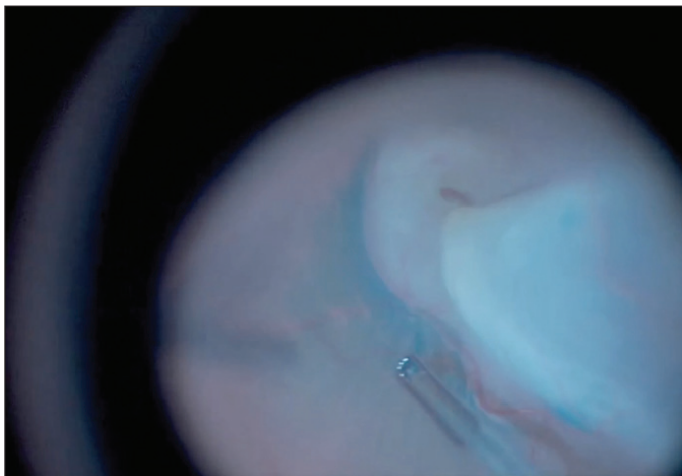


Figure 3. Image of a macular hole-related detachment.

levels than we would traditionally, because you can turn up the gain and see more detail with lower light. It provides us multiple opportunities to take better care of our patients.

Dr. Chan: Having transitioned to a new OR during the past year and a half, my biggest change was not related to which machine I would use to perform vitrectomy, it was visualization. For the last decade, I primarily used a contact wide-angle viewing system. Previously, I did not primarily use a binocular indirect ophthalmomicroscope (BIOM; Oculus Surgical) or other noncontact viewing system. So I had to transition to a new OR setting and visualize things appropriately with a completely new viewing system. Visualization is what I find so appealing about NGENUITY. It has the ability to make visualization easier and potentially even standardize visualization for surgeons and staff regardless of where you are.

MINIMALLY INVASIVE SURGERY

Dr. Kitchens: How has minimally invasive surgery changed the way you take care of pediatric patients? What does it allow you to do better or differently?

Dr. Chan: I think MIVS has definitely improved our ability to manage these children. We used to use 20-gauge instrumentation, which was great, because you needed high-efficiency cutters to remove the pediatric vitreous. But the 20-gauge instrument itself is very large relative to the size of a very young child's eye. Having an instrument that is smaller, but still has good performance regarding the cut rate and vacuum,⁶⁻⁸ can help you safely remove the child's vitreous and induce a posterior vitreous detachment in a very small space. So the evolution in instrumentation has absolutely changed what we do.

Having said that, keeping these pediatric cases sutureless is surgeon dependent. Pediatric retina surgery has a number of different considerations compared to adult retina surgery. I think many of us who take care of children have a low threshold for using sutures to close the sclerotomies. And for all of our cases,

safety is paramount. Many retina surgeons speculated whether we could safely perform a lens-sparing vitrectomy with these smaller instruments. And our experience tells us that we can.

Also, post-operatively, the care of children can be challenging, and if there is significant discomfort after surgery, the examination may be more difficult. But with the 27+, you can efficiently and effectively manage certain pediatric retina cases without having to suture. Post-operatively, day one, after 27+ surgery these children may be more comfortable and more compliant with the outpatient exam. I am not exactly sure how the 27+ platform is going to fit into our management of surgical pediatric retina patients, but I have been pleasantly surprised at how good it is so far.

Dr. Kitchens: Are you using MIVS 27+ family of advanced instrumentation for most of your pediatric cases?

Dr. Chan: No. Most of my pediatric cases are still 25+ or 23 gauge.

Dr. Berrocal: The way I approach diabetic detachments now is completely different, and it is thanks to small-gauge instruments. For example, in the past, we would be doing mostly bimanual surgery, which I always found cumbersome. It is costlier, and you need a chandelier. I like to do things as simply as possible. I use very few instruments and a streamlined approach. The 27+ (Figure 4) allows for exquisite control. When I use 27+ to tackle a traction detachment, I can insert that small probe anywhere I want. I can back shave and peel tissue from the vessels with minimum movement underneath. The difference in mobility and how few iatrogenic breaks you create is incredible. You can get on the surface of detached retina and peel abnormal tissue directly, this is something we could never do before. The way we do surgery now is totally different.

Dr. Khanani: For me, it is improved efficiency,^{4,7,8} which is huge. The case times have decreased significantly because of micro-incisional vitrectomy surgery. Intraoperatively, I am able to do most of the surgery using the vitrectomy probe. I am able to access tissue planes that I have never been able to access before with a vitrector. Before these instruments were available, I had to use scissors, forceps, and multiple other things. In private practice, the less instruments you open, the better it is for the center.

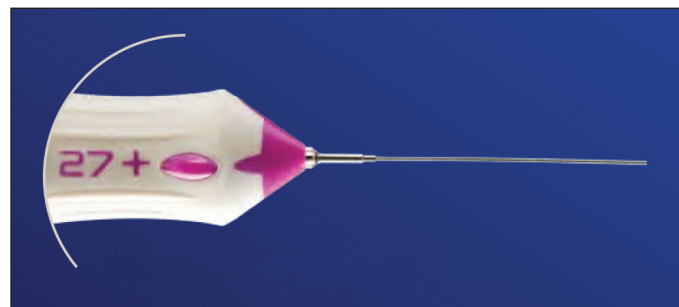


Figure 4. Alcon's 27+ Vitrectomy probe.

I also like the fast cut rate for detachments. This, combined with smaller instruments, gives me a very stable eye. The valved cannula has been amazing for eye stability.

Most importantly, patients are comfortable and their recovery time is reduced. All these positive aspects make the procedure more efficient and result in better outcomes.

Dr. Kitchens: The 27+ has allowed me to expand my surgical scope, such as with the removal of vitreous floaters, which can be extremely bothersome for patients and are still fairly controversial among retina specialists. Some patients are fairly debilitated from floaters. It is distracting enough that they do not feel comfortable reading or driving. Those are cases that I would not have taken on with 20-gauge instrumentation. But now, thanks to minimally invasive, sutureless surgery, these are some of my happiest, most rapidly recovering patients.

The second is vitreous hemorrhage in patients who come in with diabetic retinopathy. Previously when we would suture in the instrumentation, we would have to suture our sclerotomies closed and deal with the little annoyances like Vicryl suture granulomas. It was a bit of a barrier to taking these patients on.

Now, however, I am more likely to take on patients with a vitreous hemorrhage from patients with diabetes, or patients with something suspicious on the ultrasound because I have minimally invasive surgical equipment that allows me to perform a faster, more efficient, and safer surgery.⁴

ULTRAVIT

Dr. Kitchens: What are some of the surgical differences you have noticed with the Advanced ULTRAVIT 10,000 cpm beveled cutter (Figure 5).

Dr. Khanani: Before using the beveled cutter, I used to schedule a larger time slot in the operating room for diabetic tractional retinal detachments compared to other cases. Now, due to the improved efficiency in trimming membranes with the beveled cutter,¹⁰ I schedule all my detachment cases for the same length of time.

One instrument does it all. It can work like a pick, it can work like scissors, and it can work like forceps. It is very stiff, and it does not bend much. This translates into better efficiency and less post-operative complications like iatrogenic breaks and better patient outcomes. I am looking forward to using it on a routine basis. This is a great example of continual innovation by Alcon.

Dr. Berrocal: I use mostly 27- and 25-gauge instruments, but for my patients with advanced diabetic disease, I only use 27+. The 27+ is fantastic for working very close to tissues. That is very useful when I am peeling internal limiting membrane or when I am trying to peel tissue off the blood vessels. These maneuvers can be done with a high degree of safety.



Figure 5. Advanced ULTRAVIT 10,000 cpm beveled cutters in 23, 25, and 27 gauge.

The 27+ is superb in dissecting the vitreous base without the risk of causing iatrogenic breaks in proliferative vitreoretinopathy cases. Iatrogenic breaks are one of the biggest problems in primary vitrectomy for retinal detachments. The smaller gauge allows for the efficient and safe removal of vitreous near the vitreous base. I did a case like that recently, and I was pleasantly surprised with the safety factor. For me, safety is of utmost importance in these complex detachments.

Dr. Kitchens: What about the reported need for something like a twin-duty-cycle (TDC) or a TDC-type cutter to make 27+ efficient enough to be used on a routine basis?

Dr. Berrocal: 27+ is efficient enough to be used on a routine basis. I do not use it all the time because I work in a place where cost is a big issue and where our insurance reimbursements are low.

That said, I think we are all going to be using 27+ once we feel comfortable with it. It is superb for anterior segment surgeries, lens repositions, and floaters. We can perform all these surgeries so much better with 27 because you are violating the eye less.⁷⁻⁹

Dr. Chan: Many surgeons will turn down their cut rate for dense membranes and keep their aspiration high. But having used the 27+ recently, it was very efficient. I was able to cut and remove the pediatric vitreous and lens. Smaller instrumentation enables us to access smaller tissue planes.

I use the 25+ cutter for most of my adult cases, but having the 27+ cutter available to use as another instrument (eg, forceps) would be very useful. The machine, however, does not allow you to have two separate cutters functioning and ready to go at the same time. But the 27+ cutter itself is fantastic and has utility for mixed-gauge surgery.

Dr. Kitchens: My Alcon representative provided us with 27+ cutters in an individual pack for a price that is just a bit more than forceps. I do most of my cases 25+, but I have the ability to open the 27+ cutter. Priming the cutter is fast. I will do mixed cases, and I will keep my 25+ valved cannula in and use that 27+ cutter. I still stick mostly with 25+ because of the cost associated with opening different instruments. I usually open max grip forceps and then have my 25+ cutter and the chandelier light.

It is in these types of cases that the bevel tip and 10,000 cpm has really made a difference in those patients with severe diabetes. I am able to get into tissue planes much more efficiently with that technique, whether it is the bi-manual nature of the surgery or whether it is the tip that can get closer to the retina. I can do a safer, more efficient surgery.

Dr. Khanani: I have been performing hybrid surgery for more than a year now for diabetic tractional retinal detachments. I have moved away from bi-manual surgery and chandeliers because I now use the 27+ cutter as a tool. I start all cases with a 23-gauge system to perform a fast and efficient vitrectomy. Then I connect the 27+ cutter and trim all the membranes. In most cases, I am not opening the forceps, scissors, or a chandelier and just using the 27+ cutter. This has decreased the number of things I am opening. The bigger 23-gauge trocar port is useful because the 27+ vitrector bends less when you have a bigger port to go through, which is useful when you are trying to do hybrid surgery.

VALVED CANNULAS

Dr. Kitchens: How have valved cannulas (Figure 6) changed retinal surgery for you?

Dr. Berrocal: There are two things: IOP control and valved

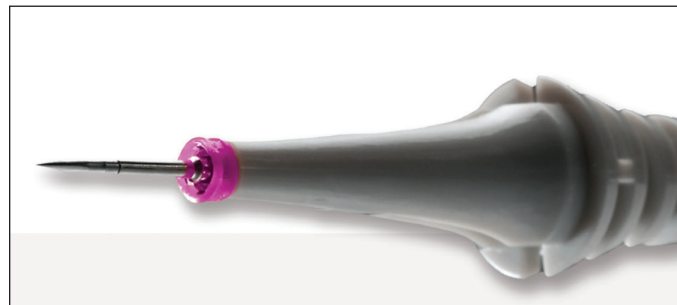


Figure 6. Alcon's 27+ valved cannula entry system.

cannulas.^{11,12} I am from the era where you had to put the bottle all the way at the ceiling, especially in patients with diabetes, to control bleeding. There are numerous potential complications when we are doing surgery in our diabetic patients,¹³⁻¹⁵ but the main problem on a diabetic eye is hemorrhage. If you have significant hemorrhage and a large clot in a detached retina in a patient with diabetes, you are in trouble. In the past, we had to close the case and then reoperate a week or 2 weeks later when the clot liquefied. Controlling bleeding is key.

IOP control and valved cannulas work hand in hand. The valved cannula gives you a controlled system, which is important because you do not want fluid running out. You also do not want shifts in the eye, and the IOP control is great for that. If a patient starts bleeding, I press on the vessel that is bleeding with the vitrector and briefly raise the bottle to 60. When the bleeding stops, I start lowering the IOP gradually. I know exactly where the pressure is. This is important because I see a lot of end-stage glaucoma patients.

These surgeries are about control. If you lose control of the eye or of the operation, that is it. All of these tools give you a more stable, controlled environment in which to perform delicate procedures.

Dr. Chan: It is all about control. Intraoperatively, having the ability to keep the eye under control with pressure stabilization is very important, regardless of the patient's age. When the valved cannula debuted, some surgeons were not that enthusiastic about it, and there were some mixed reports.¹⁶⁻¹⁸ There is a learning curve, but it can save steps, and make the case more efficient and potentially safer for the patient. Overall, the valved cannula gives you predictability and control. Now I hear many surgeons, who were previously reluctant to use the valved cannula, saying how much they like them. It is a great upgrade.

Dr. Khanani: The valved cannulas have resulted in improved efficiency and safety. As far as the efficiency is concerned, there is no need to put plugs. Also, we do not have to change the bottle as often as there is no fluid leaking from the trocars while changing the instruments. This results in saved time and money.

In regard to safety, the valved cannulas result in excellent intra-op control and stability. For example, I had a patient undergoing vitrectomy under local anesthesia. The patient



Watch it Now

See Maria Berrocal, MD, explain why efficiency is important in vitreoretinal surgery and how the Advanced ULTRAVIT 10,000 cpm beveled cutter and Vektor Articulating Illuminated Laser Probe assist her in these cases.



Eyertube.net/video/PBVOL

sat up and pulled his drapes off during the surgery, and the infusion line came out of his eye. Due to the valved cannulas, the eye stayed stable without any leaks, and I was able to proceed without intraoperative complications like choroidal effusions or hemorrhage.

EQUIPMENT VARIABILITY

Dr. Kitchens: Do we have everything we need to perform quality 27+ surgery without compromise?

Dr. Khanani: I think the instruments are better than I expected, but there is always room for improvement. The forceps can improve in terms of rigidity. The 27+ cutter can bend if you are getting very peripheral. I am sure Alcon will make improvements in the future.

Dr. Berrocal: We do not often discuss economy, but economy is tied to efficiency. The more efficient you are, the less complications you have. The patient does not get anxious. You can do more cases. You have to use less ancillary instruments. You have to use less fluid. All of this adds to a very economical experience, not only in cost, but in time, which translates to better outcomes. I think that is what all of these advantages provide.

Dr. Kitchens: Dr. Berrocal brings up an excellent point. Our surgery center analyzes the operating room cost data down to the minute. The Synergetics system allowed us to get into the operating room initially because it was affordable, and the capital costs were low. We were proud of what we were saving and what we were earning for our surgery center. As we increased our efficiency and increased our case volume, we could then afford the capital for the CONSTELLATION and the NGENUITY system. Amazingly, in the 6 months since we have had this system, the profit per case has stayed exactly the same. You can achieve a better outcome with improved efficiency and that cost can stay neutral.^{6, 19}

Inexpensive equipment is not necessarily going to be more cost effective. You can use the best equipment and still save on the time and the complications.

ILLUMINATION AND LASER TECHNOLOGY

Dr. Kitchens: Everyone here has used the VEKTOR Articulating Illuminated Laser Probe. What are your preferences?

Dr. Chan: I really liked it. Through the years, I think all of us have tried different types of laser probes: curved, straight, articulated, and different articulated methods where you are pushing down or pulling up. There is a balance to what we are looking for. The ideal situation for me would be an articulated laser probe that is illuminated. But the illumination has to be good, and the curve must be at a safe and useful angle.

What I like about the VEKTOR (Figure 7) is its ability to enter the eye. I previously used a 25-gauge illuminated, curved

laser probe that was not made by Alcon. It was good, but I had concerns that it would hit something upon entry. But with the VEKTOR you go in straight, and there is an ease-of-use when you are trying to create the curve intraoperatively. The illumination inside the eye was also excellent.

Dr. Berrocal: I do not have an assistant or a fellow working with me. What I really like to do myself is scleral depress with the left hand and then alternate hands. This allows me to see and treat the periphery. I recently used the VEKTOR on a patient with bad neovascular glaucoma. I wanted to laser the periphery and the ciliary processes, and it was easy to do because of VEKTOR's illumination. Sometimes, you cannot treat them all through the anterior chamber with the microscope illumination. For this indication, it works particularly well.

Dr. Khanani: I always use a curved, illuminated laser probe. The VEKTOR felt different in my hands. The entry through the cannula was much easier, and the tip was stiffer. Sometimes, when I used the older Alcon laser probe, the tip used to get damaged when going through the trocars. The VEKTOR's tip seems sturdier. If you have a fixed curved probe, sometimes you will hit the lens trying to treat the far peripheral retina. Being able to adjust the probe to where you need it to be to access the peripheral retina is very useful. The illumination is also much better. It is helping me avoid complications and perform more efficient surgery.

Dr. Kitchens: One of the things that I appreciate about the VEKTOR is the variability of the curvature angle. I have always used an intuitive retractable laser probe, but I have never favored the illuminated ones because it is hard to find a good, articulated one, and the angle of the cone is just not high quality. The light will often bleach out your aim. There are some compromises that seem to be made when you are making one of these multipurpose probes, in that your aiming beams, cone of light, or your articulation suffers.



Figure 7. VEKTOR Articulating Illuminated Laser Probe.

VEKTOR hits everything spot on. It is the exact angle that I like when it is fully extended, and the ability to extend it at variable angles is nice. The light quality is great. You can actually perform a vitrectomy with it as your light source. The best part is that there is a consistency about the quality of laser uptake and the aiming beam. You are able to see the aiming beam in the midst of the cone of light. It is always centered in your cone of light, which is a tough thing to do.

Dr. Chan: When thinking about cost, if you had to have one laser probe in the operating room, would you just have a 27+ articulated illuminated versus having both a 27+ and 25+ available?

Dr. Kitchens: I would start all of my cases at 25+, then use the 27+ cutter as an instrument and keep the port at 25+. I think having a 25+ VEKTOR is probably the sweet spot because I am going to have in a 25+ cannula already. That is what I use my 27+ cutter through.

Dr. Berrocal: I do a lot of 27+. It would make sense for me to just have them all be 27+.

ILLUMINATION PREFERENCES

Dr. Kitchens: What is your preference for illumination? What do you use?

Dr. Khanani: I use the wide-angle light pipe that comes in the vitrectomy pack. I only use a chandelier in rare cases. One of the great things about the CONSTELLATION is the quality of light and the illumination levels. We can now use much lower light and still have excellent visualization. CONSTELLATION was a big upgrade for that, and the NGENUITY system is even better.

Dr. Berrocal: I use as much illumination as possible because I really like seeing things well. I use the light in the pack. I only use the chandelier (25+) when I have a diabetic patient who has a lot of peripheral pathology, because it is most difficult to remove. I prefer the valved cannula for the chandelier. I know it comes with a cannula that is not valved, and I think Alcon should change that. Cannulas are much better if they are valved. You do not have egress of fluid, and you do not have to keep it in place all the time.

Dr. Kitchens: Does the chandelier go through the valved cannula and stay in the eye the same way it does through the nonvalved cannula?

Dr. Berrocal: Yes.

Dr. Chan: I do not use the chandelier much either.

Dr. Kitchens: I vary my lighting depending on the case. I often use chandeliers, which I started using to get a high-quality

surgical video. You do not have to do that with the NGENUITY system because you get such great video with it, regardless of your light source. I will still use it for patients with severe diabetes because I do like to do some bi-manual surgery. I will use the chandelier when I am doing the buckle at the microscope, and you can drain subretinal fluid. I will use a wide-angle light pipe for my routine cases, macular holes, epiretinal membranes, and traditional detachments. But if I have got a difficult case, I will use the chandelier as an adjunct to the light pipe as well.

Dr. Khanani: In my experience, the lighting is excellent with the CONSTELLATION system. I rarely use a chandelier unless it is a difficult diabetic case, where I need to do bi-manual surgery.

Dr. Kitchens: I hesitate to use a chandelier sometimes in diabetic patients because if I am going to put oil in the eye, I like to suture my sclerotomies even though I am using 25+. But, I have never regretted using a chandelier. I am always happy with the outcomes.

I also use a chandelier for a dislocated IOL. It works great with the following technique: I use a soft tip to go down and lift the intraocular lens (IOL) off the surface of the retina by aspirating on the surface of the lens. I then grab it with a forceps so that I am not actually working over the retina and down on the retina to lift the IOLs. I love that technique with the chandelier.

Dr. Chan: Chandeliers are also useful with dislocated crystalline lenses. I often use my light pipe as a second instrument to break up the lens inside the eye. So that extra lighting is critical.

IMPROVING PATIENT CARE

Dr. Kitchens: How can Alcon equipment improve patient care?

Dr. Chan: The systems and instrumentation are great, and



Watch it Now

Watch Arshad M. Khanani, MD, MA, outline the benefits of the Advanced ULTRAVIT Beveled High Speed Probe, along with his experiences using the Vektor Articulating Illuminated Laser Probe.



Eyetube.net/video/MSNOW

everything is very reliable. Alcon is laying a foundation for future development. I think this is where the field of vitreoretinal surgery is going to be in 10 years with visualization, instrumentation, hardware, and the machine itself.

We are at a place right now where, because of CONSTELLATION's ease-of-use, the machine and instrumentation with the Alcon system are very easy to adapt to for the staff, the surgeons, and our trainees. The developments that have already been made and the evolving technology will ultimately lead to better patient care both domestically and globally.

Dr. Khanani: Not all machines are created equal. You need the best tools available to maximize efficiency and patient outcomes. Alcon is the leader in innovation, in creating surgeon-friendly, staff-friendly equipment that will help you keep the surgery simple.

Alcon makes high-quality products. I believe that their disposable instruments are top of the line. Yes, you have to pay a premium for quality, but if you end up being more efficient and have better outcomes, you will save money in the long run.

Dr. Berrocal: In my opinion, Alcon products are efficient, reliable, and allow you to perform seamless surgery. So many things can go wrong when you perform surgery, starting with the machine set up. The easier it is, the more user-friendly it is, the fewer complications you are going to have. These systems have helped to make surgery safer.²⁰ We are often basing our complication rates on old data, old technology, and old machines.

I think the next step is for us to move into doing surgery earlier. For example, I think patients with diabetes should be operated on earlier. The CONSTELLATION is an ultra-efficient,

very safe platform^{6,19} that allows me to be highly efficient and have exquisite finesse when working on the retina. This reduces complications and allows me to be more aggressive and perform surgery earlier in many eyes. I think that is where we are going to be moving in the future.

Dr. Kitchens: I believe that you make the biggest difference with retina in the operating room. We have a lot of angst, debate, and hand-wringing over the differences between anti-VEGF therapies, but our treatments for diabetic macular edema and age-related macular degeneration are so good that, in many cases, it does not matter what you give the patient in the clinic. The operating room this is where you can make the difference between a patient going blind and a patient having vision.

Part of that is your surgical decision making, plus your skill level, and also the equipment you use. Equipment like the CONSTELLATION, the VEKTOR, and NGENUITY can make good surgeons great, and it can help make procedures safer for patients.

Dr. Khanani: What would we, as retina surgeons, want when we are having eye surgery? You are going to want the top-of-the-line equipment. You are not going to say, "Hey, the surgeon is saving a little bit of cost, and they are compromising quality, but that is okay." I put myself in that situation, and I say, "I need to offer my patients the best quality product that is going to help me to be more efficient and have better outcomes."

We have to think about what kind of products we would want the surgeon to use if we were having retina surgery. ■



Watch it Now

See R.V. Paul Chan, MD describe how he uses the Advanced ULTRAVIT Beveled High Speed Probe on pediatric and diabetic cases. He also explains how he uses the Vektor Articulating Illuminated Laser Probe to increase his efficiency during surgery.



Eyetube.net/Video/JWBVA

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CONSTELLATION® System

Caution: Federal law restricts this device to sale by, or on the order of, a physician. As part of a properly maintained surgical environment, it is recommended that a backup IOL Injector be made available in the event the AutoSert® IOL Injector Handpiece does not perform as expected.

Indications for Use: The CONSTELLATION® Vision System is an ophthalmic microsurgical system that is indicated for both anterior segment (i.e., phacoemulsification and removal of cataracts) and posterior segment (i.e., vitreoretinal) ophthalmic surgery.

The ULTRAVIT® Vitrectomy Probe is indicated for vitreous cutting and aspiration, membrane cutting and aspiration, dissection of tissue and lens removal. The valved entry system is indicated for scleral incision, canulae for posterior instrument access and venting of valved cannulae. The infusion cannula is indicated for posterior segment infusion of liquid or gas.

The PUREPOINT® Laser is indicated for use in photocoagulation of both anterior and posterior segments of the eye including:

- Retinal photocoagulation, panretinal photocoagulation and intravitreal endophotocoagulation of vascular and structural abnormalities of the retina and choroid including: Proliferative and nonproliferative retinopathy (including diabetic); choroidal neovascularization secondary to age-related macular degeneration; retinal tears and detachments; macular edema, retinopathy of prematurity; choroidal neovascularization; leaking microaneurysms.
- Iridotomy/Iridectomy for treatment of chronic/primary open angle glaucoma, acute angle closure glaucoma and refractory glaucoma.
- Trabeculoplasty for treatment of chronic/primary open angle glaucoma and refractory glaucoma.
- And other laser treatments including: internal sclerostomy; lattice degeneration; central and branch retinal vein occlusion; suturelysis; vascular and pigment skin lesions.

The FlexTip® laser probe is intended to be used with ALCON® 532nm laser systems.

The CONSTELLATION System is also indicated for emulsification, separation, and removal of cataracts, the removal of residual cortical material and lens epithelial cells, vitreous aspiration and cutting associated with anterior vitrectomy, bipolar coagulation, and intraocular lens injection. The INTREPID® AutoSert® IOL Injector Handpiece is intended to deliver qualified AcrySof® intraocular lenses into the eye following cataract removal. The following system modalities additionally support the described indications:

- Ultrasound with UltraChopper® Tip achieves the functionality of cataract separation.
- The INTREPID® AutoSert® IOL Injector Handpiece achieves the functionality of injection of intraocular lenses. The INTREPID® AutoSert® IOL Injector Handpiece is indicated for use with AcrySof® lenses SN60WF, SN6AD1, SN6AT3 through SN6AT9, as well as approved AcrySof® lenses that are specifically indicated for use with this inserter, as indicated in the approved labeling of those lenses.

Warnings and Precautions:

- The disposables used in conjunction with ALCON® instrument products constitute a complete surgical system. Use of disposables and handpieces other than those manufactured by Alcon may affect system performance and create potential hazards.
- Attach only Alcon supplied consumables to console and cassette luer fittings. Do not connect consumables to the patient's intravenous connections.
- Mismatch of consumable components and use of settings not specifically adjusted for a particular combination of consumable components may create a patient hazard.
- Vitreous traction has been known to create retinal tears and retinal detachments.
- The closed loop system of the CONSTELLATION® Vision System that adjusts IOP cannot replace the standard of care in judging IOP intraoperatively. If the surgeon believes that the IOP is not responding to the system settings and is dangerously high or low, this may represent a system failure. Note: To ensure proper IOP Compensation calibration, place infusion tubing and infusion cannula on a sterile draped tray at mid-cassette level during the priming cycle.
- Leaking sclerotomy may lead to post operative hypotony.
- Back scattered radiation is of low intensity and is not harmful when viewed through a protective filter. All personnel in the treatment room must wear protective eyewear, OD4 or above at 532nm, when the system is in Standby/Ready mode as well as during treatment. The doctor protection filter is an OD greater than 4 at 532nm.
- The infusion cannula is contraindicated for use of oil infusion.
- Attach only Alcon supplied products to console and cassette luer fittings. Improper usage or assembly could result in a potentially hazardous condition for the patient. Mismatch of surgical components and use of settings not specifically adjusted for a particular combination of surgical components may affect system performance and create a patient hazard. Do not connect surgical components to the patient's intravenous connections.
- Each surgical equipment/component combination may require specific surgical setting adjustments. Ensure that appropriate system settings are used with each product combination. Prior to initial use, contact your Alcon sales representative for in-service information.
- Care should be taken when inserting sharp instruments through the valve of the Valved Trocar Cannula. Cutting instrument such as vitreous cutters should not be actuated during insertion or removal to avoid cutting the valve membrane. Use the Valved Cannula Vent to vent fluids or gases as needed during injection of viscous oils or heavy liquids.
- Visually confirm that adequate air and liquid infusion flow occurs prior to attachment of infusion cannula to the eye.
- Ensure proper placement of trocar cannulas to prevent sub-retinal infusion.
- Minimize light intensity and duration of exposure to the retina to reduce the risk of retinal photic injury.
- Use of low vacuum limits, low flow rates, low bottle heights, high power settings, extended power usage, power usage during occlusion conditions (beeping tones), failure to sufficiently aspirate viscoelastic prior to using power, excessively tight incisions, and combinations of the above actions may result in significant temperature increases at incision site and inside the eye, and lead to severe thermal eye tissue damage.
- Adjusting aspiration rates or vacuum limits above the preset values, or lowering the IV pole below the preset values, may cause chamber shallowing or collapse which may result in patient injury.
- When filling handpiece test chamber, if stream of fluid is weak or absent, good fluidics response will be jeopardized. Good clinical practice dictates the testing for adequate irrigation and aspiration flow prior to entering the eye.
- Ensure that tubings are not occluded or pinched during any phase of operation.

Adverse Events/Complications: Use of handpieces during intraocular procedures in the absence of irrigation flow and/or in the presence of reduced or lost aspiration flow can cause excessive heating and potential thermal injury to adjacent eye tissues.

Attention: Please refer to the CONSTELLATION® Vision System Operators Manual for a complete listing of indications, warnings, and precautions.

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NGenuity™ 3D VISUALIZATION SYSTEM FOR THE DIGITALLY ASSISTED VITREORETINAL SURGERY PLATFORM

IMPORTANT PRODUCT INFORMATION

Caution: Federal (USA) law restricts this device to sale by, or on the order of, a physician.

Indication: The NGENUITY® 3D Visualization System consists of a 3D stereoscopic, high-definition digital video camera and workstation to provide magnified stereoscopic images of objects during micro-surgery. It acts as an adjunct to the surgical microscope during surgery displaying real-time images or images from recordings.

Warnings: The system is not suitable for use in the presence of flammable anesthetics mixture with air or oxygen. There are no known contraindications for use of this device.

Precautions: Do not touch any system component and the patient at the same time during a procedure to prevent electric shock. When operating in 3D, to ensure optimal image quality, use only approved passive-polarized glasses. Use of polarized prescription glasses will cause the 3D effect to be distorted. In case of emergency, keep the microscope oculars and mounting accessories in the cart top drawer. If there are any concerns regarding the continued safe use of the NGENUITY® 3D Visualization System, consider returning to using the microscope oculars.

ATTENTION: Refer to the User Manual for a complete list of appropriate uses, warnings and precautions.

[US-DAV-16-E-0857(1)]

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MVS IMPORTANT PRODUCT INFORMATION

Caution: Federal law restricts this device to sale by, or on the order of, a physician.

Indications for Use: The CONSTELLATION® Vision System is an ophthalmic microsurgical system that is indicated for both anterior segment (i.e., phacoemulsification and removal of cataracts) and posterior segment (i.e., vitreoretinal) ophthalmic surgery.

The ULTRAVIT® Vitrectomy Probe is indicated for vitreous cutting and aspiration, membrane cutting and aspiration, dissection of tissue and lens removal. The valved entry system is indicated for scleral incision, canulae for posterior instrument access and venting of valved cannulae. The infusion cannula is indicated for posterior segment infusion of liquid or gas.

Warnings and Precautions:

- The infusion cannula is contraindicated for use of oil infusion.
- Attach only Alcon supplied products to console and cassette luer fittings. Improper usage or assembly could result in a potentially hazardous condition for the patient. Mismatch of surgical components and use of settings not specifically adjusted for a particular combination of surgical components may affect system performance and create a patient hazard. Do not connect surgical components to the patient's intravenous connections.
- Each surgical equipment/component combination may require specific surgical setting adjustments. Ensure that appropriate system settings are used with each product combination. Prior to initial use, contact your Alcon sales representative for in-service information.
- Care should be taken when inserting sharp instruments through the valve of the Valved Trocar Cannula. Cutting instrument such as vitreous cutters should not be actuated during insertion or removal to avoid cutting the valve membrane. Use the Valved Cannula Vent to vent fluids or gases as needed during injection of viscous oils or heavy liquids.
- Visually confirm that adequate air and liquid infusion flow occurs prior to attachment of infusion cannula to the eye.
- Ensure proper placement of trocar cannulas to prevent sub-retinal infusion.
- Leaking sclerotomies may lead to post operative hypotony.
- Vitreous traction has been known to create retinal tears and retinal detachments.
- Minimize light intensity and duration of exposure to the retina to reduce the risk of retinal photic injury.

ATTENTION: Please refer to the CONSTELLATION® Vision System Operators Manual for a complete listing of indications, warnings and precautions.

PUREPOINT® Laser

Important Product Information

Caution: Federal (USA) law restricts this device to sale by, or on the order of, a physician.

Indications for Use: The PUREPOINT® Laser is indicated for use in photocoagulation of both anterior and posterior segments of the eye including:

- Retinal photocoagulation, panretinal photocoagulation and intravitreal endophotocoagulation of vascular and structural abnormalities of the retina and choroid including: Proliferative and nonproliferative retinopathy (including diabetic); choroidal neovascularization secondary to age-related macular degeneration; retinal tears and detachments; macular edema, retinopathy of prematurity; choroidal neovascularization; leaking microaneurysms.
- Iridotomy/Iridectomy for treatment of chronic/primary open angle glaucoma, acute angle closure glaucoma and refractory glaucoma.
- Trabeculoplasty for treatment of chronic/primary open angle glaucoma and refractory glaucoma.
- And other laser treatments including: internal sclerostomy; lattice degeneration; central and branch retinal vein occlusion; suturelysis; vascular and pigment skin lesions.

Contraindications: Patients with a condition that prevents visualization of target tissue (cloudy cornea, or extreme haze of the aqueous humor of the anterior chamber of vitreous humor) are poor candidates for LIO delivered laser treatments.

Warnings and Precautions:

- The disposables used in conjunction with ALCON® instrument products constitute a complete surgical system. Use of disposables and handpieces other than those manufactured by Alcon may affect system performance and create potential hazards.
- Attach only Alcon supplied consumables to console and cassette luer fittings. Do not connect consumables to the patient's intravenous connections.
- Mismatch of consumable components and use of settings not specifically adjusted for a particular combination of consumable components may create a patient hazard.
- Back scattered radiation is of low intensity and is not harmful when viewed through a protective filter. All personnel in the treatment room must wear protective eyewear, OD4 or above at 532nm, when the system is in Standby/Ready mode as well as during treatment. The doctor protection filter is an OD greater than 4 at 532nm.

Complications: Corneal burns, inflammation, loss of best-corrected visual acuity, loss of visual field and transient elevations in intraocular pressure can occur as a result of ophthalmic laser treatment. Unintentional retinal burns can occur if excessive treatment beam power or duration is used.

ATTENTION: Reference the Directions for Use for a complete listing of indications, warnings, and precautions.

ALCON® Lighted Instruments with ENGAUGE® RFID

Important Product Information

Caution: Federal (USA) law restricts this device to sale by, or on the order of, a physician.

Indications and Usage: Fiber Optic Instruments with ENGAUGE® Radio Frequency Identification Device (RFID) for use with the CONSTELLATION® System. These instruments can be used on the ACCURUS® System or ACCURUS® High Brightness Illuminator using the RFID Adapter Model Number 8065751140.

Warnings and Precautions:

- Minimize the light intensity and duration of exposure to the retina to reduce risk of retinal photic injury.
- Avoid operation of a fiber in air on consoles capable of illumination levels and settings higher than 10 lumens. This may result in fiber probe deformation and/or high surface temperatures that may cause patient injury.

ATTENTION: Reference the Directions for Use for a complete listing of indications, warnings, precautions, complications and adverse events.