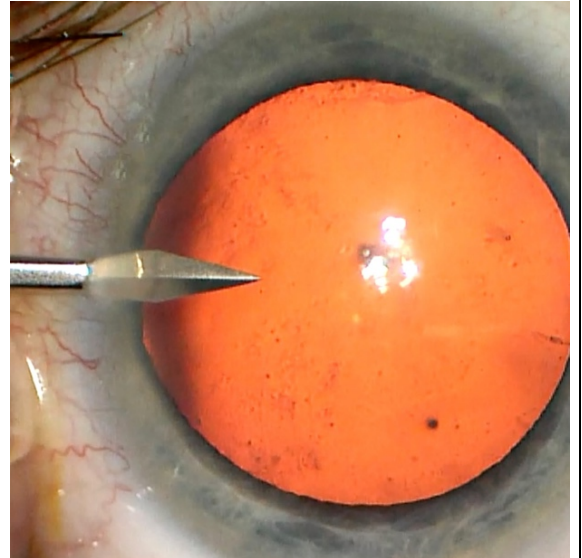


Detailed Steps for Cataract Extraction with IOL Implantation Using the “Divide and Conquer” Method for Nuclear Disassembly

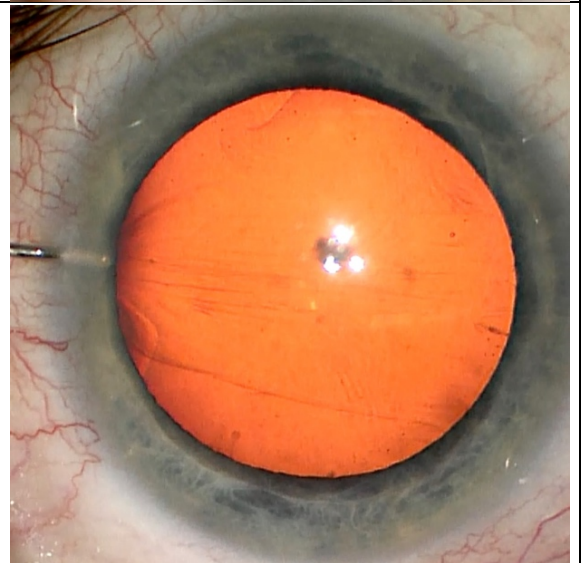
The following is a detailed narrative through a case of very routine cataract surgery to help students and new residents better understand what they’re watching in the OR and the reasoning behind certain steps. This is not medical advice or intended for surgical training. It is only one of many ways way to perform cataract surgery. There are numerous techniques to accomplish every step and I don’t do it the same way every time either. This is a fairly representative case though so hopefully it still provides a helpful look into cataract surgery.

WOUNDS

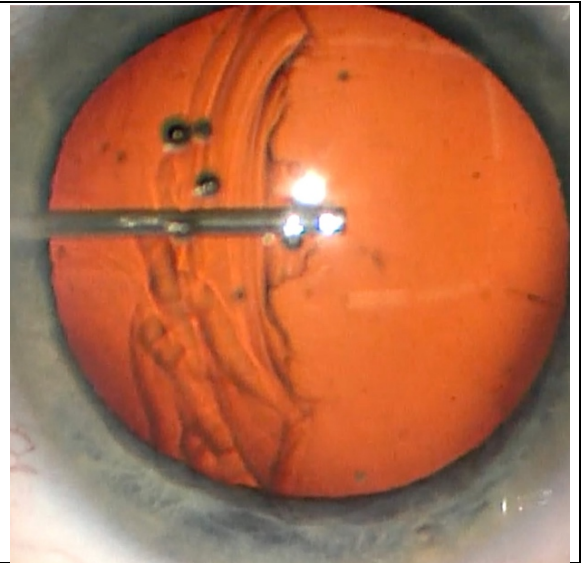
Counter pressure is applied to the eye in some fashion so a paracentesis can be created using a Sideport Blade around 9 o’clock from the surgeon’s perspective. I like to use a cut Weck-Cel® Cellulose Eye Spear for counter pressure. The widest part of the blades are passed through the endothelium to ensure an even and complete wound.



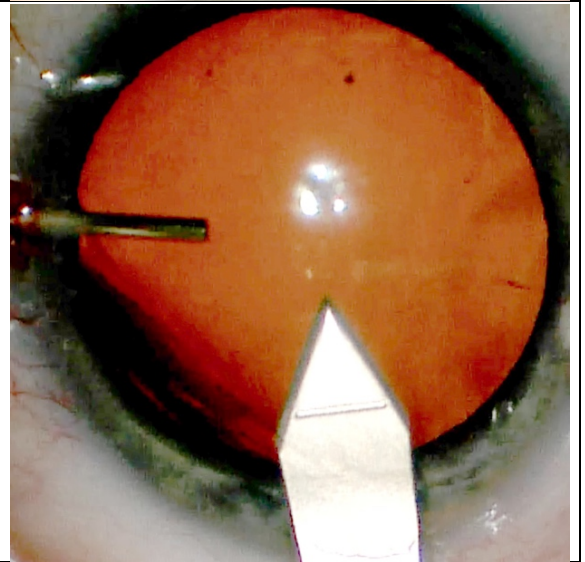
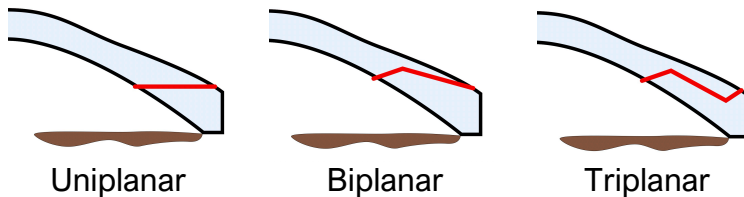
Phenylephrine with Lidocaine is injected into the paracentesis. This is to provide additional anesthesia as well as dilation. When entering the eye with a cannula, “wiggling” is sometimes more effective than trying to shove. This solution can also be sprayed over the ocular surface to provide additional anesthesia.



A dispersive Ophthalmic Viscosurgical Device (OVD) (e.g., Viscoat®, Ocucoat, etc.) is injected into the anterior chamber. Upon entering the eye, it's good to immediately begin injecting to protect any structures from the cannula. I start in the angle across from the paracentesis to push the fluid out of the eye. This forms the anterior chamber and coats to protect the endothelium from the phaco energy.

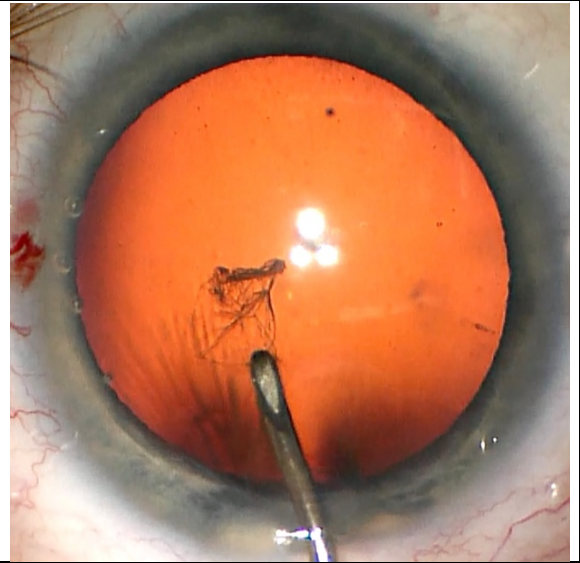
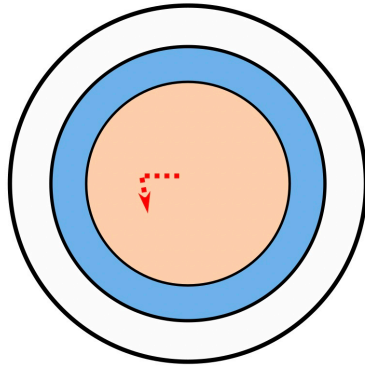


A main wound is created using a Microkeratome, the cannula from the dispersive OVD is left in the paracentesis to further stabilize the eye. Most wounds are <2.6 mm as the research has shown wounds of this size have minimal effect on surgically induced astigmatism. There are multiple ways to construct a main wound. Here are some:



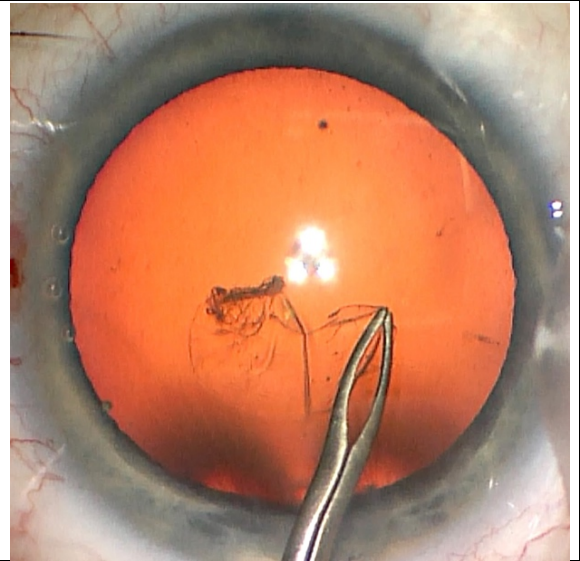
CONTINUOUS CURVILINEAR CAPSULORHEXIS

A cystotome needle is used to create a flap just left of center in a “reverse 7” pattern. This is to provide something to grasp with the forceps.

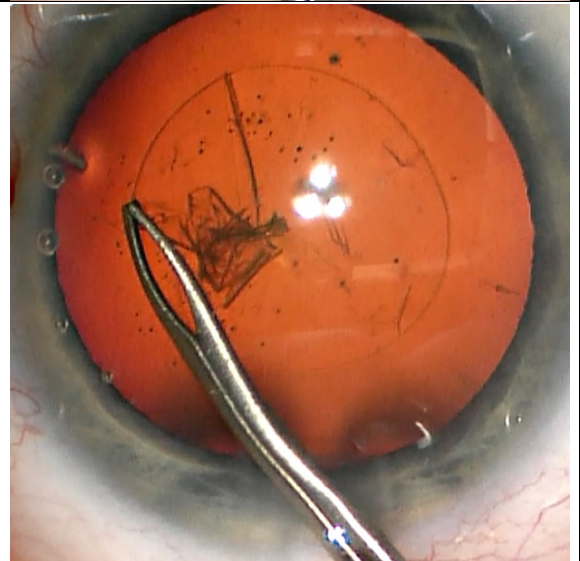


The flap is grasped with Giannetti Forceps. The way the flap is laying tends to predict the shape of the rhexis. Getting the feel for the way to apply force to minimize the chance for runout and accomplish a circular rhexis is difficult and takes time. It's reasonable to grasp the flap once per quadrant, “backing it up” and folding it over itself before letting go to provide an edge to regrasp 2-3 mm from the tear.

I sometimes imagine leading the tear by 90° (3 clock hours) and applying force in ~45° to the angle formed by a tangent line on the tear.

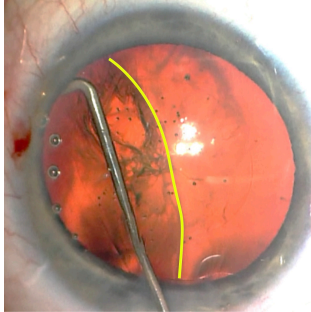


The goal is to create a rhexis of 5.0-5.5 mm since this will cover the edge of the optic to hold it in place and minimize the risk for capsular phimosis. A lot of problems can arise from the rhexis, so this is an important step to master.



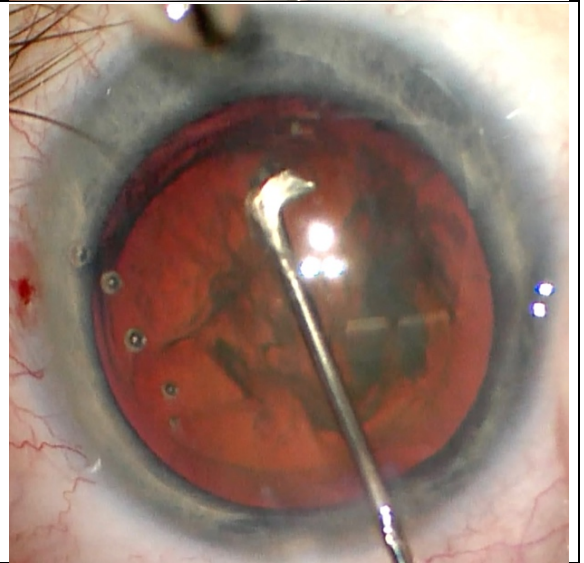
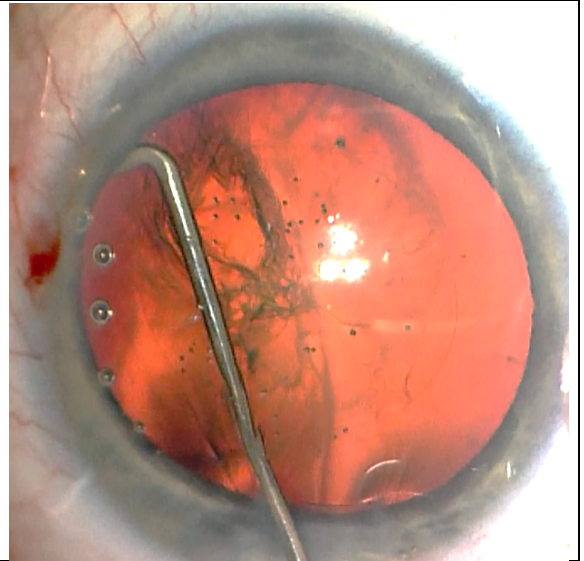
HYDRODISSECTION

A Chang cannula on BSS is inserted, applying a little downward pressure to the wound to relieve some OVD (to avoid over-pressuring the eye). The tip of the Chang cannula is placed under the rhexis ~10 o'clock, tenting the anterior capsule a little and BSS is injected.



Notice the fluid wave propagating behind the lens

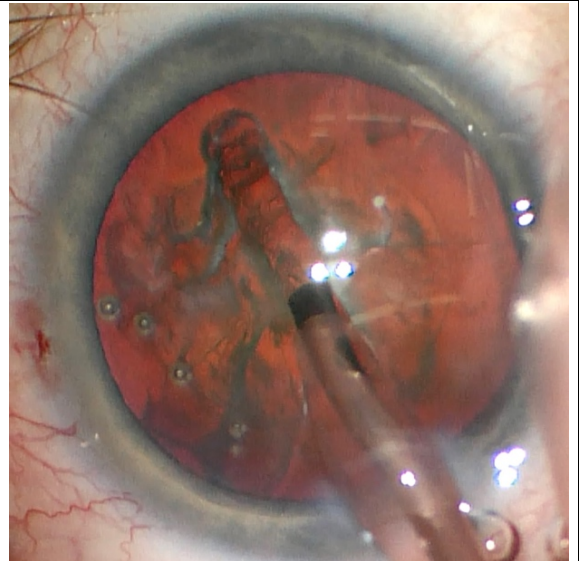
The lens can also be rocked to allow propagation of the fluid wave behind the lens and ensure the lens will spin and is free in the capsule.



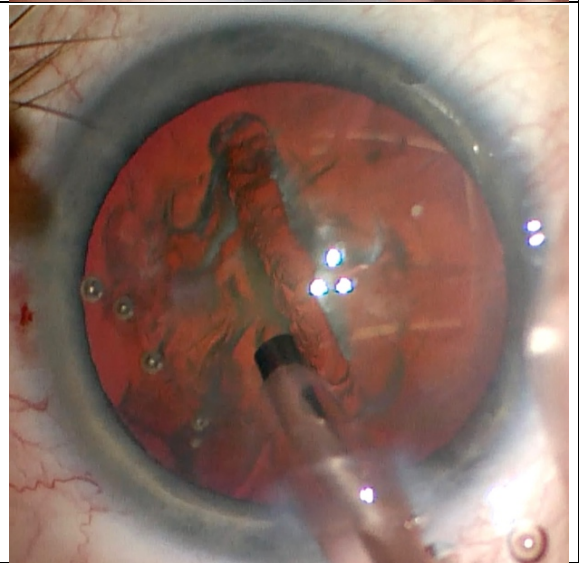
GROOVING AND CRACKING

On “Sculpt” mode for the Alcon Centurion®, ~ 2 full thickness “phaco tip” passes are made through the center of the nucleus.

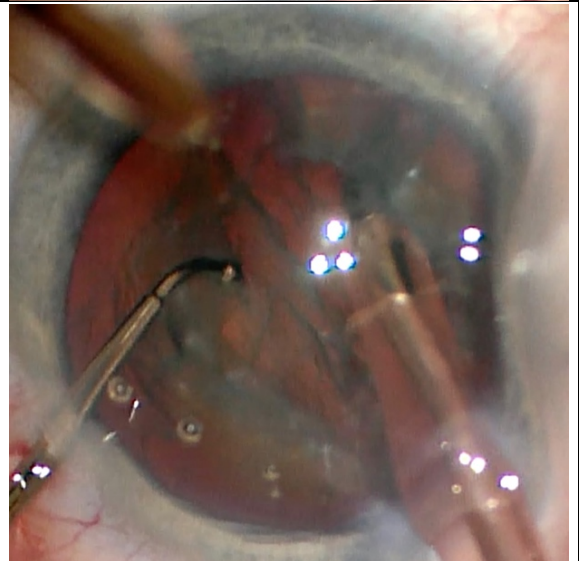
It's a good habit to be careful and only use the minimum amount of energy necessary to make it through the nucleus, otherwise the “walls” of the groove may fray.



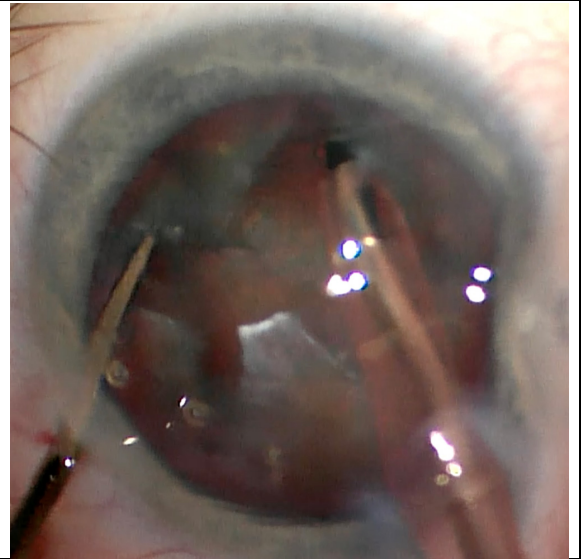
There are multiple ways to judge depth of the phaco needle. The red reflex will brighten as the nucleus becomes thinner. Additionally, parallax can be used by rocking the lens back and forth to look at the walls of the groove and how much nucleus is left. Lastly, the phaco needle is ~1mm so most lenses can tolerate 2 full thickness passes.



The second instrument and phaco needle are inserted DEEP into the groove for maximal traction. The lens is cracked using a rotational motion of the second instrument (in this case Angled Connor Wand) and a small amount of downward traction. After the lens is cracked in a “V” shape, it can be cracked in an “A” shape to crack it all the way through. It's sometimes necessary to rotate the lens 180° and possibly phaco some more to achieve a complete crack.vc

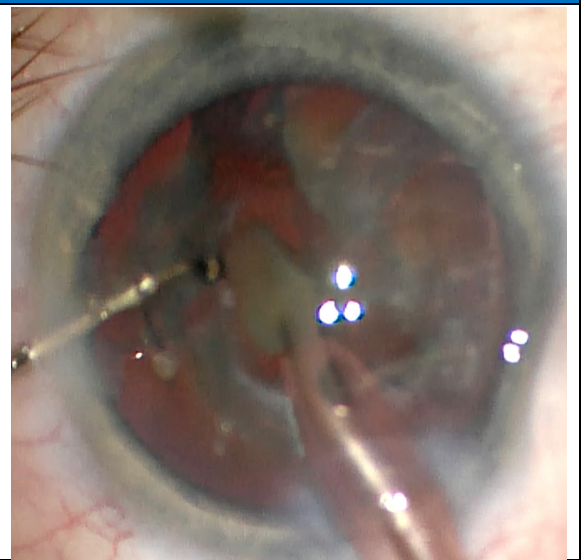


The lens is rotated 90° and the hemipiece is grooved and cracked in a similar manner.



PHACOEMULSIFICATION OF THE LENS

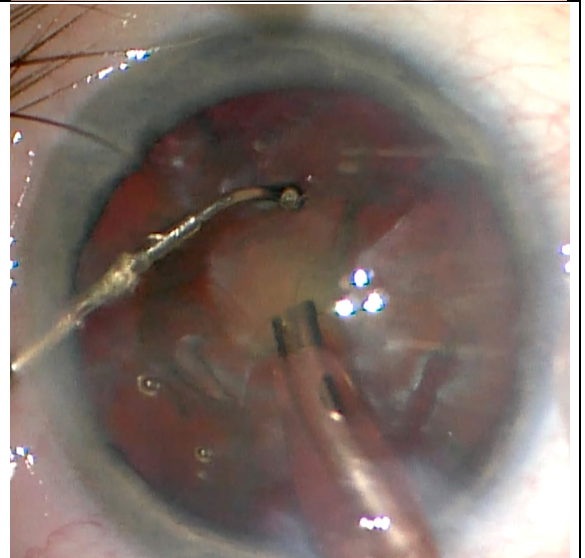
On “Chop” or “Quadrant Removal” mode on the Alcon Centurion®, a piece of the lens is aspirated and brought to the iris plane



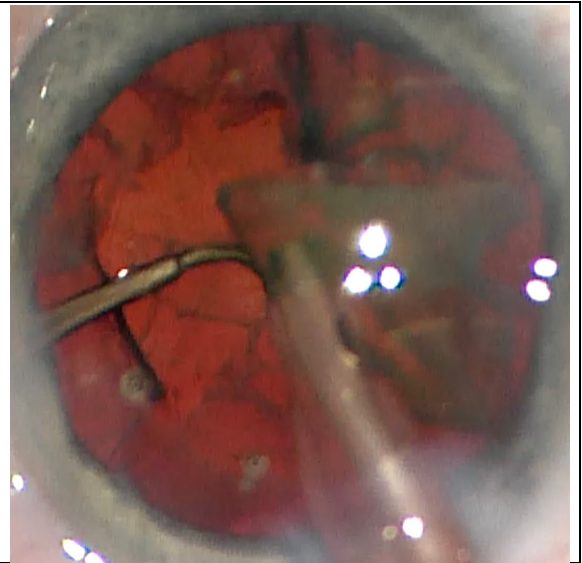
On “Quadrant Removal” mode on the Alcon Centurion®, the segment is emulsified. The posterior capsule at this point is protected by the remaining lens.

The other quadrant is removed similarly.

The remaining hemisphere is rotated to the nasal area and grooved and cracked.

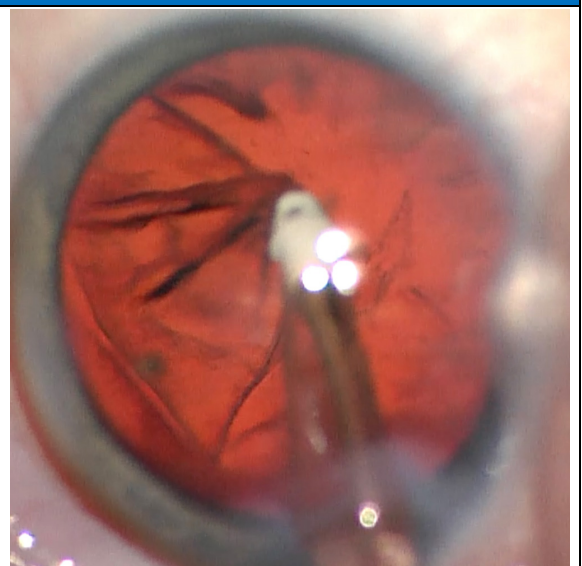


The last two quadrants are removed taking great care to protect the posterior capsule (i.e., keep it away from the phaco needle) using the second instrument.



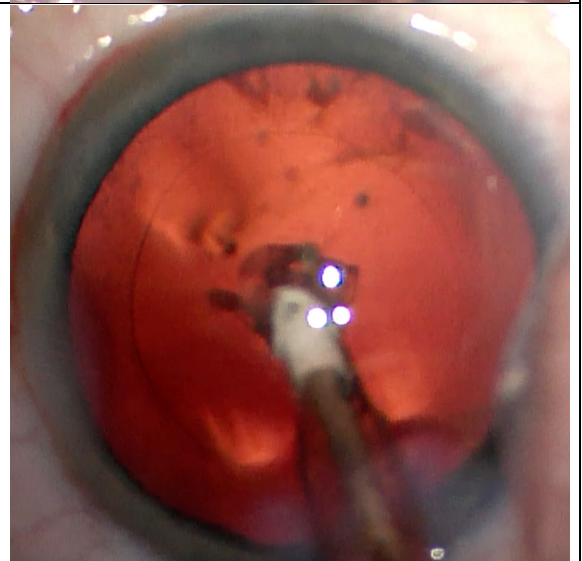
CORTEX REMOVAL

With the I/A handpiece, it's sometimes easier to remove subincisional cortex first since it's typically the most difficult. The port is occluded with cortex and the cortex is "peeled" off the capsule.

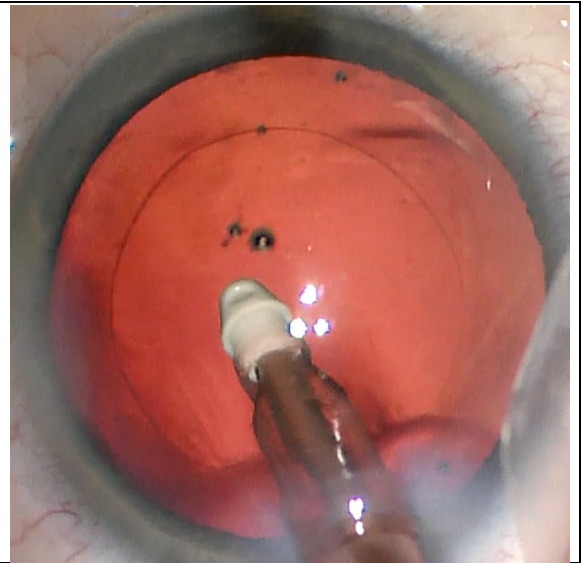


The port is always lifted to face up before more aspiration is applied to avoid inadvertently aspirating the capsule.

This process is repeated for the entire capsule. Circular motions are sometimes safer as opposed to "peeling" toward the center to minimize stress on the zonules.

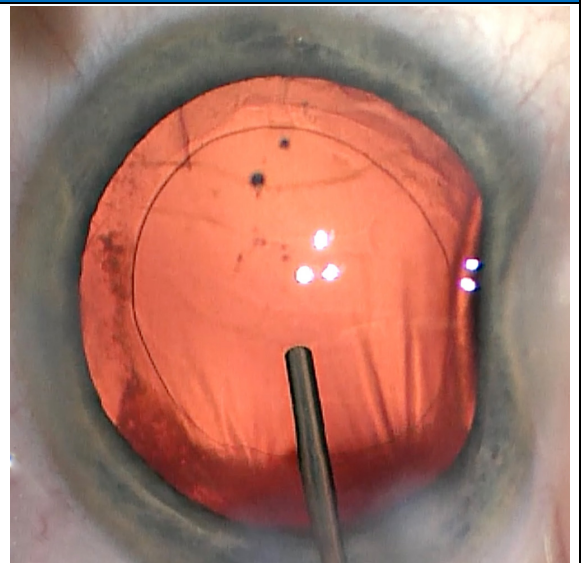


In "Polish" mode on the Alcon Centurion®, any sticky spots of cortex are removed from the posterior and anterior capsule

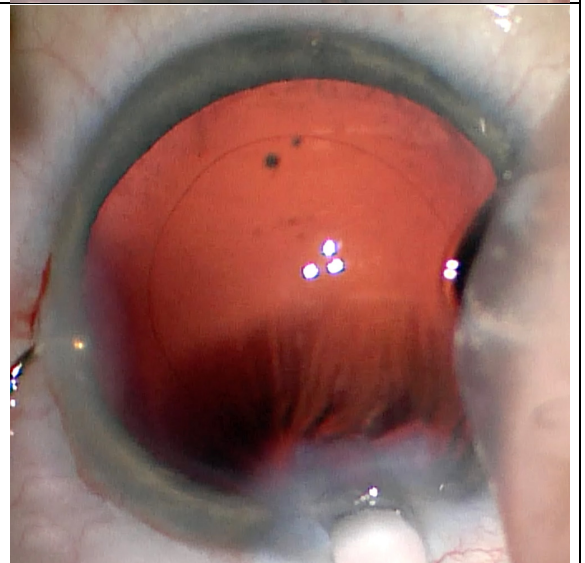


LENS INSERTION

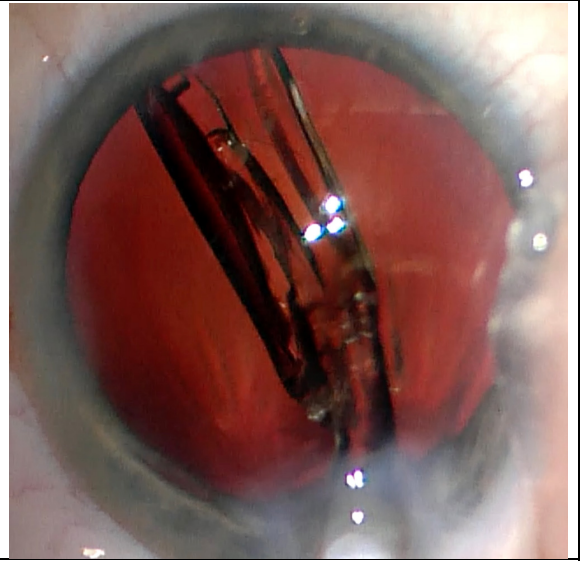
Cohesive OVD is injected into the AC and capsule to form them for receiving the lens.



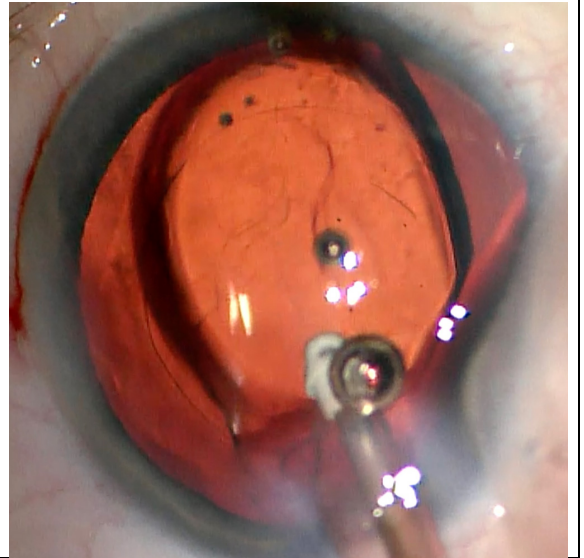
The second instrument is used to stabilize the eye by the paracentesis.



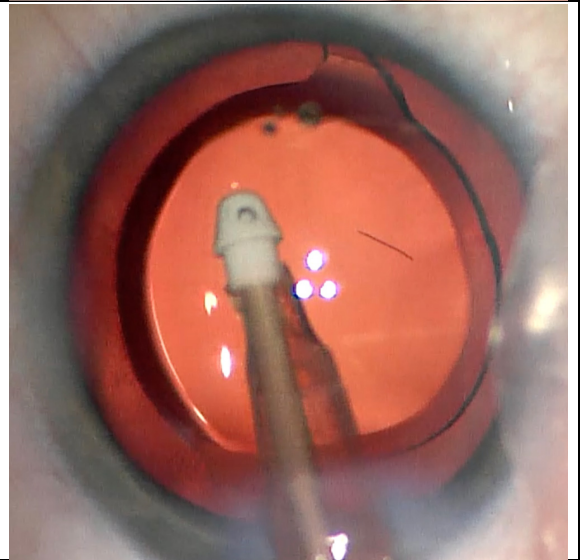
The injector is twisted and the lens is inserted into the bag. The injector is removed when the lens reaches the capsular fornix to avoid stressing the capsule.



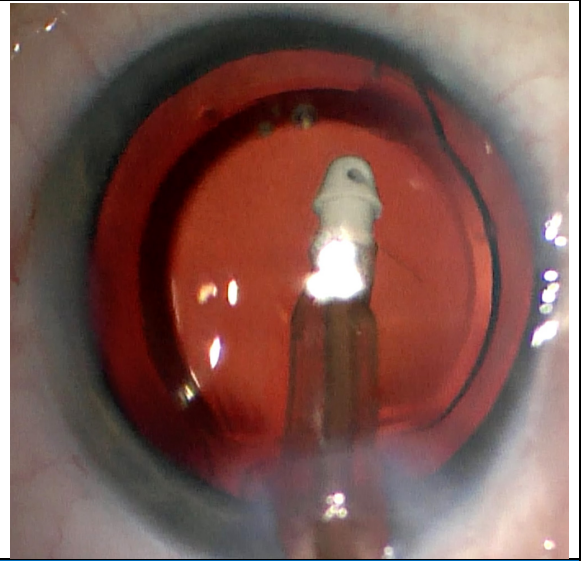
The I/A handpiece is used to sink the temporal haptic into the capsular bag.



The OVD is aspirated in “Visco” mode; care is directed toward the angle and endothelium to remove all the OVD.

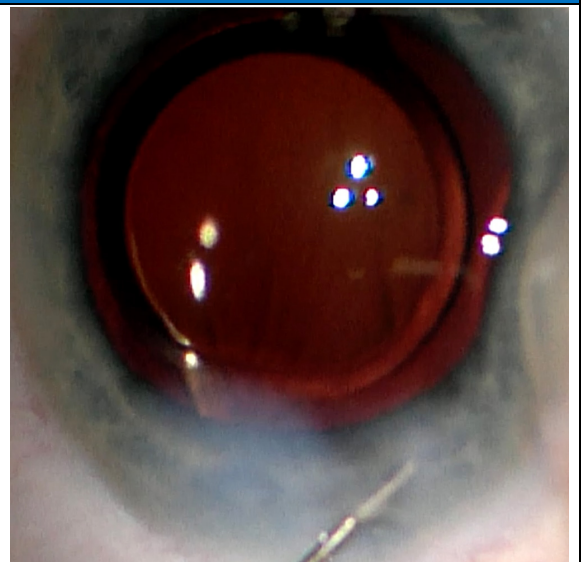


The lens is dialed (rotated) with the I/A handpiece to ensure the haptics are inside the bag. During this, watching the rhexis for peaking can provide clues if a haptic is in the sulcus.

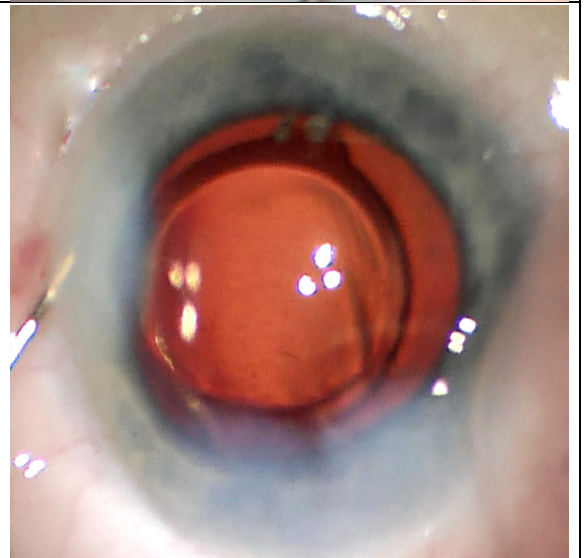


WOUND CLOSURE

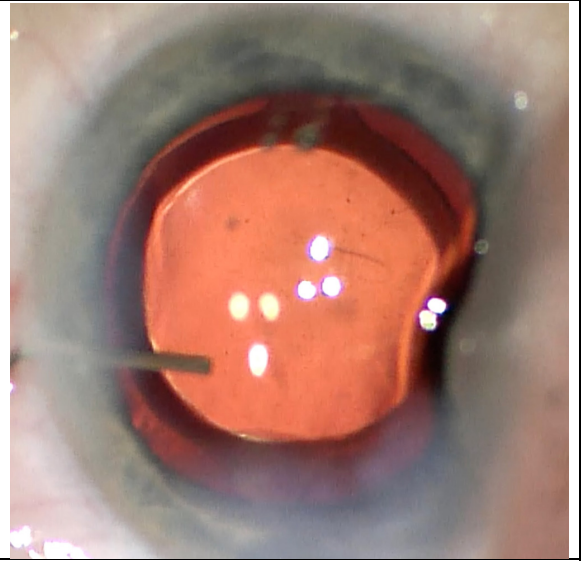
BSS is injected into the corner and along the length of the main wound taking care not to harm Descemet's Membrane.



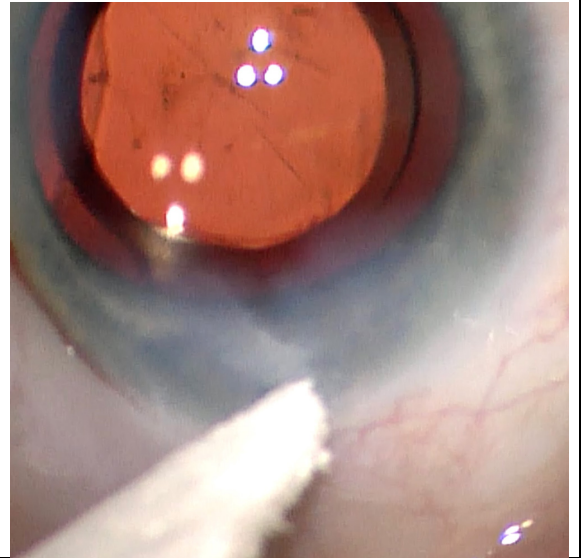
BSS is injected into the corner of the paracentesis wound to achieve a watertight seal.



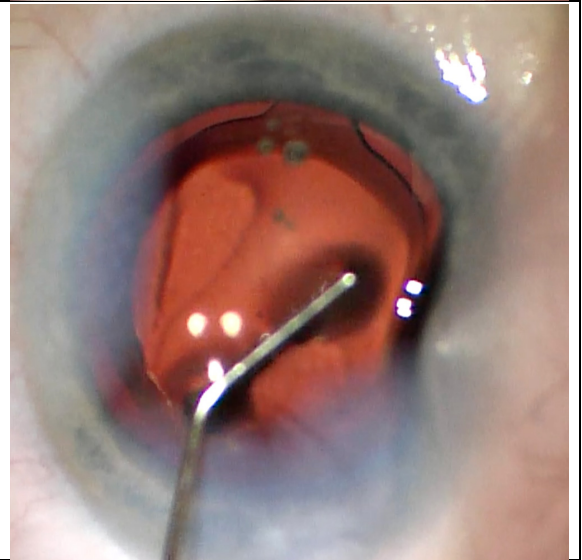
Vigamox is injected into the AC via the paracentesis.



The integrity of the wounds are confirmed with a Weck-Cel® Cellulose Eye Spear.



The cornea is tapped to ensure normal IOP. This takes some time to get a feel for.



In aviation we say, "The perfect landings starts with the perfect pattern." The traffic pattern is the circle you fly around the runway before landing. It basically means you have to set yourself up early for a good landing and the same applies to cataract surgery. Every early step counts. If the wounds aren't placed in the right location the manipulation of instruments in the eye may feel awkward or uncomfortable. If the rhexis is too small it may be damaged during surgery and cause a rent. Every step builds on the next so don't underestimate the value of perfecting the paracentesis!

*Images used after obtaining consent and a HIPAA authorization