6

Phaco Prechop

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PRINCIPLE AND HISTORY OF PRECHOP

Phaco prechop is a technique of mechanical nucleofracture performed under viscoelastic material prior to phacoemulsification. Without using any ultrasound or femtosecond laser energy, the nucleus is manually divided into fragments. Once the nucleus is divided, subsequent phacoemulsification can be performed quite easily and safely in a short time. Compared with the conventional grooving or divide-and-conquer technique, total ultrasound energy will be drastically reduced. As a result, there will be no thermal damage even through a sub-2 mm microcoaxial incision. The aspiration time and amount of balanced salt solution (BSS) irrigation will also be reduced significantly. This minimizes the risk of damage to the corneal endothelium and of elevated intraocular pressure (TOP) stressing the optic nerve. Because the total surgical time is remarkably reduced, I believe prechopping the nucleus before phacoemulsification is the most efficient and least invasive method of cataract surgery.

I first developed this phaco prechop technique in 1992 at Mitsui Memorial Hospital in Tokyo and it received the American Society of Cataract and Refractive Surgery (ASCRS) Film Festival award in 1994. Since then all my cataract surgeries have been performed using this technique. I currently perform nearly 60 cases a day and 8,000 cases a year using prechop through a sub-2mm incision as my routine procedure. I first designed and commercialized special instrumentation for this technique in 1995. This Akahoshi Phaco Prechopper received an ASCRS Film Festival award in 1997. Because I did not patent this instrument, there are dozens of different prechoppers and modified prechop techniques in use worldwide. However, I continue to use only 2 prechoppers and 2 methods: the Karate Prechop with the Akahoshi Combo II prechopper for soft cataracts and the Counter Prechop with the Akahoshi Universal II prechopper for dense cataracts. These 2 instruments and techniques are suitable for the entire spectrum of cataracts.

Chang, DF.
Photo Chop and Advanced Phaco Techniques: Strategies for Complicated Cataracts, Second Edition (pp xx-xx).

KARATE PRECHOP

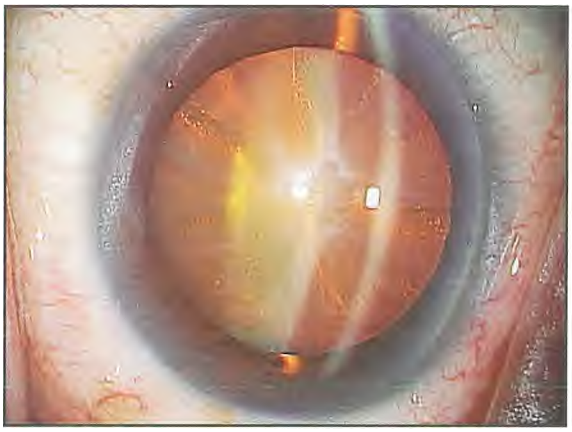

Figure 6-1. The Karate Prechop technique is used for Grade I and II soft cataracts with intact ciliary zonules.

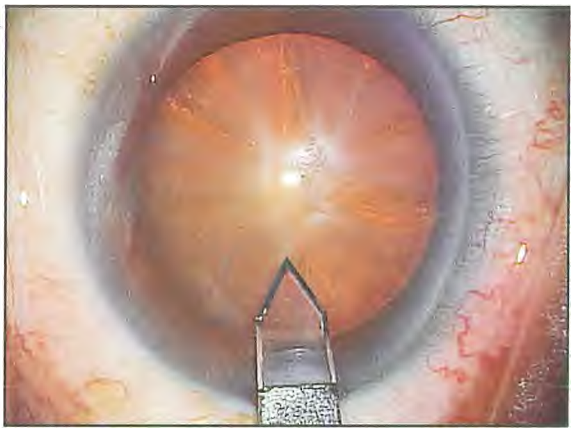

Figure 6-2. Under topical anesthesia, a temporal clear corneal incision is made with a trapezoid diamond keratome. According to the extent of the blade insertion, the incision size can be varied from 1.7 to 2.0 mm with a Nano Diamond Keratome (ASICO AE-8192) and from 2.0 to 2.3 mm with an Ultra Diamond Keratome (AE-8190). The appropriate blade should be selected considering the type of phaco tips and sleeves. For a soft cataract, a single plane keratome incision is made. A scleral tunnel that is too long may constrict the irrigation sleeve, and so the corneal tunnel length should be restricted to less than 1.0 mm long. A 2-step incision will be made for dense nuclei or eyes at risk for iris prolapse because of shallow anterior chambers or floppy iris syndrome.

Figure 6-3. Using a diamond sideport keratome (AE-8131), a 0.6 mm side port is made. To prevent ophthalmic viscosurgical device (OVD) leakage during IOL implantation, a small side port is preferable.

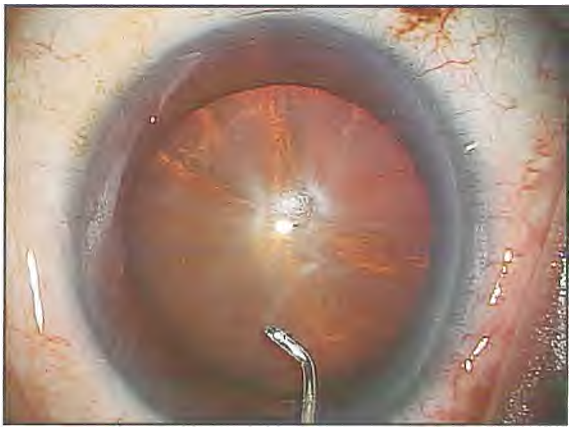

Figure 6-4. A 0.5% preservative-free Lidocaine is injected into the anterior chamber. Although this step is not mandatory, the discomfort or pain caused by phacoemulsification in a myopic patient can be reduced.

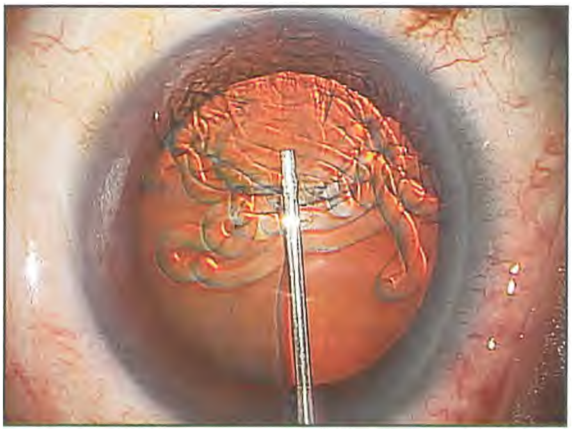

Figure 6-5. The anterior chamber is filled with a dispersive OVD such as Viscoat (Alcon Laboratories Inc, Fort Worth, TX). The technique of phaco prechop will not damage the corneal endothelium. However, protecting the endothelium with Viscoat is important because prechopped nuclear fragments will still circulate within the anterior chamber.

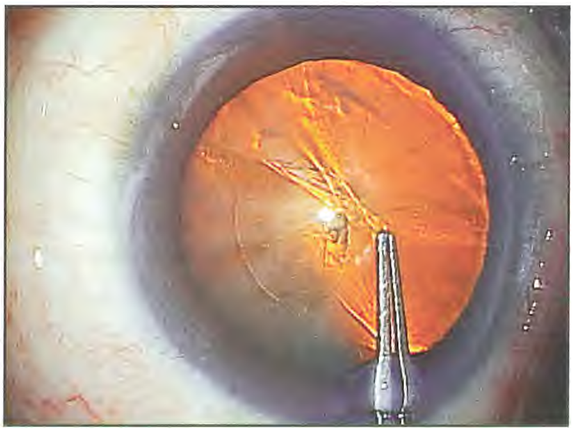

Figure 6-6. A continuous curvilinear capsulorhexis (CCC) is made using Utrata capsulorhexis forceps (AE-4344 or cross action AE-4345) that have thinner blades for easier manipulation through a small microcoaxial incision. The size of the CCC should be a bit smaller than the IOL optic diameter. For a 6.0 mm optic 10L, a 5.0 mm CCC is ideal. The CCC edge should always overlap the optic at the end of the surgery. This manner of IOL fixation is extremely important for achieving consistent refractive results and preventing posterior capsule opacification (PCO). For better visibility of the nucleus, carefully perform the capsulorhexis without disturbing the underlying cortex.

Figure 6-7. Hydrodissection is performed with a special 27-gauge hydrodissection cannula (reusable AE-7636 or disposable AS-7636) which is attached to a small 2.5 cc syringe. A pearl for successful hydrodissection is to use a small syringe to inject BSS most effectively. Because the tip of this cannula is bent and tapered, it is easy to introduce under the capsulorrhexis edge; this configuration also facilitates stromal incision hydration at the conclusion of surgery.

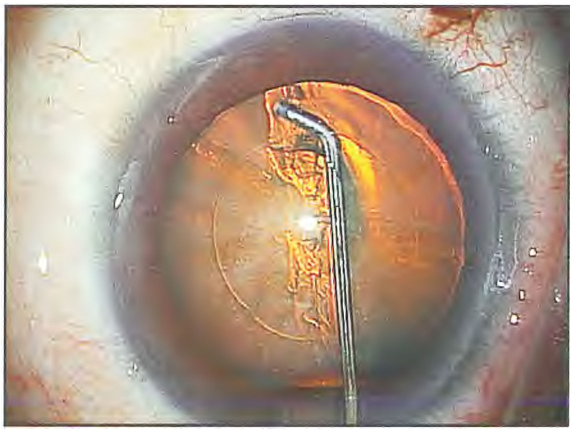

Figure 6-8. The cannula tip is introduced horizontally under the capsulorrhexis edge. The anterior capsule is slightly lifted so that the cannula tip is inserted just beneath the anterior capsule.

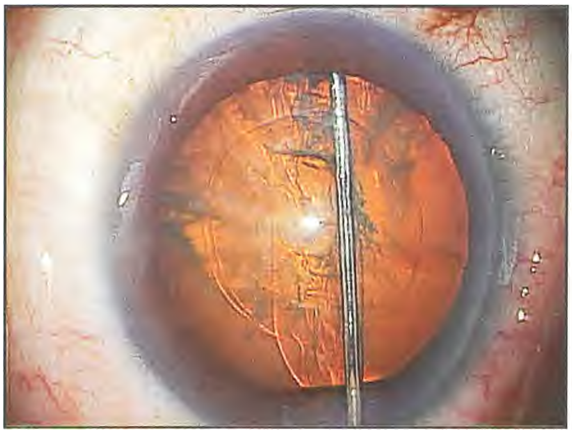

Figure 6-9. After rotating the cannula 90 degrees so that its tip is directed inferiorly, a small amount of BSS is quickly injected. When the fluid wave spreads toward the proximal end, the nucleus will start to subluxate into the anterior chamber. Push the nucleus downward so that the BSS in the space between the capsule and nucleus may spread uniformly within the capsular bag. Ascertain that the nucleus can be rotated freely in the capsular bag. Free rotation of the nucleus is mandatory at this point, because the nucleus will be more difficult to rotate after it has been prechopped into smaller pieces. With a posterior polar cataract, cortical cleaving hydrodissection should not be performed.

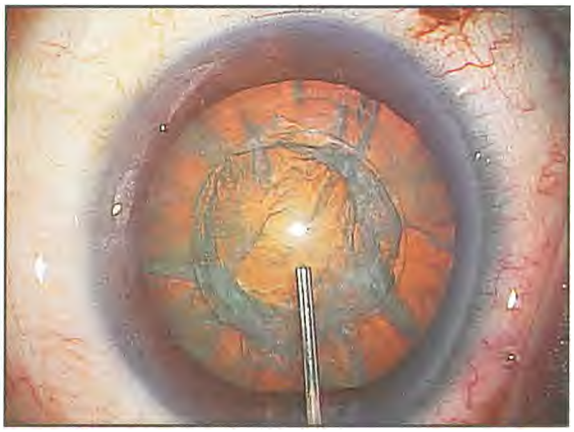

Figure 6-10. Fill up the chamber with Viscoat again. At this point, clear the cortex from the anterior nuclear surface for better visibility of the nuclear characterisitics. For those who are not familiar with prechop, it is advisable to perform this under direct visualization of nucleus. If there is too much cortex blocking visibility of the nucleus, the anterior cortex may be preaspirated with I/A tip. However, once the surgeon has become more experienced with the technique, it will be possible to perform the prechop maneuver based more on "feel" and with less dependence upon direct visualization.

Figure 6-11. For the Karate Prechop technique, a Combo II Prechopper (AE-4190) will be used. The Combo Prechopper blade has two diffenent edges — one that is sharp and angled and another that is blunt and rounded. The angular side is designed for incising into the nucleus. The rounded side can be used to safely separate the nuclear sections enough to confirm complete division.

Figure 6-12. Compared to the conventional Combo Prechopper (AE-4284), the blades of the Combo II Prechopper can be widely opened through a much smaller incision, making it suitable for microcoaxial surgery. The Combo II can be used to prechop the nucleus through a corneal incision as small as1.8 mm. Combo II is also suitable for use through a larger incision as well, and is my overall preference over the first generation Combo Prechopper.

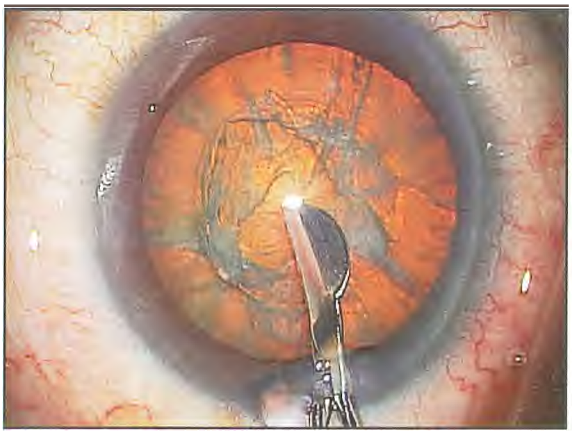

Figure 6-13. Introduce the prechopper horizontally. As the blade height is 1.5 mm, it can easily fit through a 1.8 mm incision.

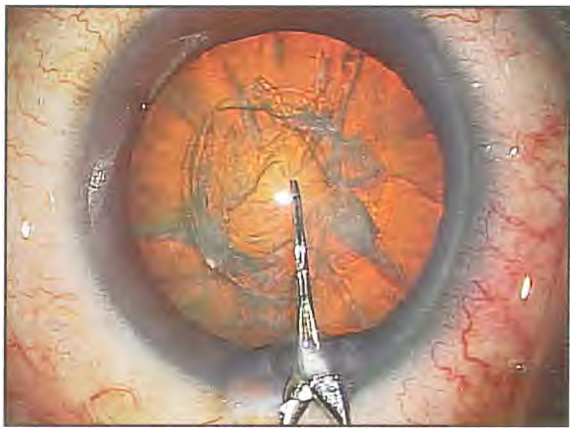

Figure 6-14. Place the sharply angled tip of the blade at the very center of the nucleus. By impaling the blade at this location, the stress on the zonules is equalized and minimized. From this center position, the blade is then incised downward.

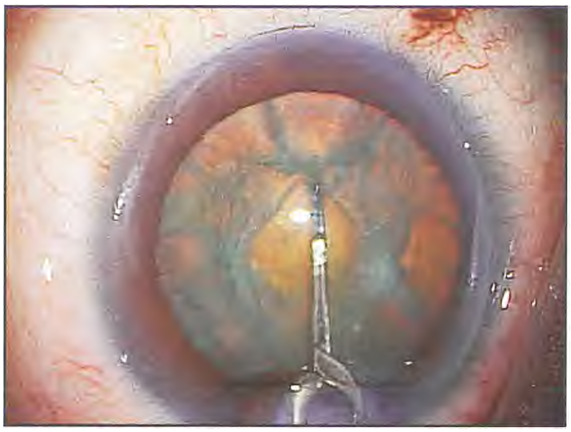

Figure 6-15. Impale the closed prechopper blades directly down into the nucleus. Insert the entire blade width into the nucleus. Because the height of the Combo prechopper blade is 1.5 mm, the entire blade can be buried into the nucleus. If the nucleus is so dense that there is too much resistance, then the Karate technique will not work.. Instead, for dense nuclei, the Counter Prechop technique should be used, in which counterfixation to the impaling prechopper is supplied by a second instrument.

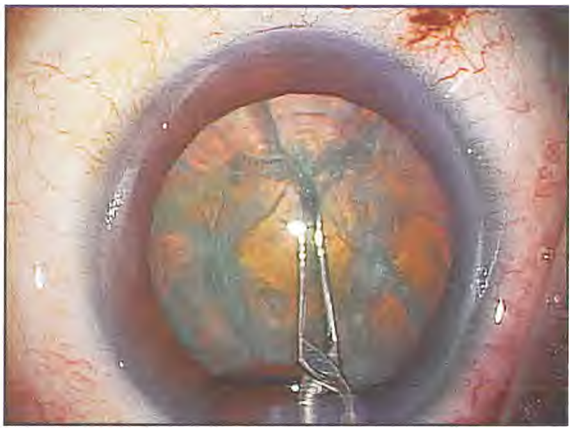

Figure 6-16. Open the blades gradually while pushing the nucleus slightly downward. An effective chop will not result if the blades are separated too quickly.

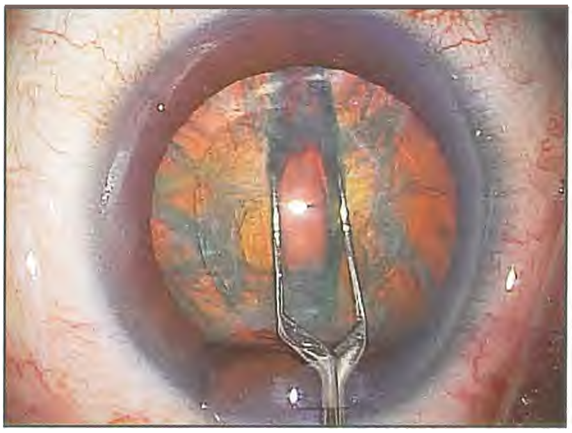

Figure 6-17. After the nucleus is completely prechopped, the posterior capsule can be observed between the 2 prechopped heminuclei. Merely making a crack in the nucleus is not enough. It is important to attain a complete division from the anterior to the posterior surface.

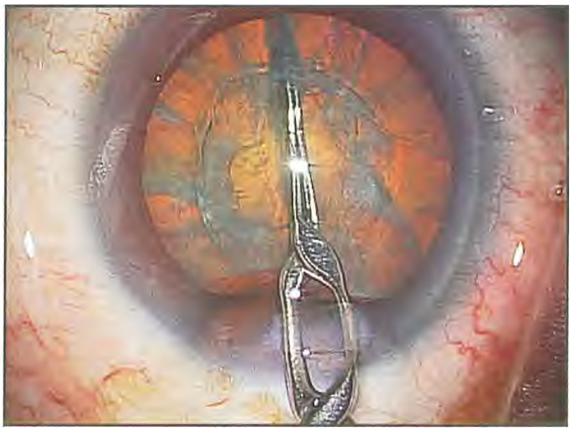

Figure 6-18. Insert the blades until they reach toward the distal end of the nucleus.

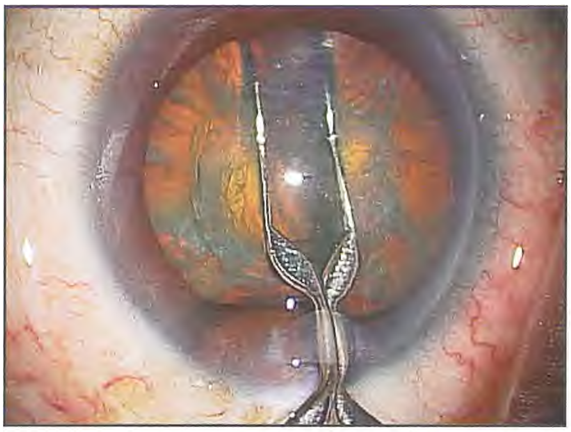

Figure 6-19. Open the blades to separate the distal part of the equator.

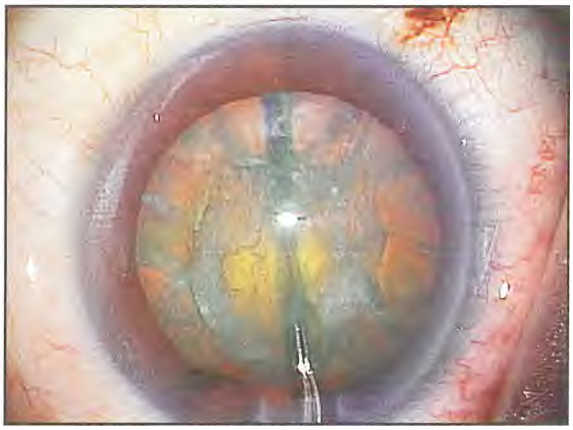

Figure 6-20. Position the blades closer to the proximal part of the nucleus.

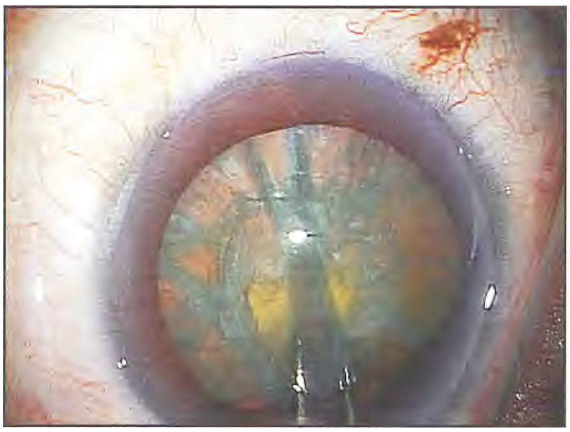

Figure 6-21. Open the blades to fracture the nucleus. The fracture propagates in two directions — from the proximal toward the distal equator and from the anterior surface through the posterior plate. The nucleus should now be completely bisected into two heminuclei.

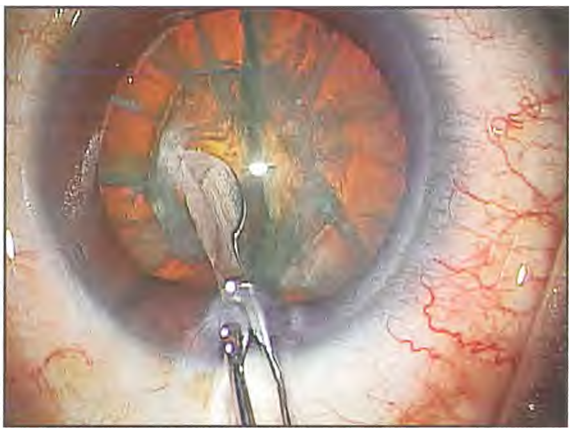

Figure 6-22. Reposition each prechopped nuclear fragment into its original location before rotation. Once the nucleus is bisected, nuclear rotation will be more difficult because of the increased nuclear volume within the capsular bag.

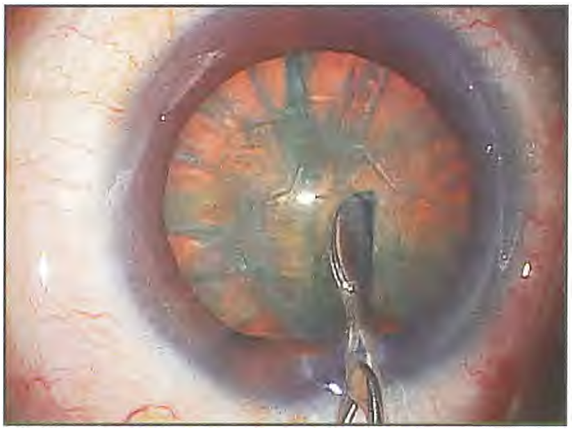

Figure 6-23. Using the angular side of the blade, rotate the nucleus 90 degrees. Slighty depressing the periphery of the nucleus faciliates nuclear rotation. If the hydrodissection is ineffective, then the nucleus may not rotate. Therefore, properly performing hydrodissection prior to prechopping is mandatory. Nuclear rotation will also be difficult if the OVD is burped out of the incision during the the initial prechop maneuver,. In this situation, the anterior chamber should be refilled with additional OVD or a second instrument can assist the rotational maneuver through the side port incision.

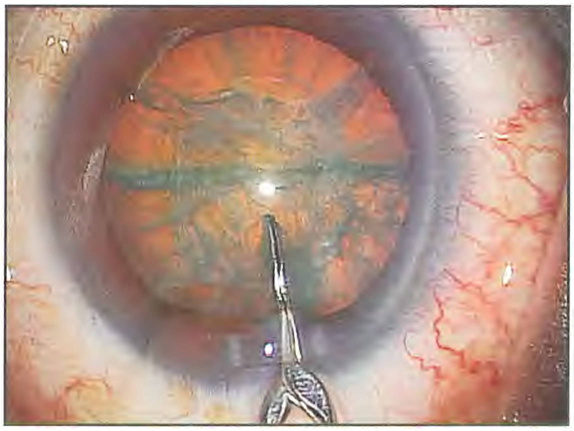

Figure 6-24. Place the angular side of the prechopper blade at the midpoint between the center of the nucleus and the edge of the anterior capsulorrhexis.

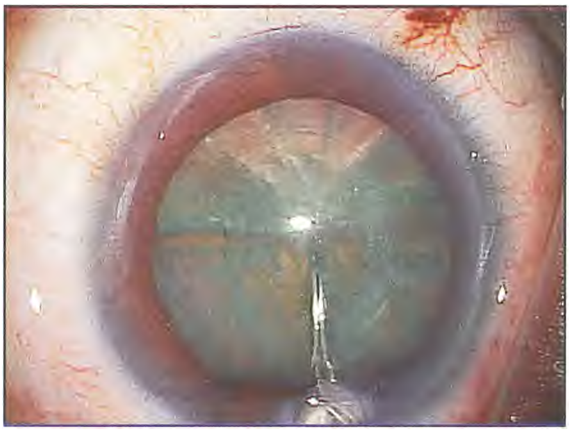

Figure 6-25. Impale the blades into the nucleus. Because the insertion point is slightly off center and the path of insertion is toward the posterior pole, the blades will be directed slightly obliquely as they are inserted. The distal half of the prechopped nuclear fragment will support the insertion of the blades into the proximal heminucleus . In the same way as for the initial prechop, the surgeon should try to bury the entire blade into the mass of the nucleus.

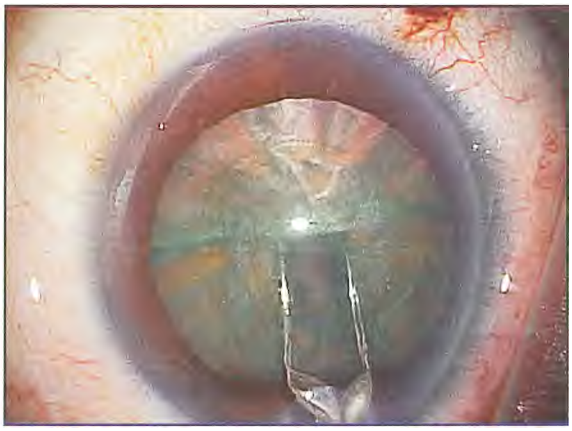

Figure 6-26. While pushing the nucleus obliquely down toward the posterior pole, open the blades slowly. Repeat this slow, opening action until the nucleus is completely prechopped from top to bottom.

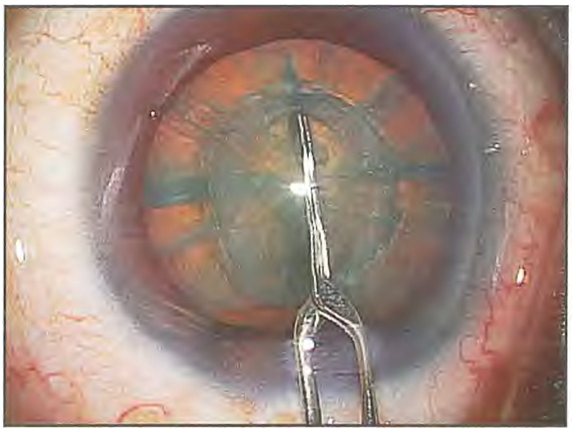

Figure 6-27. Insert the angular side of the closed pre-chopper blades into the distal heminucleus of the bisected lens. The point of prechopper insertion is at the center of the nucleus and the direction of insertion is downward.

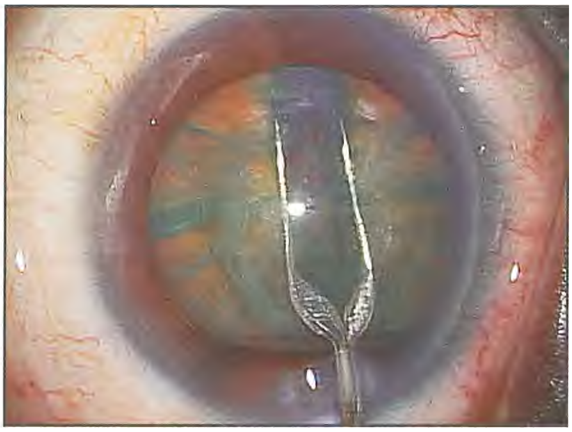

Figure 6-28. While pushing the nucleus downward, open the blades slowly. Confirm complete nuclear division from top to bottom, and from the periphery to the center of the nucleus.

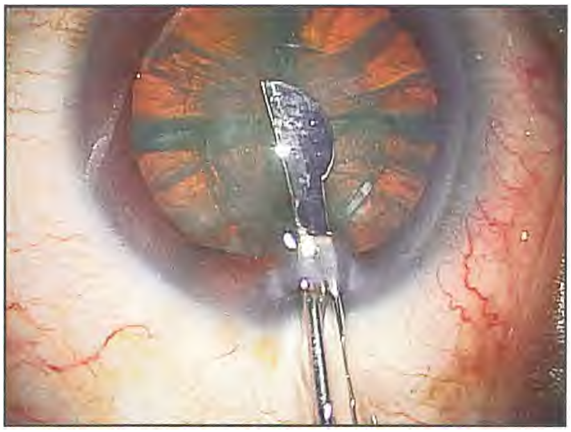

Figure 6-29. Flip the prechopper blade upside down. Using the rounded blunt side of the blade, one can safely nudge the fragments in order to confirm complete nuclear division.

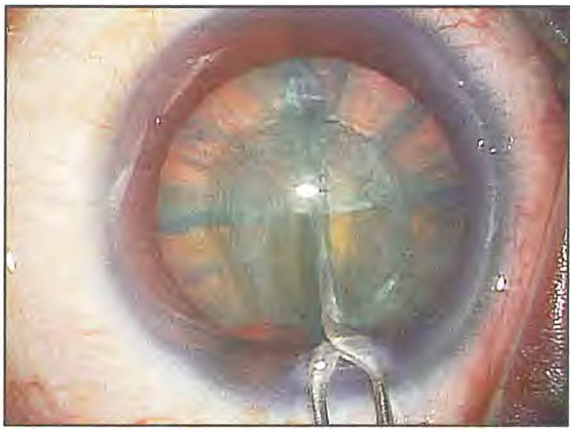

Figure 6-30. Insert the rounded side of the prechopper blades between the prechopped nuclear fragments and position them within the lower half of the nucleus. The rounded side of the blade is so blunt that it will not tear the posterior capsule upon contact.

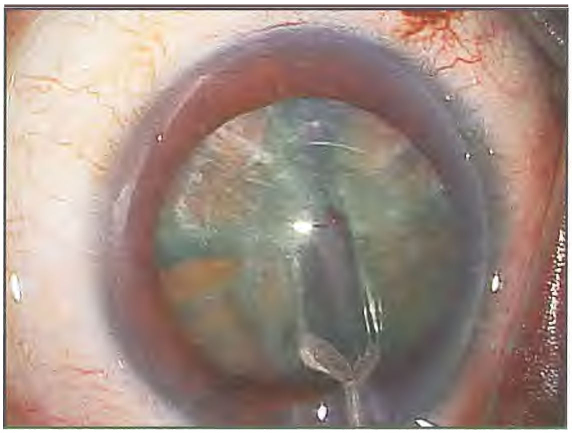

Figure 6-31. Open the blades within the lower half of the nucleus so that the posterior plate of the nucleus is completely separated. If the blades are positioned too superficially, then the posterior plate may not be transected even if the blades are widely opened. All of these dividing maneuvers are performed under a dispersive OVD and can be repeated as necessary until complete fragmentation has been achieved.

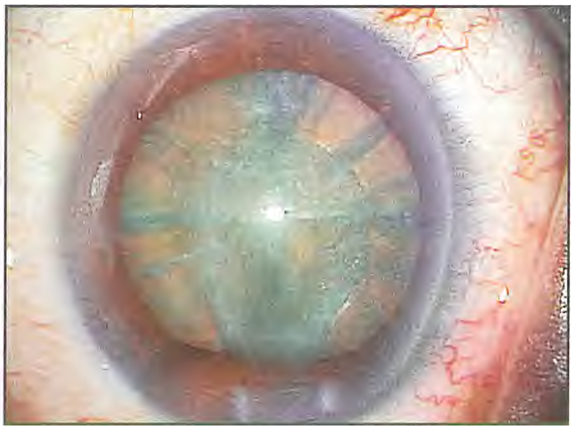

Figure 6-32. The nucleus has now been manually divided into 4 pieces without using any ultrasound energy. The creation of 4 prechopped quadrants is usually adequate to facilitate phacoemulsification. However, it may be desirable to create smaller fragments in order to reduce phaco time in complicated eyes, such as those with small pupils, intraoperative floppy iris, or Fuchs corneal dystrophy. For example, following the initial transection into two heminuclei, one can rotate the nucleus 60 degrees instead of 90 degrees and sequentially perform two additional prechop maneuvers on the same heminucleus.

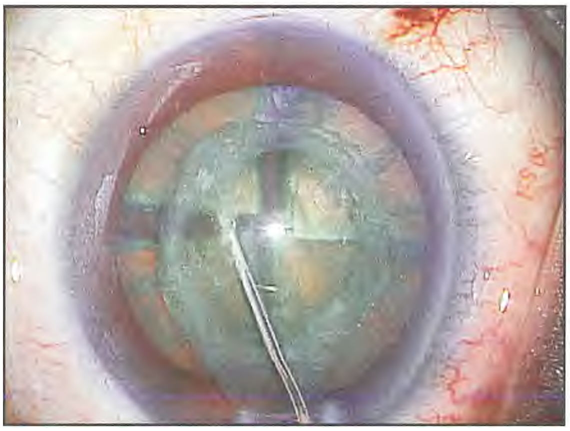

Figure 6-33. To more easily confirm complete separation of the nuclear fragments and to facilitate phacoemulsification, viscodissection may be performed. A cohesive OVD such as Provisc (Alcon Laboratories Inc, Fort Worth, TX) is injected between the chopped nuclear fragments and also into the potential space between the posterior capsule and nucleus. For this purpose, a cohesive OVD is more suitable than a dispersive one.

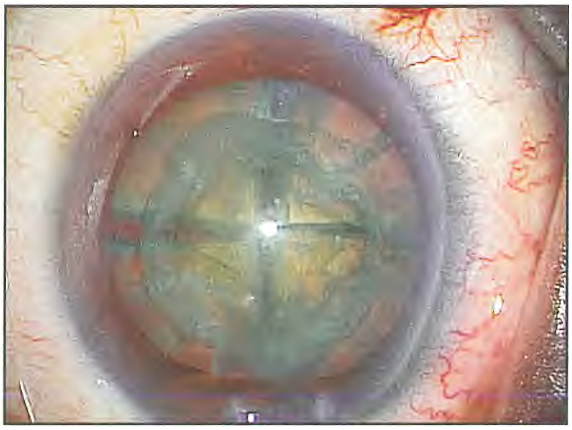

Figure 6-34. The nucleus is now completely prechopped and ready for phacoemulsification. It is important to note that even femtosecond laser nuclear fragmentation cuts cannot achieve complete nuclear division as can be done with manual prechopping. This is because femtosecond laser prechop cuts are restricted by the pupil size and the proximity of the posterior nuclear plate to the posterior capsule. In addition, it may not be possible to dock the laser to small or deep set eyes. Manual prechop techniques can achieve superior nuclear division with minimal cost and surgical time.

Figure 6-35. Because prechopping the nucleus drastically reduces ultrasound energy, phacoemulsification can be safely performed though a sub-2 mm incision using a Nano sleeve (Alton Laboratories Inc, Fort Worth, TX). Although any phaco tip can be used this author prefers the reverse-Kelman style tip for the prechopped nucleus. The Kelman tip is bent away from the bevel to facilitate sculpting, while the reverse-Kelman tip is bend toward the bevel, which allows the bent tip to be positioned bevel down in order to facilitate occlusion.

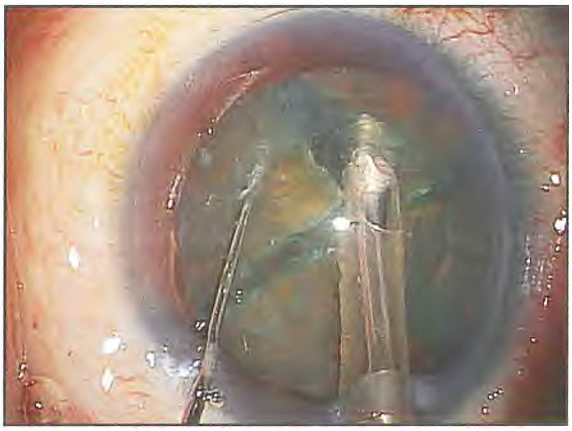

Figure 6-36. This author prefers bevel down positioning of the phaco tip for emulsification of the prechopped nucleus. With bevel down phaco, all of the ultrasound energy is effectively used to emulsify the nucleus as soon as the tip opening is completely occluded by it. Using the reverse Kelman tip with a 30-degree bevel, it is very easy to occlude the phaco tip openingwhile its shaft is parallel to the incision. This in turn lessens the risk of thermal damage or sleeve obstruction due to mechanical wound deformation. In terms of optimizing tip occlusion, the reverse Kelman 30-degree beveled tip is more suitable than the 0 or 45 degree bevels.

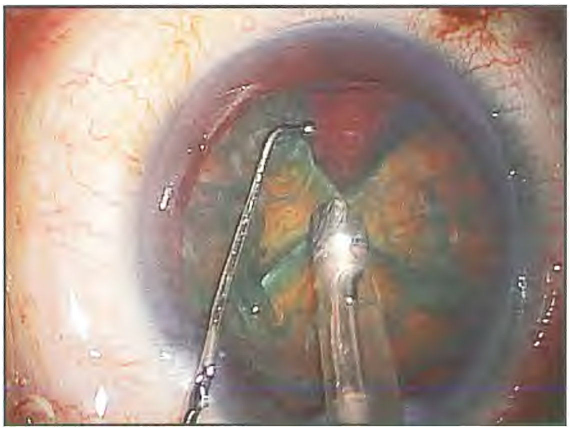

Figure 6-37. To minimize ultrasound energy, multiburst mode is recommended (see Figure 38). With this power modulation, the duration of phaco ON time is fixed, while the interval of the ultrasound emission is controlled linearly with the foot pedal. As the pedal is further depressed, ultrasound is emitted more frequently. However, it will never become continuous, even if the foot pedal is fully depressed. If the OFF time is linearly decreased to 250 m/sec, there will still be 250 m/sec of corresponding OFF time with maximum foot pedal depression. Remove the distal-most quadrant of the nucleus first in order to create vacant space into which to position the next nuclear fragment for phacoemulsification.

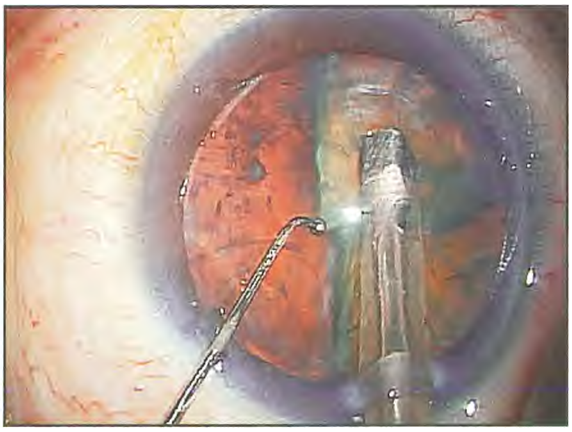

Figure 6-38. The bevel down phaco tip is first completely occluded with nucleus and the surgeon stays in foot pedal position two. Positioning the tip closer to the periphery of the nucleus (where more cortex is present) leads to a stronger occlusion. Once the higher-pitched sound from the phaco machine indicates that a maximum vacuum level has been reached, elevate the prechopped nuclear fragment from the capsular bag and emulsify it using foot pedal position 3. Employing ultrasound energy without tip occlusion and higher vacuum levels is inefficient and ineffective for emulsifying the nuclear fragments.

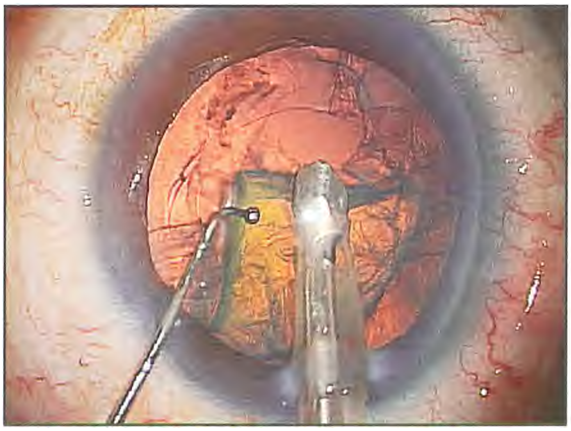

Figure 6-39. The Akahoshi Nucleus Sustainer (AE-2530; ASICO, Westmont, IL) is a second instrument that is used to manipulate the nuclear fragments and to protect the posterior capsule. Since the sustainer has a tiny blunt ball at its tip, it can safely maneuver the nucleus. To avoid inadvertent contact of nuclear fragments with the endothelium, it is best to systematically elevate one fragment at a time out of the capsular bag. However, because the nucleus has been prechopped, the other loose fragments may tumble prematurely into the anterior chamber. Using the Nucleus Sustainer or other second hand instrument can prevent this from happening.

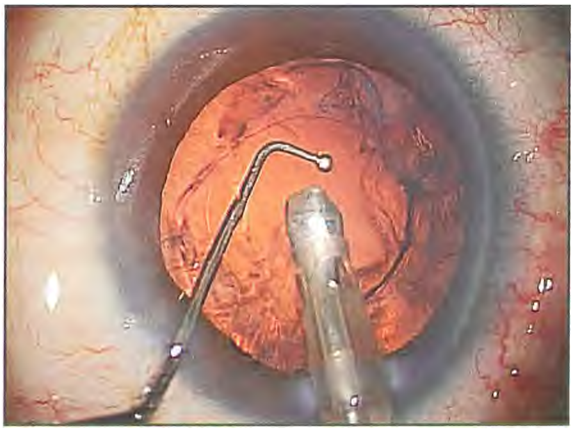

Figure 6-40. Although irrigation flowing through the inferior port of a 3-port infusion sleeve can help to keep the posterior capsule away from the phaco tip, placing the Nucleus Sustainer between the phaco tip an the posterior capsule as the last piece of the nucleus is emulsified will also block the posterior capsule from being snagged.

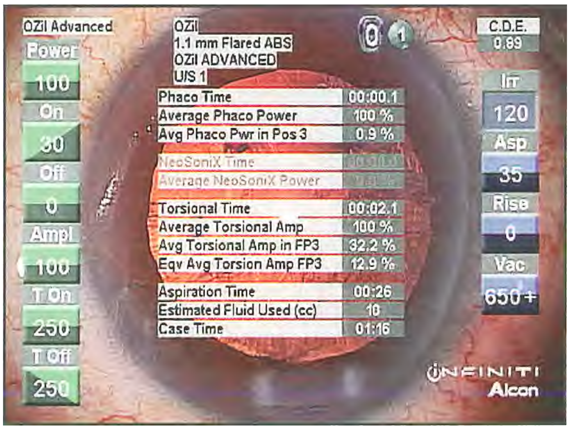

Figure 6-41. After the nucleus has been prechopped into smaller pieces, phacoemulsification can be performed using higher vacuum and aspiration flow rates. In this case the aspiration time was 26 seconds, total BSS consumption was 10 cc, and the total ultrasound energy (CDE) was only 0.89 %-seconds. The power setting will vary according to nuclear density, and the aspiration flow rate may be changed depending on anterior chamber depth and in consideration of any abnormalities of the corneal endothelium, iris, or zonules.

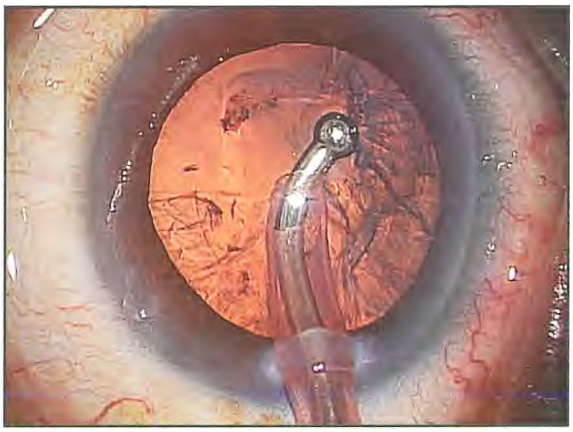

Figure 6-42. The cortex is removed with a curved ball I/A tip (AE7-3062). For sub-2 mm microcoaxial surgery, it is necessary to use an I/A tip with a smaller outer diameter. The outer diameter of this I/A tip shaft is 0.7 mm, which—when combined with the Nano infusion sleeve—can provide nearly 3 times more irrigation flow compared to using conventional I/A tips with a 1.0 mm shaft diameter.

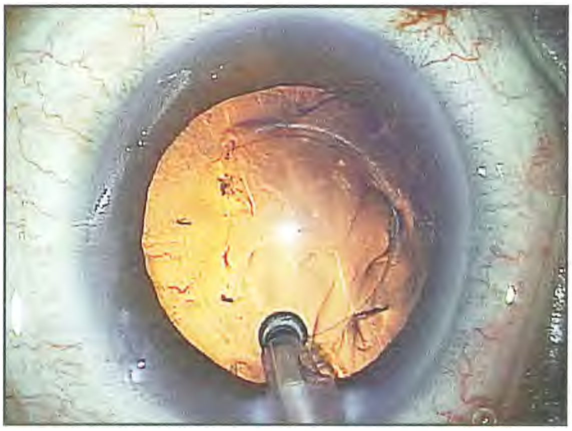

Figure 6-43. Because the tip is ergonomically curved, the subincisional cortex is easily removed without resorting to bimanual I/A.

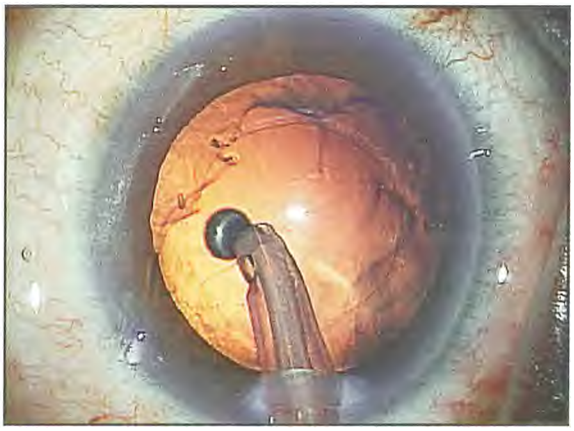

Figure 6-44. Because the I/A tip head has a spherical shape and the aspiration port is drilled at a 45 degree angle to the main shaft, the posterior capsule can be safely cleaned and polished using a lower vacuum setting.

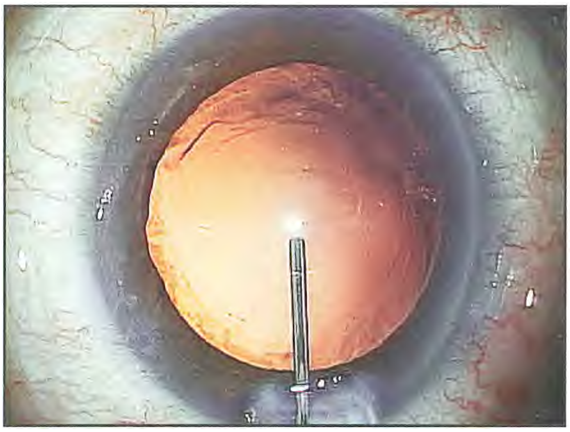

Figure 6-45. For IOL implantation, a cohesive OVD such as Provisc (Alcon, Fort Worth, TX) is preferable because it is easier to remove. It is important to refill the anterior chamber and capsular bag with sufficient OVD. This can be accomplished by continuing to inject OVD until it oozes out of the incision. Maintaining high intraocular pressure greatly facilitates IOL injection through a small incision.

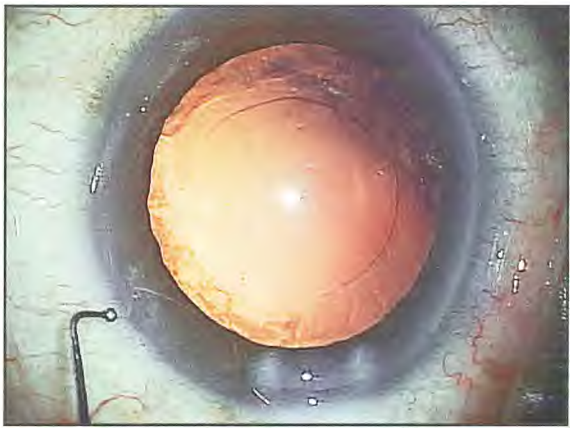

Figure 6-46. This author prefers using single-piece AcrySof 10Ls (Alcon) such as the IQ (SN6OWF), Toric (SN6ATx), ReSTOR (SN6AD1), and ReSTOR Toric (SND1Tx). The Acrysof platform can be implanted through a sub-2 mm incision using the Counter Traction Implant technique with a Monarch D-cartridge and Royale unihand injector (AE-9045LSP). Placing a second instrument through the side port provides adequate counterforce to the cartridge as it is inserted

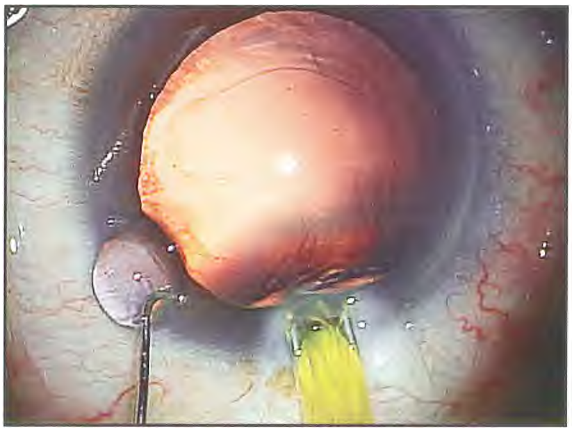

Figure 6-47. Even the smallest Monarch D-cartridge tip cannot be completely inserted into the anterior chamber though a 1.8 mm corneal incision. Only the protruding anterior lip of the cartridge tip can be inserted into the corneal tunnel. This makes countertraction with a second hand instrument important for IOL injection.

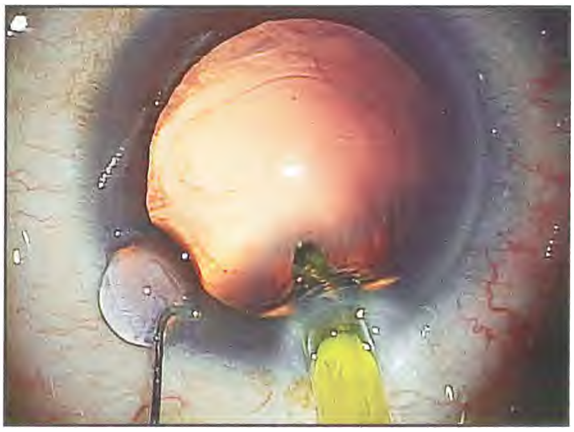

Figure 6-48. The IOL should be situated within the cartridge so that both haptics overide the optic and so that the lens is curling downward as it exits the cartridge tip. In this way, the conoid elbow of the haptic will pass through the cartridge tip first, and stretch the incision in the process.

Figure 6-49. While injecting the IOL, push the plunger continuously until the lens is completely released into the capsular bag. Continue to provide the counter traction with the second instrument and make sure not to stop halfway. If this happens, the IOL could become stuck in the incision like a napkin inside a napkin ring, which can be a significant problem. If this occurs, the lens can either be pulled back out through the incision or pushed into the anterior chamber with forceps. If neither maneuver is successful, amputate that part of the IOL external to the incision and push the remainder of the IOL into the anterior chamber where it can be cut it into smaller pieces for removal.

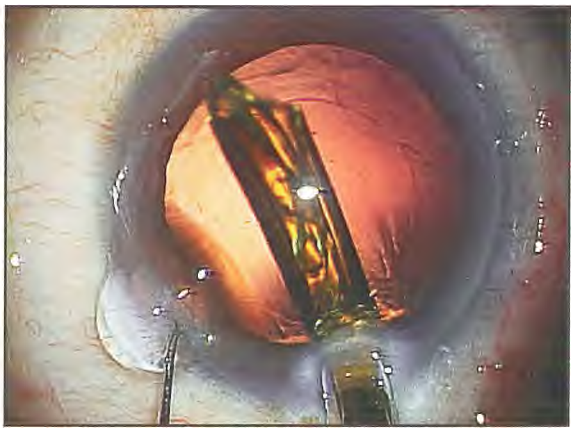

Figure 6-50. Proper placement of the Acrysof IOL into the cartridge is important. If the lens curls upward during placement, the plunger will pass underneath the lens optic and override it, rather than pushing against its edge. This in turn may result in overly abrupt exit of the 10L, which can traumatize the iris or tear the posterior capsule. Prior to docking the cartridge tip within the incision, it is important to confirm that the IOL moves smoothly as the plunger is advanced.

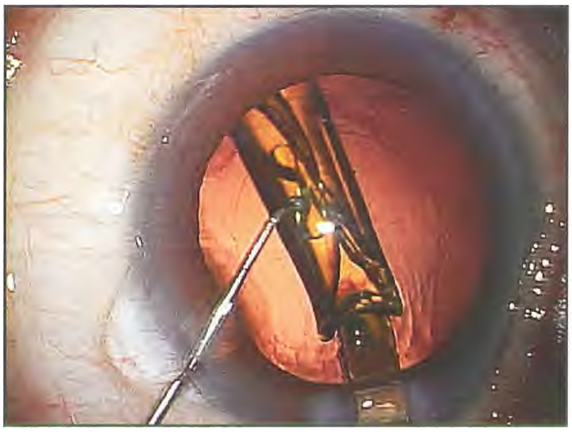

Figure 6-51. It is also important to maintain sufficient intraocular pressure during IOL implantation through a small incision. If the side port incision is too large, OVD might leak out during insertion of the cartridge tip. This will soften the eye and proper tip insertion will fail. To minimize such OVD leakage through the sideport incision, a special 0.6 mm keratome (AE-8131) can be used. Because the Royale injector (ASICO, Westmont, IL) has a long plunger, the lens position within the capsular bag can be manipulated with the extended plunger tip and the second hand instrument

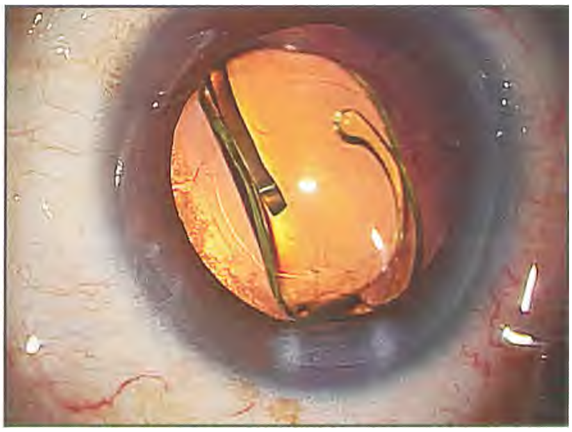

Figure 6-52. The Acrysof IOL opens slowly within the capsular bag. To prevent adhesion between the haptics and optic, the cartride should be filled with sufficient OVD prior to inserting the IOL.

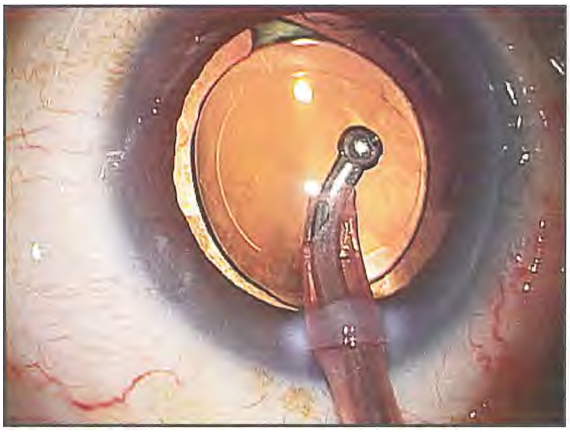

Figure 6-53. Remove the Provisc with the I/A tip. By tilting the IOL optic, any OVD behind the lens can be thoroughly removed.

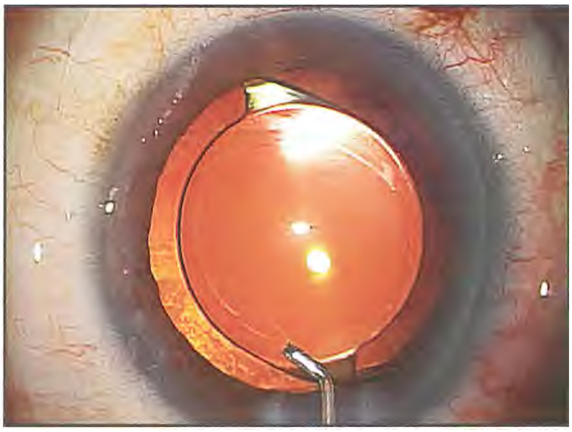

Figure 6-54. Using the hydrodissection cannula to irrigate the anterior chamber with BSS should wash out the Viscoat adherent to the endothelium. It is important to check for any small nuclear fragments which may be hidden within the residual Viscoat layer.

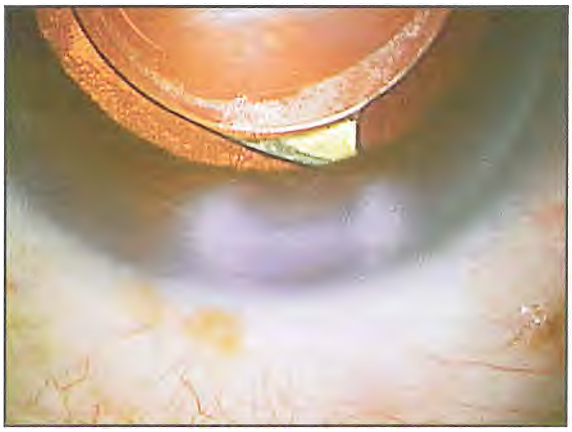

Figure 6-55. Prechopping the nucleus permits the cataract to be removed with minimal ultrasound energy. Because there is no thermal or mechanical damage, the incision is self sealing without requiring stromal hydration.

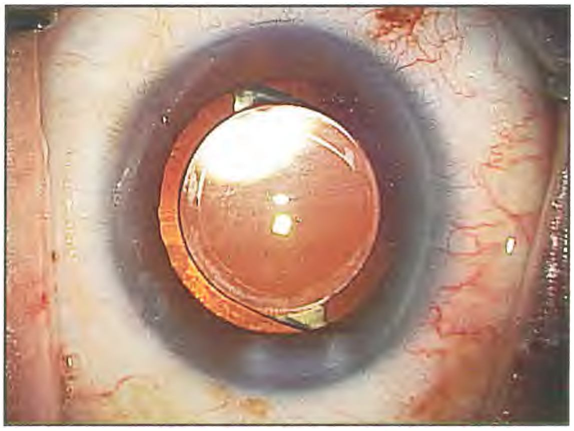

Figure 6-56. The eye is left unpatched at the conclusion of the surgery.

COUNTER PRECHOP

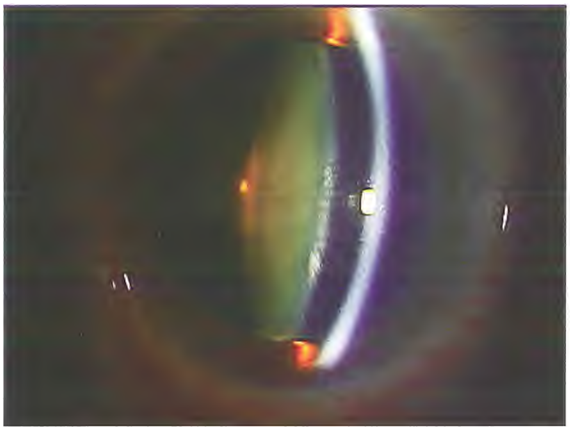

Figure 6-57. The aforementioned Karate Prechop technique is contraindicated for brunescent nuclei harder than grade III, and for eyes with weak zonules (e.g. pseudoexfoliation, Marfans, trauma, prior acute angle closure glaucoma, prior vitreoretinal surgery), or a torn capsulorrhexis. In these challenging cases, prechop should only be performed when the nucleus is supportedby a second instrument. This technique of bimaual prechopping utilizing nuclear counter support is called Counter Prechop. Both the Karate and Counter Prechop methods can be used for routine cases. However, Counter Prechop must be used for the complicated cases where standard Karate Prechop is contraindicated. In transitioning to Counter Prechop, it may helpful to stain the anterior capsule with dye to highlight the capsulorhexis edge .

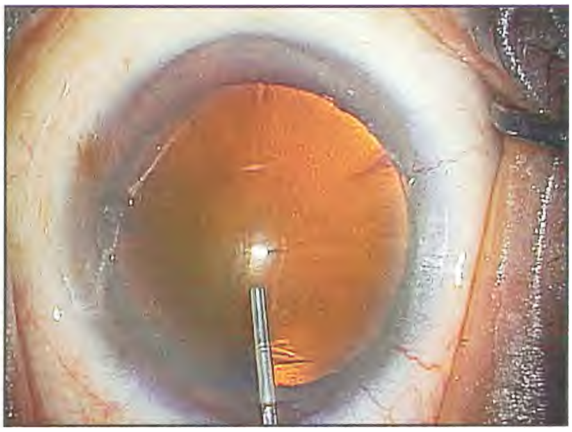

Figure 6-58. After fashioning a 2-step temporal clear corneal incision with a trapezoid diamond keratome, 0.5% preservative free Lidocaine is injected intracamerally. A small 0.6 mm side port incision is made and the anterior chamber is filled with Provisc. It is important to use a cohesive OVD such as Provisc rather than a dispersive OVD when capsular staining is planned.

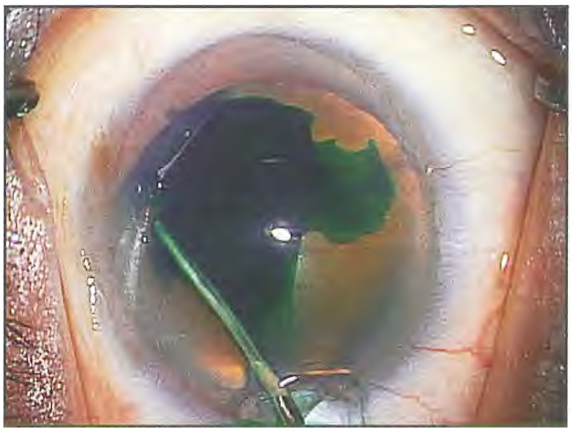

Figure 6-59. An off label Visco-ICG solution dissolved in Provisc is painted on the lens capsule using a Visco-ICG cannula (AE-7272). A small amount of Visco-ICG solution can be applied effectively on the capsule, as it has a hole on the inferior side of the curved cannula. The corneal endothelium is protected by the partition of Provisc. Because the ICG is dissolved in Provisc, it persists longer within the anterior chamber, and minimizes any chance for the dye to leak into the vitreous cavity. To create the Visco-ICG solution, 25 mg of sterile ICG powder is completely dissolved in 1.0 cc of distilled water by shaking the vial for 3 minutes. The solution is aspirated into a 2.5 cc syringe. One vial (0.7 mL) of Provisc is added into the syringe and shaken vertically for another 3 minutes.

Figure 6-60. Remove the Visco-ICG with the I/A tip and refill the anterior chamber with Viscoat. It is important to thoroughly remove any Visco-ICG behind the iris.

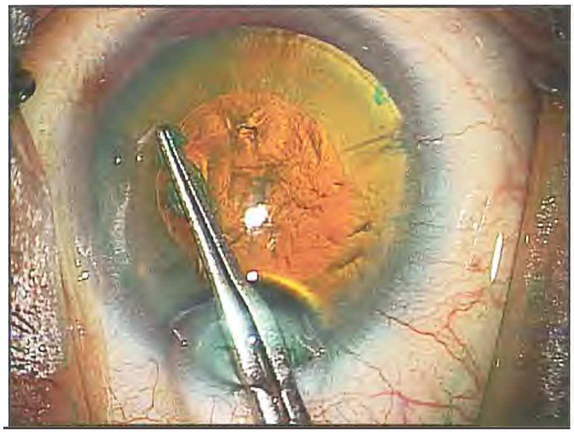

Figure 6-61. Make a 5.0 mm capsulorrhexis.

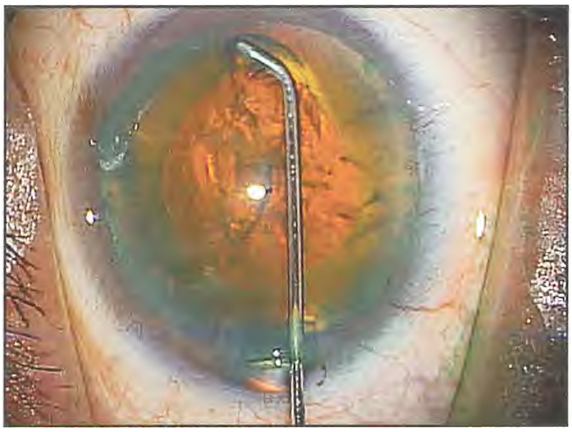

Figure 6-62. Perform cortical cleaving hydrodissection with a 27 gauge cannula (e.g., reusable AE-7636 or disposable AS-7636) attached to a small syringe. It is important to confirm that the nucleus rotates freely within the capsular bag before continuing.

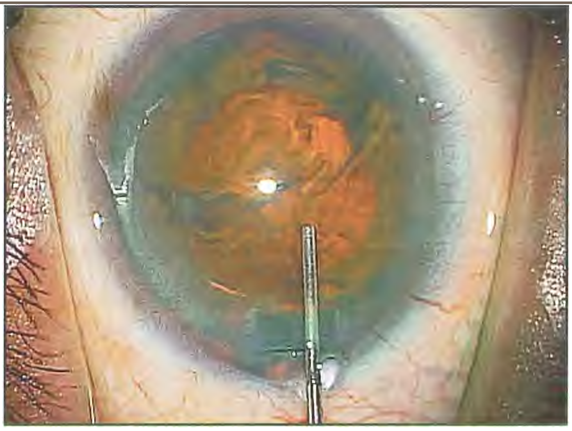

Figure 6-63. Refill the anterior chamber with Viscoat.

Figure 6-64. The Universal II Prechopper (AE-4192) and the Nucleus Sustainer (AE-2530) are used for the bimanual Counter Prechop technique. This prechopper has thinner and sharper blades which are able to open wider through a small incision compared to the conventional Universal Prechopper (AE-4282). There are many different types of prechoppers available in the market; however, 2 prechoppers, the Combo II (AE-4190) and the Universal II (AE-4192) can manage virtually any type of cataract. The Nucleus Sustainer is used to support the nucleus and provide counterfixation against the impaling force of the prechopper. Because the sustainer has a tiny dull ball at its tip, it can safely support the nuclear equator without risk of puncturing the posterior capsule.

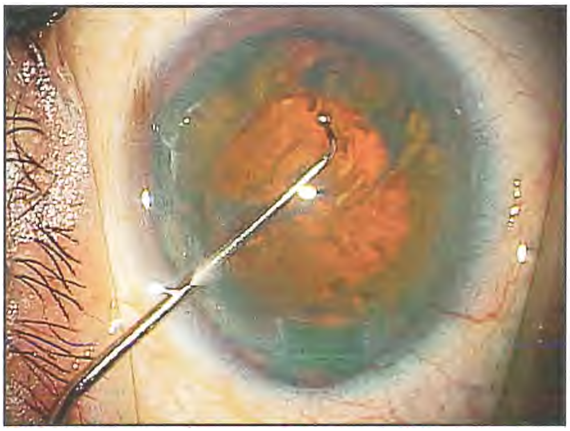

Figure 6-65. Carefully introduce the sustainer under the distal capsulorhexis edge until it drops into the epinuclear space to brace the equator of the nucleus. Accidentally placing this instrument outside the bag will result in a zonular dehiscence. Therefore visualization of the capsulorrhexis edge is important and capsule staining may be necessary in some cases.

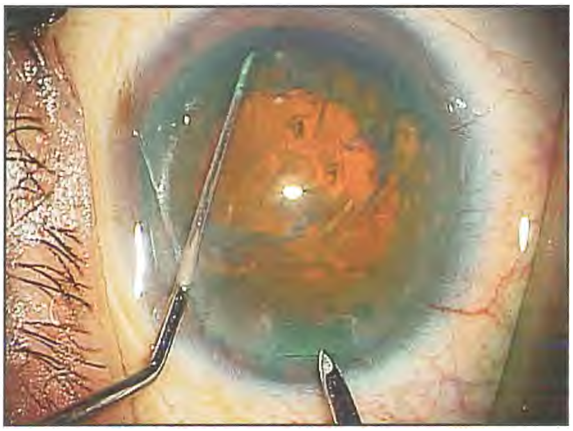

Figure 6-66. Pass the Universal II Prechopper through the incision with the blades oriented horizontally.

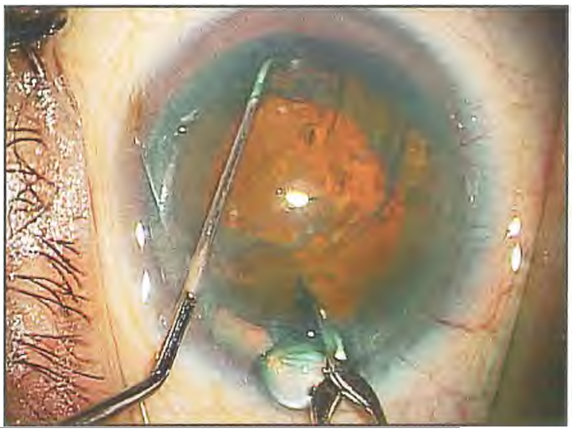

Figure 6-67. Insert the prechopper directly into the nucleus. To provide enough counterforce, the entire equator of the nucleus should be supported. This means that the tips of the second instrument and of the prechopper must be positioned deeply enough to surround the hardest central core of the nucleus. A nuclear sustainer with a longer tip (AE-2530L) can be employed for highly myopic eyes with a deep anterior chamber, or in cases with a large sized nucleus.

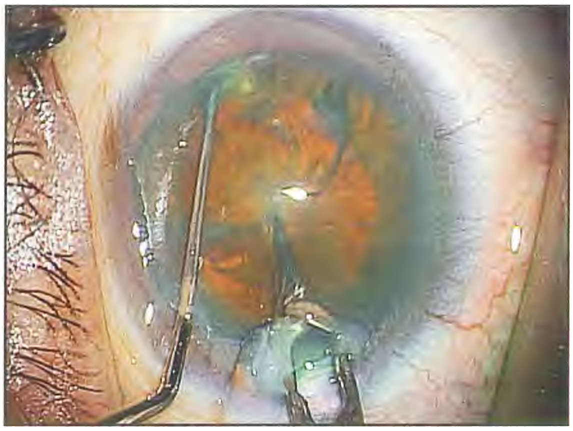

Figure 6-68. Advance the 2 instrument tips toward each other. The tip of the closed prechopper blade and the tip of the sustainer should surround and bracket the central part of the nucleus. If the nucleus was supported too superfically, the sustainer cannot provide proper counterforce to the prechopper. Such misalignment of the instrument tips may stress the zonules. Inserting the prechopper deeply into the core of the nucleus without adequate nuclear counter support may excessively displace the nucleus to the point of tearing the proximal zonules.

Figure 6-69. Open the prechopper blades once they have reached the center of the nucleus. If the nucleus is not bisected by this initial maneuver, reposition the prechopper at the bottom of the nuclear valley created by the 2 incompletely separated fragments. The goal is to open the prechopper blades within the bottom half of the nucleus; separating the blades while they are positioned too superficially within the anterior half of the nucleus will not achieve complete division. Slowly open the blades several times until complete separation of the posterior plate is achieved. The posterior capsule should become momentarily visible once complete nuclear division has been attained.

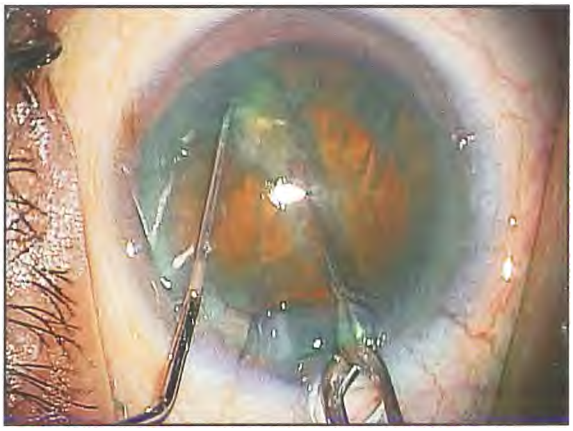

Figure 6-70. Reposition the closed prechopper blades within the proximal part of the nucleus.