

Our Phaco Technique With Whitestar

Chopping with the Signature platform requires minimal ultrasound.

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The most recently updated Whitestar Signature Phacoemulsification System (Abbott Medical Optics Inc., Santa Ana, California), is one of the most advanced machines for performing phacoemulsification. Its power delivery and enhanced fluidics also make it one of the safest machines available. We recently worked with Daniel Mojon, MD, of Switzerland, to compile a book on minimally invasive eye surgery. This article is a summary of our cataract phaco technique using the Whitestar Signature platform, which we also describe in greater detail in the book.

INCISIONS

Incisions are made in the corneal plane. Coaxial phaco incisions are 1.8 to 2.2 mm wide by 2 mm long. For biaxial microincision phaco, incisions are at least 1 mm in length but preferably 1.2 mm. The blade is applanated to the globe just anterior to the conjunctival edge. The point of the blade is tilted down to cut Descemet's membrane and is once again applanated and moved into the incision at the appropriate length (2 mm for coaxial phaco and 1.2 mm for biaxial phaco). This produces a curvilinear architecture.^{1,2}

Viscoat (Alcon Laboratories, Inc., Fort Worth, Texas) is injected through one of the sideport incisions into the distal chamber angle. The expanding wave of ophthalmic viscosurgical device (OVD) forces residual anesthetic solution, air, and aqueous humor out of the injection incision, which results in a stiff anterior chamber (Figure 1). In this way, the incision is constructed more accurately and reproducibly because the eye cannot distort unpredictably, as a soft eye generally does during incision construction. After a capsulorhexis is created utilizing a microincision capsulorhexis forceps through a sideport incision, we perform gentle cortical cleaving hydrodissection.³ A small capsulorhexis (5 to 5.5 mm) optimizes the procedure, and a large anterior capsular flap makes this type of hydrodissection easier to perform. If the nuclear-cortical complex can be rotated by the cannula, then adequate hydrodissection has been achieved.



Figure 1. Instilling OVD through a sideport incision into the distal chamber angle allows the expanding wave of OVD to extrude residual anesthetic solution, air, and aqueous humor out of the injection incision.

Next, we perform hydrodelineation^{3,4} to separate the endonucleus from the epinucleus and facilitate independent mobilization of the two layers. Hydrodelineation reduces the size of the nucleus that has to be mobilized through disassembly and emulsification, thereby reducing the amount of energy into the eye. This allows shallower and less peripheral grooving and smaller, more easily mobilized quadrants after cracking or chopping. When hydrodelineation is performed properly, a circumferential golden ring will outline the cleavage between the epinucleus and the endonucleus (Figure 2).

CHOPPING

We prefer a chopping technique in almost all cases. We can disassemble the nucleus mainly with mechanical forces by embedding the tip with vacuum and using minimal amounts of ultrasound energy. We use a 30° bevel-down, 20-gauge phacoemulsification tip with the Signature platform.

Horizontal chopping. We prefer horizontal chopping for grades 1 to 2.5 nuclear densities because it stabilizes the endonucleus during disassembly. The irrigating chopper is inserted before the phaco needle, which slips into the slit



Figure 2. The golden ring outlining the cleaving between the epinucleus and the endonucleus.

incisions more easily when inserted bevel-down. When the leading edge of the bevel touches the endothelium at the internal lip of the incision, the phaco needle is rotated bevel-up so that it enters the incision without tearing Descemet's membrane. It is then rotated bevel-down again. The chopper touches the center of the endonucleus with the vertical portion of the instrument and is pushed toward the golden ring distal to the phaco incision. Once the phaco needle is embedded 2 to 3 mm deep, we pull the chop instrument toward the side of the phaco needle to score the nucleus. We then move the phaco needle up and to the right while bringing the chop instrument left and slightly down. This allows complete fracture of the endonucleus through its floor, which creates two heminuclei (Figure 3). We then rotate the heminucleus clockwise and trap it between the chop instrument and the phaco needle, score, and chop it in the same way. We then mobilize the quadrants by occluding the bevel-down tip from above. The residual heminucleus is rotated to the distal periphery, stabilized, scored, and chopped. The last two quadrants are mobilized in the same manner (Figure 4).

Vertical chopping. This technique is done slightly differently. The bevel-down tip is buried in the endonucleus with sufficient lollipopping so that the nucleus is stable. Vacuum assists in this maneuver. We do not push down on the endonucleus as we are embedding the tip but allow phaco energy and vacuum to both drive the tip into the endonucleus and pull the endonucleus up toward the phaco tip—once again avoiding downward force on the capsule and the zonular apparatus. Once the phaco needle is embedded approximately 2.5 to 3 mm in the nucleus, we lift the phaco needle up and pull it to the right while pulling the slightly embedded chop instrument diagonally to the left and downward to avoid any force on the capsule or zonular



Figure 3. Fracture of the nucleus through its floor.

apparatus. After the endonucleus is split into two heminuclei, we rotate them 90° and chop the second heminucleus; if it is a very hard endonucleus, we subdivide the quadrants further so that we end up with bite-sized pieces.

Hard cataract. We break apart the endonucleus into a sufficient number of small, pie-shaped segments before we mobilize those segments. Mobilization is achieved by bringing the phaco needle bevel-down on top of the segment, occluding the tip, and using vacuum and bursts of ultrasound to consume the segment as it moves up into the tip.

Soft cataract. We do cortical cleaving hydrodissection and hydrodelineation and then hydroexpress the lens into the plane of the capsulorrhexis. With the bevel of the phaco needle sideways (facing the equator of the lens), we carousel the endonucleus in the plane of the capsulorrhexis until it is completely evacuated. The irrigating handpiece is held above the endonucleus to prevent contact between the spinning endonucleus and the corneal endothelium while maintaining the endonucleus in the capsulorrhexis plane.⁵

Biaxial phaco. We believe that biaxial is less invasive because it gives us fluidic advantages that are unachievable with coaxial. Specifically, through the separation of infusion from aspiration and ultrasound energy, all of the fluid is entering through one side of the eye and exiting through the other. This eliminates competing currents at the phaco tip and enhances chamber stability. If the capsule does

TAKE-HOME MESSAGE

- The nucleus can be chopped mainly with mechanical forces and minimal amounts of ultrasound energy.
- Use ultrasound power modulation to reduce energy.
- Biaxial phaco eliminates competing currents at the phaco tip, thus enhancing chamber stability.



Figure 4. Mobilization of the final quadrants.

become torn, the circulating fluid in the anterior chamber allows us to reach into the posterior chamber with an unsleeved tip and mobilize nuclear material. Conversely, the fluid coming from the sleeve surrounding a coaxial tip would drive nuclear material into the vitreous body.

It is important to use ultrasound power modulation because this dramatically reduces the amount of phaco energy in the eye and achieves cold phacoemulsification and the ability to do biaxial phacoemulsification with an unsleeved tip.^{6,7}

CORTICAL CLEAN-UP

It is more common to find residual cortex with smaller gauge phaco tips. We sweep the cortical aspirator circumferentially around the capsulorrhexis (port facing the fornix of the capsule) and draw out the remaining fragments. Because the connections to the capsule have previously been lysed by cortical cleaving hydrodissection, we rarely need to strip cortex centrally. After the epinucleus and cortex have been removed and the posterior capsule polished with the silicone-covered sleeve of the aspiration handpiece (port up, with minimal or no aspiration), we fill the posterior capsule and the anterior chamber with ProVisc (Alcon Laboratories, Inc.). We do not polish the undersurface of the posterior capsule because this may be associated with higher levels of posterior capsulotomy.^{8,9}

IOL IMPLANTATION AND STROMAL HYDRATION

We prefer cartridge injection rather than folding forceps for IOL implantation. It is important not to tear the incision by trying to inject a lens into a smaller incision than can accommodate it. Tearing will compromise the sealing capacity of the wound. OVD removal is accomplished with biaxial irrigation and aspiration

handpieces (Duet Bimanual System; MicroSurgical Technology, Inc., Redmond, Washington). We routinely lift the IOL and place the aspirator (port up) under the lens to get all of the OVD out of the bag from under the optic. We hydrate all incisions¹⁰ to cause the stroma to swell. We test all incisions with fluorescein to make sure that they are sealed. If they are not sealed, we place a single 10-0 nylon stitch. ■

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