Surgeons often select a phaco-chop technique in patients with hard cataract to reduce the amount of ultrasonic energy in the eye. However, many times cases are encountered in which the hard nucleus cannot be completely divided using this technique because of the physically robust nature of the dense posterior nuclear plate.

The subsequent division of a hard cataract following incomplete phaco chop is problematic, with few established strategies in the literature. At the beginning of this year, I described a new technique that I call phaco forward-chop, which I believe is one of the best solutions for managing hard cataracts when phaco chop is unsuccessful. It has been devised in consideration of the nature of hard cataracts, the force vector of chopping, and the safety of phacoemulsification.

**NEW DIRECTION: FORWARD**

Phaco chop techniques have been categorized as either horizontal or vertical. These approaches are thought to be among the best techniques for managing hard cataracts. However, phaco chop cannot always achieve division of the hard cataract due to the presence of a dense posterior nuclear plate. Another effective strategy is phaco flip, but this cannot be used when the zonules are weak. Therefore, alternative strategies are required.

Through surgical experience, I have realized that a forward chopping motion is more effective than horizontal or vertical chop following incomplete chop in a hard cataract. In my phaco forward-chop technique, the chopper moves from the posterior nucleus toward the anterior capsule. This new chopping direction is an alternative tool for cataract surgeons to use in eyes with hard cataracts. The technique for this procedure is outlined in Table 1 and depicted in a video that is available at http://eyetube.net/v.asp?brofor.

**WHY FORWARD-CHOP?**

**Nature of hard cataracts.** The physically robust nature of the dense posterior nuclear plate often obstructs the separation of nucleus in the presence of a hard cataract. Forward chopping at the level of the posterior nuclear plate improves the likelihood of adequate nuclear disassembly.

**Force vector.** In phaco chop, the force vector of division resonates toward the posterior capsule or zonules because the chopper does not move exactly in the opposite direction as the phaco tip. Dividing the hard cataract requires a strong force that causes the force vector to scatter. However, in forward-chop, the chopper moves from approximately 180° opposite the phaco tip so that the force vector does not scatter toward the posterior capsule and zonules. This movement concentrates the vector with enough force to divide the nucleus.

**Safety.** In the case of a leathery nuclear posterior plate, surgeons often try to insert the chopper nearest to the posterior capsule. This movement may lead to posterior capsular rupture. No matter how adequately the phaco chopper is inserted and moved, the strong force needed to divide a hard cataract causes accidental movement of the chopper. In contrast, a chop starting from posterior to the nucleus and moving toward the anterior capsule avoids accidental posterior capsular rupture.

**CASE PRESENTATION**

This patient had high myopia with a grade 4 cataract according to the Emily-Little classification. I attempted to divide the hard nucleus with phaco chop, but I could not divide it completely. As soon as I realized that subsequent phaco chop maneuvers would not be effective in this hard cataract, I converted to the phaco forward-chop technique. I made use of my first chop by immediately creating a crack at the periphery of the lens. Next, I slipped the phaco chopper through the crack and moved it in a forward direction.

---

**Phaco Forward-Chop**

This technique is useful following incomplete nucleus division in hard cataracts.

**BY KOJU KAMOI, MD, PhD**
(ie, forward-chop). Subsequent forward-chops were performed. After lens removal, the IOL was implanted uneventfully. There was no complication during or after surgery. The video of this case presentation reveals the forward chopping direction as an effective method for dividing hard cataracts. Additionally, any accidental movement of the chopper does not damage the capsule.

Koju Kamoi, MD, PhD, is an Assistant Professor, Department of Ophthalmology and Visual Science, Tokyo Medical and Dental University, Japan, and a Research Fellow, Department of Ophthalmology, University of Aberdeen, United Kingdom. Dr. Kamoi states that he has no financial interest in the products or companies mentioned. He may be reached at tel: +44 01224555950; e-mail: k.kamoi@abdn.ac.uk.


**TABLE 1. PHACO FORWARD-CHOP TECHNIQUE**

1. Create two incisions; one main incision and one sideport incision.
2. Use dye to enhance visualization of the anterior capsule if necessary.
3. Fill the anterior chamber with an ophthalmic viscosurgical device using the soft shell technique.
4. Create a continuous curvilinear capsulorrhexis (approximately 6 mm).
5. Perform hydrodissection and/or hydrodelineation depending on the condition of the lens.
6. At the sign of an incomplete phaco chop (Figure 1A), transition to the phaco forward-chop technique:
   A. Create a crack at the periphery of the lens by making use of the first chop (Figure 1B).
   B. Dislocate one side of the lens with the tip of the handpiece.
   C. Slip the phaco chopper through the crack and into the space between the posterior nucleus and the posterior capsule. Proper location of the chopper is just behind the posterior nucleus (Figure 1C).
   D. Move the phaco chopper anteriorly, from an anteroposterior plane located anterior to the posterior capsule toward the plane of the anterior capsule. Simultaneously, the nucleus is engaged with the tip of the handpiece (ie, forward-chop; Figure 1D).
   E. Consecutive forward chops are made (Figure 1E).

**Figure 1.** (A) Incomplete phaco chop. (B) A crack is created at the periphery of the lens. (C) The phaco chopper slips through the crack and into the space between the posterior capsule and posterior nucleus. Forward chop: the phaco chopper is moved in anterior direction, and (D) the nucleus is chopped from posterior to anterior. (E) Subsequent forward-chops are performed.

**TAKE-HOME MESSAGE**

- Phaco chop cannot always achieve division of the hard cataract due to the presence of a dense posterior nuclear plate.
- In phaco forward-chop, the chopper moves from the posterior nucleus toward the anterior capsule to improve the likelihood of accurate nuclear disassembly.
- Eyetube direct link: http://eyetube.net/vasp?brofor.