It is tempting to add new toys to one’s cataract set when the latest glossy brochure from an instrument manufacturer arrives in the mail. However, there are benefits to keeping surgical instrumentation to a minimum. In this article, I describe my current cataract technique to illustrate which instruments I believe are essential for cataract surgery.

Currently, my basic technique for cataract extraction is coaxial microincision surgery (MICS) through a 2-mm incision. With coaxial MICS, as opposed to bimanual, the wound does not have to be enlarged for lens implantation. It is also unnecessary to add an extra incision to implant the lens. I have performed a considerable amount of biaxial surgery in the past, and there are advantages to separating the irrigation and aspiration functions. I have retained a bimanual approach only for cortical clean-up in my current technique.

**INSTRUMENTATION**

Before I adopted coaxial MICS, the basic cataract set at the Prince Charles Eye Unit in Windsor, England, included sponge holders, a blunt pair of scissors for cutting the drape, five forceps, two speculums, and four assorted manipulators and choppers. I have now pared this down to three sets of forceps (micro Colibri, angled McPherson, and lens-loading); three manipulator/choppers (Packard Fat Boy chopper, Mackool iris repositor, and Osher-Fenzl lens manipulator); and the Shepard reversible speculum (all Duckworth & Kent, Ltd., Hertfordshire, England). I normally use a one-handed injector for lens implantation. With a few additions for special cases, this is my cataract set for coaxial MICS.

**Preparation.** After topical anesthesia is administered and the patient is draped, the blunt scissors are used to cut flaps to tuck under the lids with the Shepard speculum. I prefer a guarded speculum because it holds the drape-covered lids very well, the screw mechanism allows the surgeon to adjust the palpebral opening to enhance access to the operative field, and patients under topical anesthesia are less likely to blink. If the patient has a particularly small palpebral fissure, I use a Little reversible speculum (Duckworth & Kent) because of its smaller blades. I operate from the temporal position, so the speculum is placed nasally.

**Incisions.** My first incision is made with a 20-gauge 15° sideport knife (Alcon Laboratories, Inc., Fort Worth, Texas), 45° to the left of the main incision. The blade allows me to make a three-plane incision, which will seal very well at the end of the case. I use Troutman Barraquer Colibri forceps (Duckworth & Kent) with the blades together, placed 180° from the incision site against the limbus, to create countertraction. A second sideport incision is made with the same knife, approximately 90° to the right of where the main incision will be. The eye is then filled with ophthalmic viscosurgical device (OVD) to make it firm.

I use the Windsor knife (Core Surgical Ltd., Oxfordshire, United Kingdom; Figure 1) for the main incision. This single-bevel knife, which I designed, has a novel additional triangular facet on the front that smooths the passage of the blade through the tissues. The triangular facet also enables the surgeon to judge accurately the point to dimple down to enter the anterior chamber. It also has an extension of the handle behind the blade to stiffen the thin steel and prevent unwanted flexion during incision creation. Optical coherence tomography has demonstrated that the Windsor knife can produce three-plane architecture consistently.

**Capsulorrhexis.** For many years, I have taught my residents that it is easier to create a flap near the phaco wound to start the capsulorrhexis. Using a 25-gauge straight disposable cystotome, I draw a C shape on the surface of the cortex, and this produces a flap twice as large as the original C. I then use cross-action Calladine-Inamura capsulorrhexis forceps (Duckworth & Kent) to grasp the capsular flap and complete the capsulorrhexis. These forceps have a narrow profile in the wound and can be used through incisions as small as 1.8 mm. The blades also have a series of marks to measure the size of the capsulorrhexis, which is particularly useful for training residents.

**Hydrodissection.** With a disposable flattened cannula, hydrodissection is initiated near the main wound. Once I see a good fluid wave, I change my hand position and hold the syringe like a pencil. This simple change allows me to rotate the nucleus more easily, simultaneously applying downward and rotatory forces. Prior to doing this, I decompress the
capsular bag by sliding the nucleus from the pole opposite to where balanced salt solution has been injected.

**Phacoemulsification.** At the Prince Charles Eye Unit in Windsor, we have a variety of phaco machines, including the Infiniti Vision System (Alcon Laboratories, Inc.), the WhiteStar Signature System (Abbott Medical Optics Inc., Santa Ana, California), and the Stellaris (Bausch + Lomb, Rochester, New York). I have designed a phaco tip for coaxial MICS (Microsurgical Technology, Inc., Redmond, Washington) that is compatible with all three phaco machines and marries well with their power delivery systems (Figure 2). The needle has a 700-µm outer diameter with a 20° Kelman bend and a 30° bevel. Even though this tip’s profile is narrow, the internal diameter is 570 µm. The tip comes with its own dedicated sleeve.

This needle has a number of advantages. It cuts dense cataracts due to its Kelman style and narrow profile. The thin wall and 30° bevel enable rapid occlusion, making it easy to pick up and withdraw pieces of chopped nucleus. Additionally, dense cataract pieces do not clog the needle because the tip does not flare or narrow, and fluidics are more efficient because there is no aspiration bypass system (ABS; Alcon Laboratories, Inc.) port.

A second instrument is normally required to assist in the mechanical break-up and removal of the nucleus within the anterior chamber. These instruments can be inserted through the pair of 20-gauge sideport incisions that will ultimately be used for bimanual I/A. With smaller incisions and with less fluid entering the eye, leakage is an issue, particularly from the sideport. In order to minimize leakage, I have designed a double-ended instrument that incorporates my most commonly used sideport instruments, the Packard chopper and the Mackool iris repositor (The Packard Fat Boy chopper; Duckworth and Kent; Figure 3). The shaft of this instrument is thick to fill the sideport, and it is the same diameter as my I/A handpieces. The two ends of the instrument are used at different times during the procedure; the Mackool end is useful for splitting softer cataracts in a maneuver I call the *soft slice*. It can also be used for chopping softer cataracts, stretching the iris in small pupils, or holding the iris out of the way. The Packard chopper has a point for vertical chopping, but there is also a blade on the inside for horizontal chopping.

**Irrigation and aspiration.** Once the nucleus has been emulsified, the remaining soft lens matter is removed with 20-gauge disposable bimanual I/A handpieces (Core Surgical Ltd.). The aspiration handpiece has a 0.3-mm port. The ports do not have sharp edges, making it difficult to break the capsule, even if it is sucked into the port. The irrigation handpiece has two large side openings providing over 60 cc/minute; this is more than adequate to keep the chamber stable during cortical removal. I prefer to use bimanual I/A because all of the cortex, even under the phaco wound, can be reached simply by changing hands. Also, there is generally less leakage through the tight sideports, allowing the fornices of the capsular bag to open up. If there is a plate of epinucleus present, the irrigation handpiece can be passed underneath to lift it up for aspiration.

**Lens implantation.** After the capsular bag and the anterior chamber have been filled with an OVD, it is time to implant the lens. I generally use the AcrySof IQ (Alcon Laboratories, Inc.) for standard procedures. The nurse loads the lens in the injector with forceps (Core Surgical Ltd.) designed by the team in Windsor. The forceps have long, thin, round blades. The round nature of the blades minimizes contact with the lens surface. The long shaft means that the folded lens can be pushed a long way down into the cartridge.

I use a single-handed injector (Duckworth & Kent) with a wound-assisted technique and sideport counter-traction using the Mackool iris repositor to implant the lens. For a 2.2-mm incision, I use the Monarch C-cartridge (Alcon Laboratories, Inc.) for a gentler entry into the eye. For a 1.8-mm incision, I use the Monarch D-cartridge with the same injector; however, I am careful not to press too forcefully.

As an alternative, I use the Monarch III injector with a three-handed technique. The surgeon pushes the mouth of the cartridge against the lips of the wound and applies counter-traction with the Mackool iris repositor. At the same time, the nurse turns the screw of the Monarch to implant the lens.

**TAKE-HOME MESSAGE**

- Dr. Packard’s basic set for coaxial MICS includes three sets of forceps, three manipulator/choppers, and a speculum.
- Surgeons should aim to keep their cataract set to a minimum and be comfortable with the instruments they use.
the lens in a very controlled manner. The lens is then positioned in the capsular bag with the aspiration handpiece by pushing down on the lens optic. The lens unfolds slowly, and it can easily be positioned while this is taking place.

To remove the OVD, I push the irrigation handpiece through the opposite sideport. The OVD can be removed from under the lens by lifting the lens. Alternatively, when a sodium hyaluronate 1% OVD has been used, pressing down on the optic forces the OVD underneath out of the bag for aspiration. Finally, while the irrigation handpiece is still running fluid into the eye, the right-hand sideport is closed by injecting the stroma with balanced salt solution with the hydrodissection cannula.

**Astigmatic correction.** With the standard procedure complete, additional instruments may be used to correct existing astigmatism. I have been using limbal relaxing incisions (LRIs) for many years. I have designed a set of four rings for different corneal diameters (11, 12, 13, and 14 mm) to assist in creating incisions of appropriate depth and shape. Angle markings are visible on top of the rings. Grips are positioned underneath the rings for holding on to the ocular surface while the eye is marked and the incisions are made.

A special diamond knife with guarded footplate and a 600-µm blade is run around the inside of the ring to create arcuate incisions. An alternative knife that works well with the rings is the BD Atomic Edge Accurate Depth Knife (BD Medical, Waltham, Massachusetts).

For LRIs and toric lens implantation, it is important to mark the patient’s eye before surgery when he is sitting upright. This is because cyclotorsion may occur when the patient lies down. The Cionni Toric Reference marker (Duckworth & Kent) is an easy marking instrument to use.

**CONCLUSION**

There are many other instruments that could be added to a cataract set for special situations. I recommend that surgeons settle on a small number of instruments that they are comfortable using. In essence, these instruments are an extension of the surgeon’s fingers. If he is comfortable with the instruments, they will perform as is desired.

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