

Phacoemulsification

Phacoemulsification refers to modern cataract surgery in which the eye's internal lens is emulsified with an ultrasonic handpiece, and aspirated from the eye. Aspirated fluids are replaced with irrigation of balanced salt solution, thus maintaining the anterior chamber, as well as cooling the handpiece.

Origin: phaco- (< Gk phako-, comb. form of phakós lentil; see lens) + emulsification^[1]

Preparation and precautions

The eye is a delicate organ, requiring extreme care before, during and after a surgical procedure. An ophthalmologist must identify the need for phacoemulsification and be in charge of conducting the procedure safely. Many university programs allow patients to specify if they want to be operated upon by the consultant or the resident / fellow.

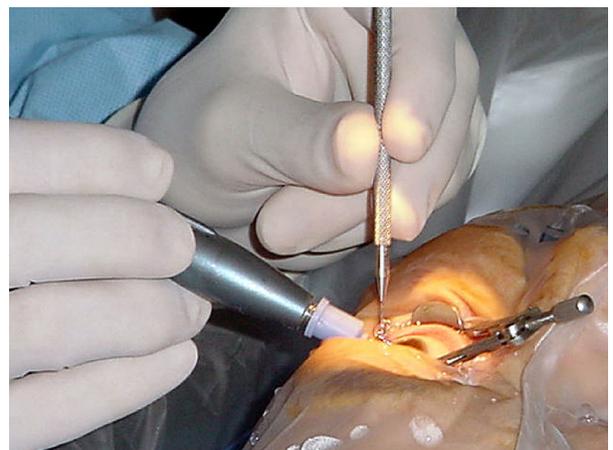
Proper anesthesia is a must for any eye surgery. Topical anesthesia is most commonly employed, using tetracaine eyedrops or lidocaine gel. Alternatively, lidocaine and/or longer-acting bupivacaine anesthetic may be injected into the area surrounding (peribulbar block) or behind (retrobulbar block) the eye muscle cone to more fully immobilize the extraocular muscles and minimize pain sensation. A facial nerve block using lidocaine and bupivacaine may occasionally be performed to reduce lid squeezing. General anesthesia is recommended for children, traumatic eye injuries with cataract, for very apprehensive or uncooperative patients and animals. Cardiovascular monitoring is preferable in local anesthesia and is mandatory in general anesthesia. Proper sterile precautions are taken to prepare the area for surgery, including use of antiseptics like povidone-iodine. Sterile drapes, gowns and gloves are employed. A plastic sheet with a receptacle helps collect the fluids during phacoemulsification. An eye speculum is inserted to keep the eyelids open.

Surgical technique

Before the Phacoemulsification can be performed, one or more incisions are made in the eye to allow the introduction of surgical instruments. The surgeon then removes the anterior face of the capsule that contains the lens inside the eye. Phacoemulsification surgery involves the use of a machine with microprocessor-controlled fluid dynamics. These can be based on peristaltic or venturi type of pump.

The phaco probe is an ultrasonic handpiece with a titanium or steel needle. The tip of the needle vibrates at ultrasonic frequency to sculpt and emulsify the cataract while the pump aspirates particles through the tip. In some techniques, a second fine steel instrument called a "chopper" is used from a side port to help with chopping the nucleus into smaller pieces. The cataract is usually broken into two or four pieces and each piece is emulsified and aspirated out with suction. The nucleus emulsification makes it easier to aspirate the particles. After removing all hard central lens nucleus with phacoemulsification, the softer outer lens cortex is removed with suction only.

An irrigation-aspiration probe or a bimanual system is used to aspirate out the remaining peripheral cortical matter, while leaving the posterior capsule intact. As with other extracapsular cataract extraction procedures, an intraocular lens implant (IOL), is placed into the remaining lens capsule. For implanting a PMMA IOL, the incision has to be enlarged. For implanting a foldable IOL, the incision does not have to be enlarged. The foldable IOL, made of



Phacoemulsification: Cataract surgery, by a temporal approach, using a phacoemulsification probe (in right hand) and "chopper" (in left hand), being done under operating microscope at a Navy medical center

silicone or acrylic of appropriate power is folded either using a holder/folder, or a proprietary insertion device provided along with the IOL.

It is then inserted and placed in the posterior chamber in the capsular bag (in-the-bag implantation). Sometimes, a sulcus implantation may be required because of posterior capsular tears or because of zonulodialysis. Because a smaller incision is required, few or no stitches are needed and the patient's recovery time is usually shorter when using a foldable IOL. ^{[2] [3]} .

History

Charles Kelman introduced phacoemulsification in 1967 after being inspired by his dentist's ultrasonic probe.

See also

- Eye surgery
- Africa Cataract Project

Resources

- A web site that contains a description and animation illustrating the phacoemulsification process ^[4]
- A web site that contains information on Phacoemulsification training ^[5]

References

- [1] <http://dictionary.reference.com/browse/Phacoemulsification>
 - [2] Surgery Encyclopedia - Phacoemulsification for cataracts (<http://www.surgeryencyclopedia.com/Pa-St/Phacoemulsification-for-Cataracts.html>)
 - [3] Surgery Encyclopedia - Extracapsular cataract extraction (<http://www.surgeryencyclopedia.com/Ce-Fi/Extracapsular-Cataract-Extraction.html>)
 - [4] http://www.clinicareinoso.com/conditns/qx_cat.htm
 - [5] <http://www.phacotraining.com>
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