The Evolution of Cataract Surgery

This course will look at the ever changing landscape of cataract surgery, focusing on new laser procedures and new implant lenses as well as what the future may hold for Intraocular Lenses (IOLs).

Our Course Objectives:
- Review cataract surgery comanagement with an emphasis on recent advances and new techniques.
- Discuss complications of cataract surgery.
- Survey new equipment and procedures in cataract surgery.
- Look at advanced technology IOLs and concepts for future IOLs.

- Introduction
- Cataract Surgery
  - Began in 5th century BC in India with Susruta
  - Couching
- 2500 Years of Surgery Later…
  - Cataracts are still the most prevalent ophthalmic disease in the world.
  - In 1998, 20 million people were blind from cataracts.
  - In U.S., visually significant in 14% of men and 24% of women 65-74 yr old.
  - In U.S., visually significant in 30% of men and 46% of women 75 yr or more.
- More Modern Cataract Extraction
  - Intracapsular cataract extraction
    - Removal of the entire lens (including capsule)
    - Anterior chamber IOL used (use angle-fixated IOL)
    - Surgery of choice until 20 yr ago
  - Extracapsular cataract extraction
    - Removal of lens with exception of capsule
    - Posterior chamber IOL used
    - Less risk of retinal detachment, cystoid macular edema, or vitreous loss.
    - Small incision lessons likelihood of astigmatism changes.
- Pre-Op
  - Comprehensive Eye Exam
  - History
  - BCVA (BAT)
  - Pupils (size…pre and post dilation)
  - Refraction
  - Keratometry (can attempt to correct some astigmatism during surgery)
- Slit Lamp (watch out for PAS, PXS, & subluxation)
- DFE
- Ultrasound (axial length)
- Potential Acuity Meter, interferometer, super pinhole
- Corneal topography/Endothelial cell counts?

- Phacoemulsification & IOL Implantation
  - Incision
  - Partial thickness scleral incision with tunnel
  - Clear cornea incision
    - Biplanar (Z) incision: self-sealing
  - Paracentesis with viscoelastic injection
    - The importance of high quality viscoelastics
  - Capsulorrhexis
  - Hydrodissection with blunt tipped cannula
    - Separates the nucleus
  - Hydrodelineation
    - Further separates and mobilizes the nucleus
  - Phacoemulsification of nucleus
  - Irrigation and aspiration of remaining contents and viscoelastic
  - IOL Implantation
  - Wound closure

- Complications
  - Decentration of IOL
  - Endophthalmitis
  - Toxic lens syndrome
  - Uveitis-Glaucoma-Hyphema (UGH) Syndrome
  - Anterior chamber cells and flare with increased IOP
  - Phacoanaphylactic Endophthalmitis
  - Corneal decompensation, corneal edema, and bullous keratopathy

  - Retinal complications
    - CME and retinal detachments

  - Posterior Capsular Opacification
    - Due to proliferation of remnants of lens epithelial cells.
    - *Up to 50% of adults within 5 yr of surgery.*
    - 100% of pediatric patients.
    - Silicone implants more likely to be damaged by YAG than other materials.
    - Less likely with newer IOL technology

- Advances in Phaco Techniques
Phacoemulsification Systems

- Alcon Infiniti with AquaLase Liquefaction Device
  - *Uses high energy, high velocity pulses of warm liquid solution to break up the cataract rather than excess ultrasonic pulses*
  - Does not work well on hard nuclei
  - Less risk of thermal burn at site of incision
  - Less risk of disruption of posterior capsule & reduced PCO
  - Intrepid plus Fluidics Management System is key to Aqualase’s success
    - Allows very high flow and vacuum while maintaining a very stable anterior chamber

- Centurion

- AMO Whitestar
  - Ellips ultrasound system
    - Longitudinal and transverse ultrasound
  - Update has Ellips FX
    - Variable frequency
    - More efficient with different nuclei

- AOI Vizual
  - Portable phaco system
  - 22lbs

- LenSx and Catalys
  - Yes, we can use a laser to take out your cataract!
  - *Femtosecond laser increases predictability and reproducibility*
  - Part of the “Refractive Cataract Surgery” concept

  - “Although approximately one-fourth of the estimated 400,000 cataract operations performed each year in the U.S. now involve implantation of IOLs, questions continue to be raised about the use of these devices.”

- IOL Calculations
  - IOL power = \[ \frac{1336}{(AL-ELP)} - \frac{1336}{(1336/\{1000/[(1000/DPostRx)-V]\+K}\{ELP}\}) \]
  - *Basically, Ks and As no matter how you put it*
  - Zeiss IOL Master
  - Immersion/Contact A-Scan
  - Verion System and ‘Closing the Loop’
  - GIGO
• Current IOLs
  o Monofocal IOLs
    ▪ Plate
    ▪ Multi-piece
    ▪ Single piece
    ▪ Aspheric and AT IOLs
    ▪ Blue Blocking
  o Toric IOLs
  o Multifocal IOLs
    ▪ CrystaLens
    ▪ ReZoom
    ▪ ReStor
      ▪ “Apodized diffractive multifocal” and evolution
    ▪ Tecnis Multifocal

• Future IOLs
  o Toric Multifocal IOLs (Acrysoft, Tecnis and Crystalens)
  o Calhoun Vision LAL
  o Visiogen Synchrony
  o Lenstec Tetreflex
  o Nu Lens Dynacurve
  o AT LISA
  o Akreos M160
  o Lentis MPlus
  o Fluidvision Accommodating IOL
  o Rayner M-flex T
  o Elenza
  o Implantable telescope

• The key to success:
  o Cataract Meet Refractive Surgery
    ▪ Patient Selection
    ▪ Patient Selection
    ▪ Patient Selection

• Conclusions