Surgical Management of Presbyopia

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Optimizing Visual Function with Multifocal IOLs

- Multifocal IOLs: split available light between distance and near focus
- Contrast of object of interest is affected by the attendant defocus, which affects contrast sensitivity
  - Refractive
  - Diffractive
- Enhance function by reducing spherical aberration and residual astigmatic defocus

AcrySof IQ ReSTOR Multifocal Toric IOL

- Alcon, FW Texas
- Not available in the US
- UV and blue filtering
- Diffractive aspheric toric
- Cylinder powers 1, 1.4, 2.25, 3 D
- Sparse clinical data

Acknowledgements

- The presenter had in the past a financial interest in the subject matter of this presentation (Visiogen Inc.; now AMO)
  - Founding stock
  - Research support
- Some devices discussed are under FDA investigation, and are unavailable for general use
Oculentis Multifocal Toric

- Lentis Mplus toric IOL, Oculentis GmbH
- One piece multifocal toric IOL
- Sector-shaped near vision segment
- 3D add
- Sparse clinical data. Study comparing stray light and symptoms between refractive, diffractive and near segment suggested greatest halos in refractive designs

PresbyLasik

- Use laser to induce multifocality in cornea
  - Multifocal
    - decentered hyperopic profile
    - Significant vertical coma
  - Center distance, midperiphery near
    - Relies on negative peripheral asphericity
    - Miosis with accommodative effort counters effectiveness
    - Esp. in myopic correction, large volume of tissue removal
  - Hyperpositive center near, peripheral distance
    - Minimal tissue removal
    - Better performance with small pupil or miosis
    - Associated with high risk of induced coma due to alignment challenges

Rayner M-flex T Multifocal IOL

- Rayner, East Sussex, UK
- Multizone refractive aspheric lens
- 4 or 5 annular zones
- +3 or +4 giving +2.25 or +3D at spectacle plane
- Outer haptics absorb initial capsule contraction
- Engage inner haptics to stabilize lens

AT Lisa toric IOL

- Previously called the Acri.Lisa toric 466TD, Carl Zeiss Meditec AG
- Diffractive multifocal aspheric IOL
- 65% to distance, 35% to near
- +3.75 add
- Hydrophilic acrylate with hydrophobic surface
- 11 mm diameter, 6.0 mm optic, 0 degrees angulation
- Cylinder from 1 to 12 D in 0.50 D increments
- Custom made, 6-8 wks
- 50% moderate glare and halo
IntraCor

- Technolas Perfect Vision, Munich, Germany
- Femtosecond intrastromal concentric cylindrical tissue ablation
- Produces hyperprolate cornea; steeper center produces myopic shift
- Proposed that avoidance of tissue removal required by excimer ablation reduces risk of ectasia
- Femtosecond tool to reproduce Hexagonal keratotomy

Femtosecond Laser-Assisted Lens Modification

- Finite element modeling suggests cleavage planes that can allow lens fiber sliding and enhanced flexibility
- Primate and minipig studies suggested only focal lens opacities
- Krueger: 14 patients planning cataract extraction treated in Philippines, measured at 1 month
  - 0.25D change in subjective and objective accommodation seen at 1 month
- Attempt prior to refractive lens exchange?

Intracorneal Implants

- Flexivue Microlens (Presbia, Los Angeles, CA)
- Kamra (AcuFocus, Irvine, CA)
- Vue+ (Revision Optics, Lake Forest, CA)

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  - Placed at 280-300µ
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- **Kamra (AcuFocus, Irvine, CA)**
  - Pinhole increase in depth of focus
  - 5µ thick, 3.8mm diameter, 1.6mm opening
  - Microperforations 5-11µ
  - Placed at 170µ

- **Vue+ (Revision Optics, Lake Forest, CA)**
  - Hydrogel implant to steepen cornea
  - 2mm diameter
  - Placed at 120-130µ