**The Future of Cataract Management**
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**Description:** We will discuss the economic impact of cataract management. Current literature will be presented that addresses cataract prevention and if cataract does occur, can it be medically managed. Timing of referral to surgery will be discussed along with the risk-benefit ratio of modern cataract surgery.

**Objectives:**
1. To understand the local and global impact cataract has on society.
2. To review the cost-effectiveness of modern cataract care.
3. Literature review of proposed strategies to prevent cataract formation.
4. Literature review of proposed strategies to medically manage cataract.
5. Current thinking of when a cataract patient should be referred to surgery will be discussed.
6. How the evolution of surgery has impacted surgical outcomes.
7. Current cataract surgical techniques will be discussed.

I. **Economic impact of cataract care**

A. Cataract as a leading cause of vision loss
      a. Ethnicity
      b. Blindness and low vision statistics
      a. Underdeveloped and developing countries

B. Cataract surgery in the U.S.
   1. Number of procedures performed annually
   2. Medicare spending
   3. Discussion of cost-effectiveness of managing cataract
      b. Second eye surgery (Tan, A., BJO 2012), and others

II. **Can cataract formation be prevented?**

A. The most common age-related cataracts and why they develop
   1. Three forms of age related cataracts
      a. Cortical
      b. Nuclear
      c. Posterior subcapsular
   2. Why age-related cataracts develop
      a. Lens proteins
      b. Influence of environmental factors
B. The most common risk factors
   1. Unable to modify
      a. Age
      b. Gender
      c. Race
      d. Family history
      e. Ophthalmic diagnoses and their treatments
         (1). Congenital
         (2). Acquired [trauma, diabetic eye disease, AMD, others]
   2. Able to modify
      a. UV exposure
      b. Smoking
      c. Diet and body weight [BMI]
      d. Medical diagnoses
         (1). Medications used to treat systemic disease
      e. Where one resides

III. Once present, can age-related cataract be medically managed
   A. Proposed use of supplements to slow progression and/or reverse cataract
      1. Oral supplements
         a. Large clinical trials investigating the use of nutrition and supplementation
            (1). Age Related Eye Disease Study Report #9 (Arch Ophth, Oct 2009)
               (a). Vitamins C & E and beta carotene
               (b). AREDS II is adding zinc
            (2). Physicians Study (Christen, WG, Arch Ophthalmol. 2010)
               (a). ARC in a randomized trial of vitamins E and C in men
            (3). The Women’s Health Study (Christen, WG, Ophthalmic Epidemiology, 2004)
               (a). Beta-carotene
               (a). Beta-carotene, vitamins C & E mixture would modify progression of ARC
      2. Eye drops and others delivery systems
         a. N-acetylcarnosine (Can-C eye drops)
            (1). Babizhayev, MA.
         b. Similasan Cataract Care
         c. Natural Ophthalmics – Cataract Eye Drops with Cineraria
      3. Investigational preparations under investigation.

IV. When should a patient be referred for surgical consideration?
   A. Patient symptoms
      1. General reduction in vision (distance and near), with or without best-correction
      2. Asymmetry in vision
3. Glare in either bright light or with night driving

B. Clinical findings
1. How the cataract is graded
   a. Clinical experience – does the grade of cataract (sign) coincide with the symptoms
   b. Formal grading scales
      (1). Lens Opacification Classification System (LOCS)
      (2). World Health Organization – WHO Simplified Grading System
      (3). Wisconsin Cataract Grading System
      (4). AREDS Lens Grading Protocol
      (5). Wilmer System of Cataract Classification

C. Medical need for cataract extraction
1. Mature or hyper-mature cataract
   a. Significant reduction in functional vision
   b. Impact on health of the eye
      (1). Adjacent structures
         (a). Impact cataract surgery may have on anterior segment anatomy
         (b). Literature discussing the impact on glaucoma care
      (2). Inability to image posterior segment structures

D. Issue of access to care
   a. Financial
   b. Geographic

V. The risk and benefits of modern cataract surgery
A. Surgical outcomes in the U.S.
   1. Considered a safe procedure
   2. Significant improvement in functional vision

B. Most common complications
   1. Infection, endophthalmitis
   2. Inflammation (cornea, anterior chamber, posterior chamber)
   3. Residual refractive error
   4. Elevated intraocular pressure
   5. Ptosis
   6. Iris trauma, Intra-operative floppy iris syndrome (IFIS)
   7. Retained lens materials, retained surgical materials
   8. Posterior capsule
      a. Rupture of capsule during surgery
      b. Opacification of the capsule as a late complication of surgery
   9. Posterior vitreous detachment (PVD) and/or floaters
   10. Cystoid macular edema (CME)
   11. Retinal detachment
   12. Choroidal detachment
   13. Vascular occlusion
VI. Current surgical techniques

A. The evolution of surgery
   1. Couching
      a. Earliest recorded attempt to manage cataract
      b. Still being performed today?
   2. Intracapsular cataract extraction (ICCE) and aphakia
   3. ICCE with IOL
   4. Extracapsular cataract extraction (ECCE) with IOL
   5. Phacoemulsification
   6. Large incision at the limbus vs. clear corneal incision
      a. Evolution of IOLs
      b. Compared to peritomy with large wound
   7. Micro-incisions of the cornea
      a. Early small incisions – 3 mm.
      b. Investigational – 1.5 mm.
   8. Femtosecond laser cataract surgery
      a. Clear corneal incision
      b. Capsulorhexis
      c. Phacofragmentation
   9. What the future holds
      a. Simultaneous bilateral cataract surgery - same day surgery on both eyes
         (1). PRO - Sarikkola AU, J Cataract Refract Surg. 2011

B. How improved surgical techniques have influenced outcomes?
   1. Earlier improvement and stabilization of functional vision
      a. Juan, Optometry and Vision Science, Jan 2013
   2. Fewer complications
      a. Intraoperative
      b. Postoperative

VII. Intraocular lens designs

A. Early IOL design
   1. Location of the lens
      a. Posterior segment
      b. Anterior segment
      c. Iris fixed
   2. Lens materials
B. Evolution of materials
   1. The foldable IOL
   2. Optics of the lens
3. Complications associated with early lenses
C. Improved lens designs
1. Lens characteristics
   a. Design of haptics
   b. Edge design
   c. Aspheric lens designs
2. Range of refractive errors able to be corrected
   a. Wider range of hyperopia and myopia
   b. Ability to correct astigmatism,
      (1). Toric lens designs
      (2). Corneal treatment
         (a). Limbal relaxing incision (LRI)
         (b). Corneal refractive treatments
            i. LASIK
            ii. PRK
   c. Ability to correct distance, intermediate, and near vision
      (1). Multifocal lenses
      (2). Accommodating lenses
      (3). Economic impact of “premium lens” design

VIII. Perioperative medications
A. Antibiotics
   1. Moxifloxacin
      a. Vigamox 0.5% (Alcon)
      b. Moxeza 0.5% (Alcon)
   2. Gatifloxacin
      a. Zymar 0.3% (Allergan)
      b. Zymaxid 0.5% (Allergan)
   3. Besifloxacin
      a. Besivance 0.6% (B&L)
   4. Levofoxacin
      a. Quixen 0.5% (Vistakon)
      b. Iquix 1.5% (Vistakon)
   5. Ciprofloxacin
      a. Ciloxan 0.3% (Alcon)
      b. Generic 0.3%
   6. Ofloxxacin
      a. Ocuflox 0.3% (Allergan)
      b. Generic 0.3%
   7. Others

B. Non-steroidal anti-inflammatory drugs (NSAIDs)
1. Ketorolac
   a. Acular 0.5% (Allergan)
   b. Acular LS 0.4% (Allergan)
   c. Acuvail 0.45% single dose vials (Allergan)
   d. Generic 0.4%, 0.5%
2. Diclofenac
   a. Voltaren 0.1% (Alcon)
   b. Generic
3. Bromfenac
   a. Xibrom 0.09% (Ista)
   b. Bromday 0.09% (Ista)
   c. Prolensa 0.07% (Ista)
4. Nepafenac
   a. Nevanac 0.1% (Alcon)
   b. Ilevro 0.3% (Alcon)

C. Corticosteroids
1. Prednisolone acetate
   a. PredForte 1.0% (Allergan)
   b. Generic 1.0%
2. Rimexolone
   a. Vexol 1% (Alcon)
   b. Generic
3. Loteprednol etabonate
   a. Lotemax 0.5% (B&L)
4. Difluprednate
   a. Durezol 0.05% (Alcon)