CONTROVERSIES IN PRE-OPERATIVE PROPHYLAXIS FOR THE PREVENTION OF ENDOPHTHALMITIS:

WHAT IS THE EVIDENCE?

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POSTOPERATIVE ENDOPHTHALMITIS REPRESENTS AN INFREQUENT BUT DEVASTATING COMPLICATION OF OCULAR SURGERY

Incidence of Endophthalmitis Following Anterior Segment Surgery

- **Penetrating Keratoplasty** **0.18%**
- **Cataract and Trabeculectomy** **0.11%**
- **Glaucoma Surgery** **0.12%**
- **Cataract Surgery** **0.08%**

Bascom Palmer Eye Institute 1984-1994

OVER THE PAST DECADE THERE HAVE BEEN REPORTS OF AN ALARMING **INCREASE** IN THE INCIDENCE OF ENDOPHTHALMITIS

WHAT DOES THE LITERATURE SAY?

LITERATURE

- EXTRA VS INTRACAPSULAR SURGERY
- ACRYLIC VS SILICONE LENSES
- FOLDABLE VS NON-FOLDABLE LENSES
- CAPSULAR TEAR +/- VITREOUS LOSS
- CLEAR CORNEA INCISION – NO SUTURE

CONTROVERSY EXISTS REGARDING THE POSSIBLE INCREASED RISK OF POSTOPERATIVE ENDOPHTHALMITIS WITH CLEAR CORNEAL INCISIONS

EXPERIMENTAL STUDY OF CORNEAL WOUND DYNAMICS IN CADAVER AND RABBIT CORNEAS REPORTED THAT IN PROPERLY CONSTRUCTED CORNEAL WOUNDS, MAY SEE COMMUNICATION BETWEEN INTRAOCULAR AND EXTRACULAR ENVIRONEMNTS

McDonell PJ, et al. Ophthalmology 2003

REPORT OF ENDOPHTHALMITIS INCIDENCE:
PHACO AND IOL IMPLANTS THROUGH A CLEAR CORNEAL INCISION
0.26%!

University of Utah study
Invest Ophthalmol Vis Sci , 2002

SCLERAL TUNNEL
vs
CLEAR CORNEAL INCISION

- Retrospective case review
- 13,886 cataract surgeries at hospital-based surgical center
- Incidence of endophthalmitis 0.129% (CCI) vs (0.05%) scleral tunnel.
- Not statistically significant

Colleaux, et al. Can J Ophth, 2000

SCLERAL TUNNEL
vs
CLEAR CORNEAL INCISION

- Retrospective, case controlled study
- 38 Endophthalmitis cases
- 371 control patients
- 3X higher incidence with CCI compared to superior scleral tunnel

Cooper, et al. AJO, 2003

SCLERAL TUNNEL vs CLEAR CORNEAL INCISION

- Randomized, Prospective study
- 11,595 patients enrolled (15 cases)
- No difference silicone vs acrylic
- Clear corneas clearly worse (4.6 X more)
- P value = 0.037

Nagaki, JCRS 2003:29:20

MOST RECENT PUBLISHED STUDY (AJO, June 2005)

- **Retrospective observational case series**
- **Between Jan 2000-November 2004**
- **Incidence for all cases: 0.04% (7/15,920)**
- **Incidence for CCI cases: 0.05% (6/11,462)**
- **Incidence for non-CCI cases: 0.02%**
- **Coagulase negative Staph most common**

Miller JJ, et al (BPEI). AJO, 2005

THEORIES

- **Requires an intact wound lip**
- **Requires IOP**
- **Corneal pump seals wound**
- **Stromal hydration forces wound closed**
- **Only lasts 10-15 minutes!!**
- **False sense of security**

WHEN IN DOUBT…… ALWAYS PLACE A SUTURE!!

IDEAL SELF-SEALING WOUND ARCHITECTURE

- Placed at the limbus
- Have multiple planes (3 ideal)
- Have as long a tunnel as possible
- Length equaling the width of the incision
- Self-sealing at normal IOP
- Minimal hydration required

OTHER FACTORS TO CONSIDER

- 5/7 (71%) immune compromise
- 4/7 (57%) intraoperative complication
- Inferior CCI (86%)

Miller, et al. (BPEI). AJO, 2005

JURY IS STILL OUT!

Common Sources of Bacteria in Endophthalmitis

- Conjunctiva
- Eye lids
- Lacrimal sac
- Airborne contaminants
- Contaminated irrigating fluids

Mode of Post-surgical Endophthalmic Inoculation

- Bacterial particles travel from corneal surface into all incisions
- IOP variation causes incisions to gape after clear corneal incisions
- Surface fluid influx into anterior chamber causing inoculation after surgery

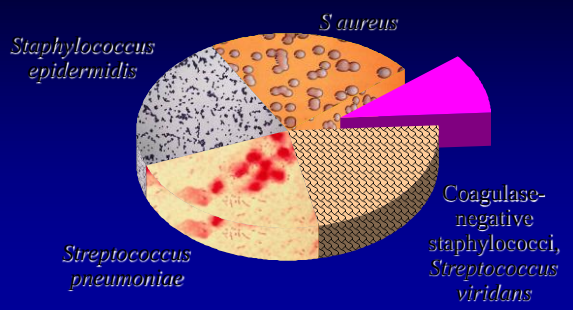
Organisms Isolated in the Endophthalmitis Vitrectomy Study

• Coagulase negative Gram positive cocci	70%
• Staph Aureus	10%
• Streptococci	9%
• Gram negative rods	6%

Arch Ophthalmol 1995, 113:1479-1496

Gram-Positive Organisms

- 90% of ocular infections



Optimizing Strategies for Endophthalmitis Prophylaxis in Anterior Segment Surgery

- Antisepsis
- Surgical Prep
- Antibiotics

Antisepsis

- **Probably the single most effective way of reducing postoperative infection**
- **Povidone-iodine one of the best products when toxicity and effectiveness are considered**
  - **Can be toxic to corneal endothelium**
- **Preoperative lid hygiene, preoperative lid scrubs, intra-operative lid draping**

Endophthalmitis-Surgical Prep

- **5% povidone-iodine solution**
  - **Reduce colony forming units-conjunctiva**
  - **Synergistic effect when used with antibiotics**
  - **Implicated in reducing post op endophthalmitis**

Speaker et al., Ophthal., 1991
Isenberg et al., Arch., 1985
Apt et al., A.J.O., 1995

Antibiotics

- **Treat with an antibiotic that addresses potential pathogens**
- **The antibiotic must be at the site *prior* to the inoculation with organisms**
- **Use the least toxic and most effective antibiotic**
- **Use at an appropriate time and dose**

Options for Prophylactic Antibiotics

- Preoperative
  - Oral
  - Topical
- Intraoperative
  - Intracameral via the irrigating solution
  - Subconjunctival
- Perioperative
  - Topical
- Postoperative
  - Topical

Collagen Shields

- Good intraocular antibiotic levels
- Resists wound leak
- Patching helpful to prevent loss

Ophthalmic Fluoroquinolones have become the antibiotic standard for American Ophthalmologists

IMPORTANT QUESTION!

WHEN DOES THE EYE BECOME INFECTED?

Intra-operative or Post-operative??

PROPHYLAXIS AIMED IN TWO DIRECTIONS

- **Reduce the opportunity for organisms to enter the eye during and after surgery**
- **Reduce the bacterial load that is present on the ocular surface and periocular tissues**

DECREASE MICROBES INTO THE EYE

- Careful, sterile draping of the lids, margins, and lash follicles
- Avoid touching the eye surface during surgery (IOL lens injector)
- Low complication rate
- Shorter operating time
- Appropriate wound management-Good seal

PROPHYLAXIS…….

WHAT DOES THE OPHTHALMIC LITERATURE SAY???

IS THERE ANY EVIDENCE TO SUPPORT ONE PREVENTION APPROACH OVER ANOTHER?

"Preoperative povidone-iodine received the highest evidence rating. All other reported prophylactic interventions, including preoperative topical antibiotics received the lowest clinical recommendation based on weak and often conflicting evidence justifying their use."

Ciulla TA, Starr MA, and Masket S. Bacterial Endophthalmitis Prophylaxis for Cataract Surgery. An Evidence-Based Update. Ophthalmology. Jan 2002

THERE IS GOOD RATIONALE TO TAKE ADVANTAGE OF THE SYMBIOTIC RELATIONSHIP BETWEEN POVIDONE IODINE (SHORT TERM EFFECT) AND A FLUOROQUINOLONE ANTIBIOTIC (LONG TERM EFFECT)

RESISTANCE AMONG GRAM-POSITIVE ORGANISMS HAS STEADILY INCREASED OVER THE PAST DECADE!

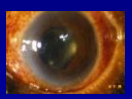
BACTERIAL RESISTANCE

- A major problem in eye care
- Can be created and prevented by eye care professionals
- Requires cultures when necessary
- Necessitates appropriate treatment

Changing Resistance Patterns

- Ocular surface flora
- Bacterial conjunctivitis
- Bacterial keratitis
- Postoperative endophthalmitis
- Orbital and preseptal cellulitis

pneumococcal keratitis



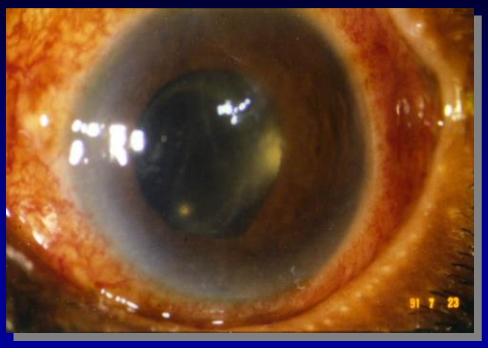
endophthalmitis

Antibiotics and Bacterial Resistance

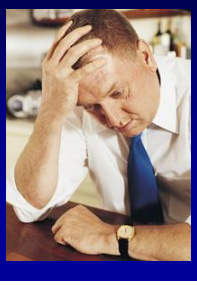
- Low concentration
- Mechanism of action: bacteriostatic
- Insufficient dose frequency: <qid
- Poor tissue delivery
- High organism burden
- Preferred dosing

The Bugs ARE Winning

MRSA Endophthalmitis



HOW DO DOCTORS DECIDE WHAT TO DO?



ANTIBIOTIC CHOICE RATIONALE

Ideal Antibiotic:

- **Broad spectrum**
- **Excellent penetration**
- **Excellent drug solubility**
- **Rapid Onset**
- **Low Toxicity**
- **Low resistance**
- **Compatible with other drugs**

THE FLUOROQUINOLONE ANTIBIOTICS

Key Properties:

- **Bactericidal**
- **Inhibit DNA synthesis (DNA gyrase)**
- **Broad spectrum of activity in vitro**
- **Low toxicity**
- **Excellent penetration**

FIRST-GENERATION FLUOROQUINOLONES

- **Ofloxacin, ciprofloxacin, norfloxacin**
- **Widely used, well-tolerated**
- **Excellent Gram-negative activity**
- **Variable Gram-positive antimicrobial activity**
- **Increasing resistance, especially among streptococci**

NEXT GENERATION FLUOROQUINOLONES

- Levofloxacin, sparfloxacin, gatifloxacin, moxifloxicin, others
- Enhanced pharmacokinetics
- Improved Gram-positive antimicrobial activity
- Responsible and appropriate prescribing and dosing essential (regardless of agent)

Development of resistance among older generation fluoroquinolones is why we must evaluate newer antibiotics

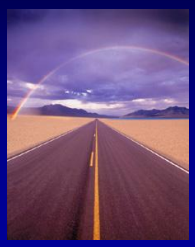
HOW TO USE FLUOROQUINOLONE

(and avoid resistant strain emergence)

- **Minimum dosage four times a day**
- **Maximum time course – 2 weeks**
- **Never taper dose**

The higher the attainable drug concentration relative to the minimum inhibitory concentration, the less likely that resistance will develop!

Broad Spectrum Coverage: How Much Is Enough?



Avoid Topical Antibiotic Resistance

- Use high concentrations
- Use bactericidal drug
- Use high dose frequency (>qid)
- Use a highly soluble drug
- Limit duration of dosage

USE THESE NEW ANTIBIOTICS APPROPRIATELY TO EXTEND THEIR USE IN OPHTHALMOLOGY

REMEMBER: IDEAL SELF-SEALING WOUND ARCHITECTURE

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