

Preoperative Antibiotics for Infection Prophylaxis in Cataract Surgery

Fabrizio I. Camesasca, MD

Istituto Clinico Humanitas – Milan - Italy

Postoperative Endophthalmitis

- Mostly after cataract surgery
- Almost totally caused by bacteria
- Entering eye:
 - At the time of surgery
 - Postoperatively, before wound epithelialization
- Patient's ocular **surface** and eyelid **flora**
- 75% - 95% **Gram +**
- Important percentage of **culture-negative** endophthalmitis
(EVS: 30.7 %)

(Eifrig CW, Ophthalm Surg Lasers 2002;33)

(Speaker MG, Ophthalmology 1991; 98)

Postoperative Endophthalmitis

- Potentially devastating, vision-threatening complication
- Incidence – 0.072 % / 0.082 %

(Kattan H.M., Ophthalmology 1991)

(Aaberg T.M., Ophthalmology 1998)

- USA: 4,000 cases/year
- 1/10 or worse final visual acuity in 15-30% of cases

(Yu-Wai-Ma P, J Cataract Refract Surg, Mar 2008)

Endophthalmitis and Cataract Surgery (ECCE vs Faco)

- 30.000 cases, Mass Eye & Ear, 1964-1977:
0.06%
- 23.625 cases, Bascom Palmer: 0.07%
- 1999 – 2002: 0.03% - 0.04%
- Sweden (2002): 0.1%
- Norway (2003): 0.15%

(Allen HF, *Ophthalmology* 1978; 85)

(Kattan HM, *Ophthalmology* 1991;98)

(Bohigian G, *Ophthalm Surg Lasers*, 1999;30)

Endophthalmitis and Clear Corneal Incision (CCI) Cataract Surgery

- Meta-analysis of 215 studies (1992-2003)
- Limbal incision: 0.062%
- Scleral incision: 0.074%
- CCI: 0.189%

(Taban M, Arch Ophthalmol 2005; 123)

- Fine H, Gills J: no increase in incidence
(ASCRS 2005)

Endophthalmitis Following CCI Cataract Surgery

Bascom Palmer Eye Institute (Jan 1996 – Dec 2004)

- Retrospective series, 71 patients
- Most frequently involved organism: coagulase-negative *Stafilococcus (epidermidis)*
- Frequently **resistant** to fourth generation **fluoroquinolones**
- Final VA: 46% > 0.5

(Flynn HW – AAO Subspecialty Day – Retina – Chicago 14-15, 2005)

Endophthalmitis Prophylaxis

Goals

1. **Sterilize** ocular surface
2. **Supplement** natural **defenses** if bacteria enters cornea or aqueous

ESCRS Endophthalmitis Study Group

- Partially masked multicenter cataract surgery study
- 2002 design
- 16,603 pts
- **Topical** perioperative **levofloxacin** 0.5%
- **Intracameral cefuroxime** (1 mg in 0.1 ml saline) at the end of surgery:
 - Five-fold reduction in the occurrence of postoperative endophthalmitis
- CCI and silicone IOLs as possible risk factors

(J Cataract Refract Surg, Jun 2007)

2007 ASCRS Member Survey

- 91% used topical antibiotic prophylaxis
- 4th generation fluoroquinolones (gatifloxacin or moxifloxacin) preferred by 81%
 - 88% preoperatively
 - 98% postoperatively
 - 90% at the conclusion of surgery
- Intracameral antibiotics: 30%

(Chang DF, J Cataract Refract Surg, Oct 2007)

United Kingdom Survey

- 55% were using intracameral **cefuroxime**
- 48% had **switched** after ESCRS study
- Among non-users:
 - 68% afraid of **dilution errors**
 - 67% would switch if product available

(Gore D, Cataract Refract Surg, Oct 2007)

Caveats

- There has **never** been a randomized controlled **clinical trial** demonstrating the prophylactic benefit of any preoperative or postoperative topical **antibiotic**
- No **commercially available** antibiotic preparation for injection in the AC

(Chang DF, J Cataract Refract Surg, Oct 2007)

Prevention Strategies Endophthalmitis

1. Antibiotic **selection** (type)
2. Antibiotic **dosing** regimen
3. Role of pre-op antiseptics (**the only proven prophylaxis method until 2007**)

Endophthalmitis Prophylaxis

Antibiotic selection: Ideal

- Broad spectrum antimicrobial activity, esp. gram +
- Adequate solubility to penetrate ocular tissue (bioavailability)
- Achieve aqueous and vitreous concentration > MICs potential bacterial pathogens for 24-48 hrs
- Minimum Corneal Toxicity

Antibiotic Prophylaxis

Antibiotic selection: Practice

- Topical use
- 3rd Generation Fluoroquinolones
 - Ciprofloxacin, Ofloxacin: 0.197% endoph. rate
- 4th Generation Fluoroquinolones
 - Gatifloxacin (0.3%) 0.015% endoph. rate
 - Moxifloxacin (0.5%) 0.1 % endoph. Rate
 - Highly lipophile
 - High aqueous solubility
 - Only option for intracameral use of 4th gen.

(Jensen MK, J Cataract Refract Surg, Sep 2008)

(O'Brien T, J Cataract Refract Surg, Oct 2007)

Antibiotic Prophylaxis

Antibiotic selection: Practice

- Intracameral use:
- ESCRS:
 - Cefuroxime (1mg in 0.1 mL normal saline)
- 4th Generation Fluoroquinolone:
 - Moxifloxacin 0.5% (250µg/0.050 mL)

(J Cataract Refract Surg, Jun 2007)

(Lane SS, J Cataract Refract Surg, Sep 2008)

MRSA

- Introduction of penicillin: 1940
- Methicillin-Resistant *Staphylococcus Aureus*
- First identified in the 1960s
- In late 1970s: resistant to β -lactam compounds and other antibiotics
- MRSA now indicates resistance to all β -lactam antibiotics
- Traditionally confined to health care facilities
- Presently becoming a dominant pathogen in community-associated infections

(O'Brien T, J Cataract Refract Surg, Oct 2007)

(Asbell PA, J Cataract Refract Surg, May 2008)

MRSA

- Continues to evolve
 - expanding resistance to a broad variety of antimicrobial agents
- Sensitive to trimethoprim and aminoglycosides
- Also MR-coagulase-negative *Staphylococcus* (epidermidis) (MR-CNS) are increasing in frequency

(O'Brien T, J Cataract Refract Surg, Oct 2007)

(Asbell PA, J Cataract Refract Surg, May 2008)

(Hori Y, J Cataract Refract Surg, Mar 2009)

Staph: EVS (1996) vs Today

- EVS: Coagulase-negative *Staphylococcus (epidermidis)* was most frequent organism
- Methicillin-resistant *Staphylococcus aureus* (**MRSA**):
 - 1996 (EVS): **1.9%**
 - 1998: **4.1%**
 - 2006: **16.7%**

(Asbell PA, Am J Ophthalmol, Jun 2008)

(Blomquist PH, Trans Am Ophthalmol Soc, 104, 2006)

(Friedlin J, Am J Ophthalmol, Aug 2007)

MRSA and Fluoroquinolones

- MRSA: only 15.2% susceptible to fluoroquinolones
- Resistant to ALL fluoroquinolones
 - 81.8% of MR-CNS
 - 100% of MRSA

(Asbell PA, Am J Ophthalmol, Jun 2008)

(Hori Y, J Cataract Refract Surg, Mar 2009)

(Friedlin J, Am J Ophthalmol, Aug 2007)

MRSA Today

The prudent course would be to consider the possibility of methicillin or multidrug resistance with any *S. Aureus* ocular infection, even in the absence of recognized risk factors

(Asbell PA, Am J Ophthalmol, Jun 2008)

MRSA and Aminoglycosides

- Most frequent community-acquired MRSA are susceptible to tetracycline and aminoglycosides

(Blomquist PH, Trans Am Ophthalmol Soc, 104, 2006)

- Ocular surface MRSA nearly universally susceptible to aminoglycosides (vancomycin and gentamicin)

(Kotlus BS, Am J Ophthalmol, Nov 2006)

(Moshirfar M, J Cataract Refract Surg, Mar 2006)

MRSA and Aminoglycosides

- The activity of **netilmicin** against gentamicin and tobramycin –resistant MRSA isolates was found to be more potent than those of gentamicin and tobramycin

(Ida T, Antimicrobial Agents and Chemotherapy, May 2002)

(Aslan O, Eur J Ophthalmol, Jul-Aug 2008)

- **Netilmicin:**

- Derivative of gentamicin
- Activity superior to that of ofloxacin against gram – and gram+
- Activity on gentamicin-resistant bacteria

(Sloane H, Can J Ophthalmol, Jan 1981)

MRSA and Endophthalmitis

- 18% of culture-positive cases of post-cataract endophthalmitis
- Advisable to obtain microbial cultures in cases of ocular surface infection when firstline treatment **fails**
- May be **resistant** in vitro to **all** generations of **fluoroquinolones**

(Deramo VA, Am J Ophthalmol, Mar 2008)

Endophthalmitis Prophylaxis

Top Recommendations

1. Apply an antiseptic such as **povidone iodine** to lids and ocular surface prior to sx.
2. Apply a draping technique that **sequesters the lid & lashes** during surgery
3. Stromal **hydrate** all clear corneal wounds
4. Consider **intracameral** antibiotic

Courtesy of Frank J. Bucci, Jr.

Endophthalmitis Prophylaxis

Top Recommendations

5. Best available topical **fluoroquinolone** immediately post op to replenish aqueous and corneal levels (depot effect)
6. Use best available fluoroquinolone 4 x day for at least 1 week post op
7. Be suspicious of **MRSA** (blefaritis, nosocomial, old age...) and promptly adopt adequate **aminoglycoside**
8. Avoid extended low frequency dosing of fluoroquinolone as this facilitates the development of resistant organisms

(Chang DF, J Cataract Refract Surg, Dec 2007)

Courtesy of Frank J. Bucci, Jr.

Conclusions

- 2,500,000 **cataract** surgery cases per year in Europe
- Incidence rate of 0.3% (without use of perioperative antibiotics)
- **7,500** cases per year...

(J Cataract Refract Surg, Jun 2007)

Conclusions

- Prevention of endophthalmitis requires sound prophylactic procedures
- Recent studies provide better information on use of antibiotic supplements
- **Remember** that normal patient's **bacterial flora** – the main culprit – is **rapidly changing**
- **MRSA** is emerging as a frequent pathogen
- Aminoglycosides (i.e., netilmicin) are safer than any fluoroquinolone with MRSA



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