RECOGNITION, TREATMENT AND PREVENTION OF ENDOPHTHALMITIS

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Use of Guidelines:

The guidelines included in this document are based on the authors experience and opinions as well as on a review of published endophthalmitis studies. High level, evidence-based recommendations from randomized clinical trials are not available for many clinical issues. However, clinical case-series and case reports are usually available for even rare causes of infection. This document provides guidance for an overall approach to managing endophthalmitis but does not always apply to the care of an individual patient. Depending on a spectrum of clinical features, sensitive and resistant organisms, and systemic risk factors, it is anticipated that it will be necessary to approach some patients' needs in different ways. The ultimate judgement regarding treatment of the individual patient must be made by the physician in light of all of the clinical circumstances as well as on the resources available to the physician. The guidelines in this document should not be deemed to be inclusive of all proper methods of care exclusive of other methods which may achieve similar outcomes. The current document is not a medical-legal resource but is rather intended an overview of endophthalmitis.

A. **Classification (most frequent organisms in various clinical settings):**

1. Postoperative:
   a. Acute-onset postoperative endophthalmitis: Coagulase (-) *Staphylococci, Staphylococcus aureus, Streptococcus,* Gram-negative bacteria
   b. Delayed-onset (chronic) pseudophakic endophthalmitis (> 6 weeks postop): *P.acnes*, Coagulase (-) *Staphylococci*, Fungi
   c. Conjunctival filtering bleb-associated endophthalmitis: *Streptococcus* species, *Hemophilus influenza*, *Staphylococcus* species

2. Post-traumatic: *Bacillus* species (30-40%), *Staphylococcus* species

3. Endogenous: *Candida* species, *S. aureus*, Gram-negative bacteria,

4. Keratitis-associated: *Pseudomonas, Staphylococcus* species

5. Intravitreal injection-associated: *Staphylococcus*/*Streptococcus* species

B Acute-onset postoperative endophthalmitis at BPEI :

	1984-1994		1995-2001		2002-2009		2010-2016	
Procedure	#/Total	Incidence	#/Total	Incidence	#/Total	Incidence	#/Total	Incidence
CE + IOL	34/41,654	0.08%	08/21,972	0.04%	08/28,568	0.03%	16/33140	0.05%
PPV	03/6,557	0.05%	02/7,429	0.03%	02/18,492	0.01%	2/17569	0.01%
Cornea	05/2,805	0.18%	02/2,362	0.08%	03/2,788	0.11%	8/5935	0.13%
Secondary IOL	05/1,367	0.37%	01/485	0.21%	01/1,783	0.06%	NA*	NA*
Glaucoma	04/3,233	0.12%	04/1,970	0.20%	00/5,041	0.00%	3/4529	0.06%
Totals	51/55,616	0.09%	17/34,218	0.05%	14/56,672	0.03%	29/61173	0.05%

*NA – Not available

Acute-onset endophthalmitis after cataract surgery (2010-2016) at BPEI by year:

Year	#/Total	Incidence rate
2010	00/4644	0.00
2011	01/4896	0.02
2012	03/4861	0.06
2013	04/4729	0.08
2014	02/4340	0.05
2015	02/4538	0.04
2016	04/5130	0.08
Total	16/33148	0.05*

*Without the use of intracameral antibiotics

2. Post-traumatic endophthalmitis (incidence)
   a. After open globe injury (larger studies)
      - Barr (1982) (3.2%) 04/122
      - Brinton (1984) (7.4%) 19/257
      - Thompson (1995) (5.0%) 13/258

   b. With retained intraocular foreign body (IOFB)
      - Williams (1988) (13%) 14/105
      - National Eye Trauma System (1993) (6.9%) 34/492
        I. Metallic IOFB (7.2%)
        II. Non-metallic IOFB (7.3%)
        III. Organic IOFB (6.3%)

3. Endogenous endophthalmitis- associated risk factors:
   a. Elderly or debilitated patients
   b. IV drug abuse
   c. Indwelling catheters
   d. History of abdominal surgery

4. Keratitis associated- increased in advanced corneal ulcers and keratoprosthesis

5. Intravitreal injection- rare (< 1/5000)

Clinically Suspected Endophthalmitis Rates for Each Anti-VEGF Medication Administered at BPEI from 2006-2016[1]

Year	Bevacizumab	Ranibizumab	Aflibercept	Pegaptanib	Total
2006	0/3139	1/2523	0	0/672	1/6443 (0.016%)
2007	1/6198	2/4317	0	0/8	3/10523 (0.029%)
2008	3/9345	1/3399	0	0	4/12744 (0.031%)
2009	3/10680	1/3630	0	0	4/14310 (0.028%)
2010	0/9340	0/4738	0	0	0/14078 (0%)
2011	2/9641	0/5434	0/192	0/12	2/15279 (0.013%)
2012	0/6885	0/3444	2/4368	0	2/14697 (0.014%)
2013	0/5036	1/2882	4/6648	0	5/14566 (0.034%)
2014	0/5781	0/2767	0/7895	0	0/16443 (0%)
2015	1/5846	0/2180	0/10682	0	1/18708 (0.005%)
2016	0/7214	0/1477	1/12693	0	1/21384 (0.005%)
Total Culture Positive	6/79105 (0.008%)	4/36791 (0.011%)	1/42478 (0.002%)	0/692 (0%)	11/159066 (0.007%)
Total Culture Negative	4/79105 (0.005%)	2/36791 (0.005%)	6/42478 (0.014%)	0/692 (0%)	12/159066 (0.008%)
Total Culture Positive and Negative	10/79105 (0.013%)	6/36791 (0.016%)	7/42478 (0.016%)	0/692 (0%)	23/159066 (0.014%)

[1]Data provided by Infection Control Committee of University of Miami, Miller School of Medicine Bascom Palmer Eye Institute

C. Diagnostic Features

1. Postoperative endophthalmitis
   a. Acute-onset endophthalmitis- signs and symptoms:
      - Marked intraocular inflammation (100%)
      - Hypopyon (86%)
      - Reduced vision (100%)
      - Pain (75%)
   b. Delayed-onset endophthalmitis- signs:
      - *P.acnes*- white intracapsular plaque, granulomatous uveitis, fibrin strands in anterior chamber, vitritis
      - Coagulase negative *Staphylococcus* – Vitritis, Hypopyon
      - Fungi – Vitreous infiltrates, "string of pearls" lesions
   c. Bleb-associated endophthalmitis- purulent bleb, hypopyon, marked intraocular inflammation.
2. Trauma - hypopyon, periphlebitis, vitreous infiltrates around IOFB
3. Endogenous- chorioretinal infiltrate, vitritis, history of systemic disease
4. Keratitis- marked intraocular inflammation/hypopyon
5. Intravitreal injections- fibrin/marked intraocular inflammation

D. Possible risk factors for endophthalmitis

a. Immunocompromise (Diabetes mellitus, systemic disease)
b. Operative preparation (Xylocaine jelly before Povidone-iodine prep)
c. Intraoperative complications (vitreous loss)
d. Perioperative factors (surface bacteria)
e. Wound construction (wound leak; inferior wound placement)
f. Chronic blepharitis

G. Treatment Options (usually outpatient)

1. Needle tap (usually performed in minor OR)
   a. Peribulbar anesthesia
   b. Povidone-iodine prep
   c. 23-gauge needle (one inch)- may use butterfly needle
   d. Inject IOABs in separate syringes

2. Pars plana vitrectomy (PPV)- Transconjunctival PPV 23 or 25 gauge
   a. Peribulbar anesthesia
   b. Povidone-iodine prep
   c. 2 instrument approach (when view limited) vs. standard 3 port PPV
   d. Inject IOABs in separate syringes

H. Clinical Management of Suspected Acute-Onset Bacterial Endophthalmitis

1. Initial approach (usually outpatient treatment)
   a. Obtain intraocular specimen by needle tap or by vitrectomy (use peribulbular anesthesia)
   b. Administer intravitreal antibiotics (0.1 ml of each)
   c. Administer intravitreal steroids (0.1 ml – optional)
   d. Consider periocular antibiotics and steroids
   e. Postoperative topical antibiotics, steroids, and cycloplegics (started on the first morning after initial treatment)
   f. Postoperative systemic antibiotics (generally not used; can be considered for the more severe cases: rapid onset, LP vision, large hypopyon, no red reflex)

2. Follow-up approach
   a. If clinically worsening status at 48-72 hours, consider repeating intraocular cultures and/or re-injection of intraocular antibiotics (and intraocular steroids).
   b. Consider vitrectomy if not performed initially. Change topical antibiotics if indicated by results of cultures and/or clinical course

I. Recommended Initial Antibiotic and Drug Therapy

1. Acute-onset Postoperative Bacterial Endophthalmitis:
   a. Intravitreal:
      - Vancomycin 1 mg/0.1 ml
      - Ceftazidime 2.25 mg/0.1 ml or amikacin 0.4 mg/0.1 ml
      - Dexamethasone 0.4 mg/0.1 ml (optional)

   b. Periocular (subconjunctival): Optional
      - Vancomycin 25 mg
      - Ceftazidime 100 mg
      - Dexamethasone 12 to 24 mg

   c. Topical (started on first postoperative day): Optional
      - Vancomycin 25 mg/ml q 1 hour (during day)
      - Ceftazidime 50 mg/ml q 1 hour (during day)
      - Topical steroids and cycloplegics (q.i.d)

   d. Systemic: usually - none
      (when used, it is generally reserved for eyes with more severe inflammation, LP vision, rapid-onset, glaucoma drainage device, panophthalmitis)
      - Vancomycin 1 gm IV q 12 hours and ceftazidime 1 gm IV q 12 hours
        Or
      - Oral fluoroquinolone for susceptible organisms (levofloxacin 500-750 mg once daily)

2. Delayed-Onset (Chronic) Postoperative Endophthalmitis
   a. Intravitreal: (bacterial cases)
      - Vancomycin 1.0 mg/0. 1 ml
      - Ceftazidime 2.25 mg/0.1 ml or amikacin 0.4 mg/0.1 ml
      - Dexamethasone 0.4 mg/0. 1 ml (optional) – Not used in the initial treatment until the organism is identified.

   b. Intravitreal: (fungal cases)
      - Voriconazole 0.1mg/0.2 ml or
      - Amphotericin 0.005 mg/0.1 ml

   c. Periocular (subconjunctival): Optional
      - Vancomycin 25 mg
      - Ceftazidime 100 mg
      - Dexamethasone 12 to 24 mg

   d. Topical (started on first postoperative day): Optional
      - Vancomycin 25 mg/ml q 1 hour (during day)
      - Ceftazidime 50 mg/ml q 1 hour (during day)
      - Topical steroids and cycloplegics (q.i.d)

   e. Systemic: usually none
      (but consider in more severe cases) (bacterial vs. fungal etiology)

3. Conjunctival Filtering Bleb-Associated or Glaucoma Drainage Implant Endophthalmitis:

   a. Intravitreal:
      - Vancomycin 1 mg/0.1 ml
      - Ceftazidime 2.25 mg/0.1 ml or amikacin 0.4 mg/0.1 ml
      - Dexamethasone 0.4 mg/0.1 ml (optional)

   b. Periocular (subconjunctival): Preferred in bleb cases
      - Vancomycin 25 mg
      - Ceftazidime 100 mg
      - Dexamethasone 12 to 24 mg

   c. Topical (started on first postoperative day):
      - Vancomycin 25 mg/ml q 1 hour (during day)
      - Ceftazidime 50 mg/ml q 1 hour (during day)
      - Topical steroids and cycloplegics (q.i.d)

   d. Systemic: usually none but consider oral fluoroquinolone in eyes with marked inflammation, LP vision, rapid onset.

4. Post-Traumatic Endophthalmitis

a. Intravitreal:
- Vancomycin 1 mg/0.1 ml
- Ceftazidime 2.25 mg/0.1 ml or amikacin 0.4 mg/0.1 ml)
- Dexamethasone 0.4 mg/0.1 ml (depending on clinical history, this option may be used)

b. Periocular (subconjunctival): Preferred
- Vancomycin 25 mg
- Ceftazidime 100 mg
- Dexamethasone 12 to 24 mg

c. Topical (started on first postoperative day):
- Vancomycin 25 mg/ml q 1 hour (during day)
- Ceftazidime 50 mg/ml q 1 hour (during day)
- Topical steroids and cycloplegics (q.i.d)

d. Systemic (generally reserved for more severe cases):
- Vancomycin 1 gm IV q 12 hours and ceftazidime 1 gm IV q 12 hours
  Or
- Oral fluoroquinolone for susceptible organisms (levofloxacin 500-750 mg once daily)

5. Endogenous Fungal Endophthalmitis

a. Intravitreal:
- Voriconazole 0.1 mg/0.2 ml or amphotericin-B 0.005 mg/0.1 ml
- Usually do not use dexamethasone 0.4 mg/0.1 ml

b. Periocular (subconjunctival): Optional
- Vancomycin 25 mg and
- Dexamethasone 12 mg to 24 mg (must have anti-fungal coverage)

c. Topical (started on first postoperative day):
- Topical steroids and cycloplegics (q.i.d)
- Topical amphotericin-B has poor intraocular penetration and is not used

d. Systemic antibiotics (selected in consultation with internist):
- Voriconazole 200 mg p.o. b.i.d. for 2-4 weeks or
- Fluconazole 200 mg p.o. b.i.d. for 2-4 weeks or
- Itraconazole 200 mg p.o. b.i.d. for 2-4 weeks or
- Ketoconazole 200 mg p.o. b.i.d. for 2-4 weeks or
- Amphotericin B 0.25 to 1.0 mg/kg of body weight/IV over 6 hours as tolerated (only if disseminated disease present)

6. Endogenous Bacterial Endophthalmitis

a. Intravitreal:
- Vancomycin 1.0 mg/0.1 ml
- Ceftazidime 2.25 mg/0.1 ml or amikacin 0.4 mg/0.1 ml
- Dexamethasone 0.4 mg/0.1 ml (optional)

b. Periocular (subconjunctival): Optional
- Vancomycin 25 mg
- Ceftazidime 100 mg
- Dexamethasone 12 to 24 mg

c. Topical (started on first postoperative day):
- Vancomycin 25 mg/ml q 1 hour (during day)
- Ceftazidime 50 mg/ml q 1 hour (during day)
- Topical steroids and/or cycloplegics (q.i.d)

d. Systemic antibiotics (selected in consultation with internist):
- Vancomycin 1 gm IV q 12 hours or ceftazidime 1 gm IV q 12 hours
  Or
- Oral fluoroquinolones for susceptible organisms (levofloxacin 500-750 mg once daily)

J. Preparation of Intravitreal Antibiotics/Antifungals

NOTE: Intraocular antibiotics are prepared in a volume of 10 ml or greater volume and labeled in a sealed sterile vial. The physician will withdraw the appropriate dose in a tuberculin syringe for injection into the eye.

Vancomycin (VANCOCIN®) 1 mg/0.1 ml

1. Begin with 500 mg vial of vancomycin (this is a powder)
2. Add 10 ml of 0.9% Sodium Chloride for Injection, USP (no preservatives) (or BSS) to 500 mg vial in #l
3. Inject 2 ml of solution #2 into a sterile empty vial
4. Add 8 ml of 0.9% Sodium Chloride for Injection, USP (no preservative)(or BSS) to produce a solution containing 1 mg/0.1 ml vancomycin
5. Seal the vial containing solution #4.

Ceftazidime (FORTAZ®) 2.25 mg/0.1 ml

1. Begin with 500 mg vial of ceftazidime (this is a powder)
2. Add 10 ml of 0.9% Sodium Chloride for Injection, USP (no preservatives) (or BSS) to 500 mg vial in #1
3. Inject 1 ml of the solution #2 into an empty sterile vial.
4. Add 1.2 ml of Sodium Chloride for Injection, USP (no preservatives) into the vial #2 to produce a solution containing 2.25 mg/0.1 ml ceftazidime.
5. Seal the vial containing solution #4.

Amikacin (AMIKIN®) 0.4 mg/0.1 ml

1. Begin with 500 mg/2 ml vial of amikacin
2. Inject 0.16 ml of solution #1 (40 mg) into sterile empty vial
3. Add 9.84 ml of 0.9% Sodium Chloride Injection, USP (no preservatives to produce a solution of 0.4 mg/0.1 ml amikacin
4. Seal the vial containing #3

Amphotericin B (FUNGIZONE®) 0.005 mg/0.1 ml

1. Begin with a vial containing 50 mg of amphotericin B
2. Add 10 ml of Sterile Water for Injection USP (no preservatives) to vial in # 1
3. Inject 0.1 ml of solution #2 into a sterile empty vial
4. Add 9.9 ml of Sterile Water for Injection, USP (no preservatives) to vial in #3 to produce a solution containing 0.005 mg/0.1 ml amphotericin B
5. Seal the vial containing solution #4

Voriconazole (Vfend® I.V. powder) 0.05 mg/0.1 ml

1. Reconstitute a 200 mg vial of voriconazole (Vfend® I.V.) powder with 19 mL of preservative-free sterile water for injection.
2. Withdraw 1 mL of voriconazole solution from step 1 and q.s. to make 20 mL with preservative-free sterile water for injection.
3. Transfer the solution from step 2 in 10 mL aliquots to each of 2 sterile empty vials. Seal the vial.

K. **Preparation of Subconjunctival Antibiotics**
(Dilutions should be made with non-bacteriostatic sterile water)

Antibiotic	Amt. in Package	Vol. Added	Vol. for Inj.	Dose
Amikacin	100 mg/2 mL	0	0.5 mL	25 mg
Ampicillin	1 gm	5 mL	0.5 mL	100 mg
Clindamycin	600 mg/4 mL	0	0.33 mL	50 mg
Cephalothin	1 gm	5 mL	0.5 mL	100 mg
Cefazolin	500 mg	2.5 mL	0.5 mL	100 mg
Ceftazidime	500 mg	2.5 mL	0.5 mL	100 mg
Chloramphenicol	1 gm	5 mL	0.5 mL	100 mg
Gentamicin	80 mg/2 mL	0	0.5 mL	20 mg
Methicillin	1 gm	5 mL	0.5 mL	100 mg
Tobramycin	80 mg/2 mL	0	0.5 mL	20 mg
Vancomycin	500 mg	5 mL	0.25 mL	25 mg

L. **Preparation of Fortified Topical Antibiotics:**

1. Vancomycin (VANCOCIN®) 25 mg/ml
   a. Add 20 ml of 0.9% Sodium Chloride Injection, USP (no preservatives) or Tears Naturale artificial tears to a 500 mg vial of vancomycin to produce a Solution of 25 mg/ml vancomycin
   b. Refrigerate and shake well before instillation

2. Ceftazidime (FORTAZ®) 50 mg/mL
   a. Add 9.2 mL of Tears Naturale to a vial of ceftazidime 1gm (powder for injection)
   b. Dissolve. Take 5 mL of this solution and add it to 5 mL of Tears Naturale to produce a solution of 50 mg/mL ceftazidime
   c. Refrigerate and shake well before instillation

3. Amikacin (AMIKIN®) 20 mg/mL
   a. Add 1 mL of amikacin (500 mg/2 ml) to 11.5 ml of sterile preservative free water to produce a solution of 20 mg/ml amikacin
   b. Refrigerate and shake well before instillation

M. Endophthalmitis Vitrectomy Study (EVS)

1. Purpose:

   a. To determine the role of immediate 3 port pars plana vitrectomy versus immediate tap/biopsy
   b. To determine the role of IV antibiotics versus no IV antibiotics

2. EVS Entry Criteria:

   a. Clinical diagnosis within 6 weeks of CE or secondary IOL
   b. Hypopyon or clouding of AC or vitreous media sufficient to obscure clear visualization of second-order retinal arterioles
   c. The cornea and AC were clear enough to visualize some part of iris.
   d. The cornea was clear enough to allow the possibility of PPV.
   e. Visual acuity: worse than 20/50 but at least light perception.

3. EVS Results:

   a. No difference in final VA or media clarity whether or not systemic antibiotics were employed.
   b. No difference in outcomes between immediate 3 port PPV vs. tap/biopsy for patients with hand motion or better vision.
   c. For patients with initial visual acuity of LP only, much better visual results occurred in the immediate 3 port PPV group (versus tap/biopsy group)
      - 3 times more likely to achieve $\geq$ 20/40 (33% vs. 11%)
      - 2 times more likely to achieve $\geq$ 20/100 (56%vs.30%)
      - Less likely to incur <5/200 (20% vs. 47%)

4. EVS Microbiologic Isolates

"Confirmed growth"	- 69.3%	(291/420)
Coagulase negative micrococci	- 70.0%	
Staphylococcus aureus	- 9.9%	
Streptococcus species	- 9.0%	
Enterococcus species	- 2.2%	
Gram negative organisms	- 5.9%	
Miscellaneous gram positive	- 3.1%	

5. EVS Microbiologic Isolates/Antibiotic Sensitivities

a. Gram positive organisms - 94.2% (274/291)
(all sensitive to vancomycin)
b. Gram negative organisms - 6.5% (19/291)
(17/19 were sensitive to both amikacin and ceftazidime and 2/19 were resistant to both)

6. Rates of (+) culture from a single source

a.	Aqueous alone	4%
b.	Undiluted vitreous	21%
c.	Vitrectomy cassette	8.9%

7. EVS Visual Acuity (≥ 20/40) Outcomes versus Microbiology Results

Visual Acuity	(N = 123) No or Equivocal	(N = 187) Coag (-) micrococci growth	(N = 56) Other gram (+)	(N = 16) Gram (-)	(N = 12) Mixed growth
≥ 20/40	55%	62%	29%	44%	25%
≥ 20/100	80%	84%	43%	56%	42%
≥ 5/200	92%	96%	63%	69%	92%

8. EVS Media Clarity Outcomes (20/40 or better view to retina) at final follow-up (9- or 12- months) by Microbiologic Results vs Initial Treatment

Microbiology Results	**Vitrectomy**			**TAP/Biopsy**		
	N	(n)	%	N	(n)	%
Total	200	179	90	191	159	83
No. growth/equiv.	56	51	91	65	58	89
Coag. (-) micrococci	94	94	100	90	81	90
Other gram-positive	35	22	63	23	10	44
Gram-negative	8	5	63	8	6	75
Polymicrobial	7	7	100	5	4	80

N = total number of patients n = number achieving ≥ 20/40 view to retina

9. EVS Outcomes: Causes of VA < 20/40 at Final Follow-up

N = 185	n	%
Pigmentary degeneration of the macula	33	18
Macular edema	32	17
No apparent cause	26	14
Macular distortion or preretinal membrane	15	08
Presumed optic nerve damage	13	07
Corneal opacity or irregularity	11	06
Phthisis bulbi or atrophia bulbi	13	07
Posterior capsular opacity	07	04
Retinal detachment	08	04
Macular ischemia	06	03
Vitreous opacification	03	02
Other miscellaneous	18	10

N = total number of patients n = number achieving ≥ 20/40 view to retina

10. Additional Procedures (ADPROC) *(10.5% or 44/420 EVS Patients)*
Early ADPROC= within 7 days
Late ADPROC= 8 days to 1 year

a. Early ADPROC in each treatment category:
- 8% in 3 port PPV group versus 13% in tap/biopsy group
- 12% in IV antibiotics group versus 9% no IV antibiotics group.
- 86% for worsening ocular inflammation
- 14% for complications of the initial procedure

b. Early ADPROC by organisms isolated

• Gram (+) coag. negative or no growth	5%	
• Gram (-) or other gram (+)	30%	

c.

Early ADPROC Recultures performed:	82%	(36/44)
• Positive growth	39%	(14/36)
• Reculture positive by treatment category		
(i) Initial 3 port PPV group	13%	
(ii) Initial tap/biopsy group	71%	
• Reculture positive by organism isolated		
(i) Gram (+) coag. neg. (e.g. *Staph. epidermidis*)	17%	
(ii) Gram (+) other (e.g. *Streptococci*)	40%	
(iii) Gram (-) organisms (e.g. *Serratia*)	60%	

d. Visual acuity outcomes $\geq$ 20/40
ADPROC= Additional Procedures after Initial Rx

ADPROC	15%
NO ADPROC	57%

11. Factors associated with higher rates of both gram (-) and other gram (+) organisms:
a. Symptom-onset within 2 days of surgery
b. Light perception only visual acuity
c. Afferent pupillary defect
d. Wound abnormalities
e. Corneal infiltrate
f. Hypopyon > 1.5 mm
g. Loss of red reflex
h. Eyelid swelling

12. Other EVS Findings
    a. Diabetes associated with higher yield of coagulase negative *Staphylococci*
    b. If retinal vessel was visible on initial exam (N = 42), isolates were gram (+), coagulase-negative micrococci or no/equivocal growth
    c. 40% (85/211) had prep with povidone-iodine at cataract surgery (when information was recorded)
    d. Ten patients had received antibiotics in the infusion fluid.

13. RD rates: Overall incidence was 8.3%
    a. LP initial vision (15%) vs > LP vision……... (05%)
    b. Initial PPV group (7%) vs. Tap/Biopsy group……(09%)
    c. Attempted RD repair in 23 of 35……... (66%)
    d. VA ≥ 20/40 - No RD (55%) vs. with RD…… (26%)

14. Diabetes (58/420 had DM)
    a. VA ≥ 20/40 outcomes in overall EVS patients:
        • Non-diabetic…….(55%)
        • Diabetic……(39%)
    b. VA ≥ 20/40 outcomes in Diabetic patients with better than LP
        • Initial PPV……...(57%)
        • Initial TAP/Biopsy...(40%)

N. **Endophthalmitis Prevention:**

1. Selective prophylactic systemic therapy for open globe injuries
    a. Vancomycin 1 gm IV q 12 hours and ceftazidime 1 gm IV q 12 hours
    Or
    b. Levofloxacin 500-750 mg orally once daily

2. Identify high risk patients before elective surgery
    a. Chronic Blepharitis
    b. Lacrimal drainage abnormalities
    c. Prosthesis in fellow eye
    d. Active infection elsewhere

3. Preparation of operative field
    a. Pre-prep in holding room (5% povidone-iodine solution)
    b. Second 10% povidone-iodine prep immediately before surgery
    c. Drape to cover lashes and lid margins

4. Use of Prophylactic Antibiotics (controversial)
    a. Preoperative topical antibiotics – No definitive studies
    b. Subconjunctival antibiotics at the end of surgery
    c. Intracameral antibiotics (ESCRS Cefuroxime Study-2007)
        • Emergence of resistant organisms
        • Enormous cost for all cataract procedures
        • Risk of toxicity or contamination
5. Discard old topical medications (esp. glaucoma drops used prior to surgery)

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