

ENDOPHTHALMITIS

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Endophthalmitis Overview

- **Endophthalmitis Definition:** Intraocular inflammation involving ocular cavities (vitreous cavity and/or anterior chamber) & their adjacent structures
- Can be classified according to:
 - **Infectivity** (infectious or sterile)
 - **Mode of entry** (exogenous or endogenous)
 - **Mechanism of contamination:**
 - Exogenous - intraocular surgery
 - nonsurgical trauma
 - blebitis
 - Endogenous – hematogenous spread

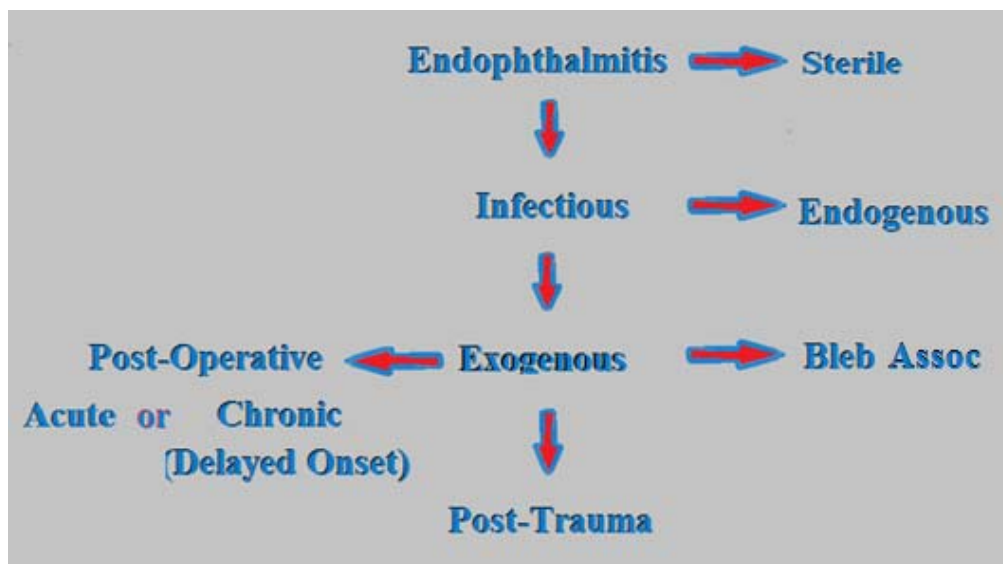
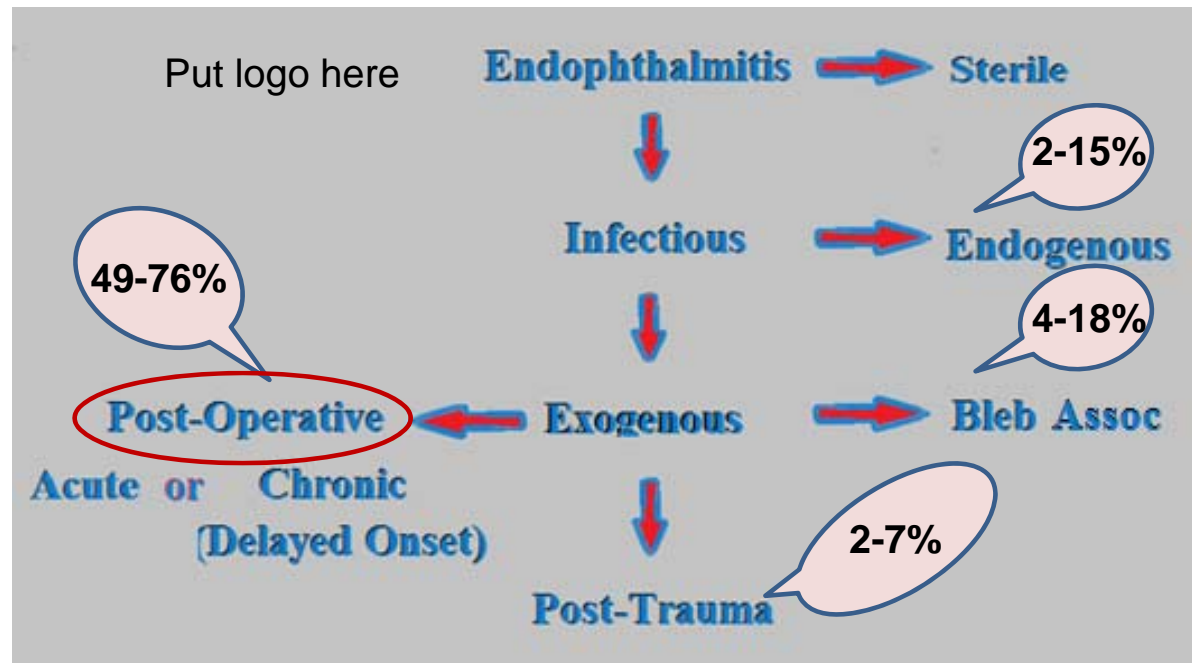


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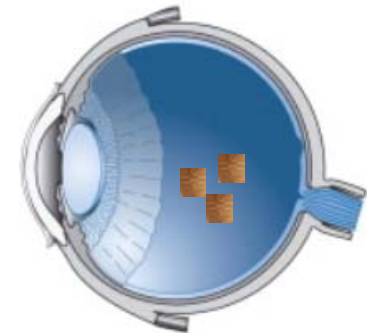


Etiologic Agents

| Gram positive bacteria 75%-85% | Gram negative bacteria 10%-15% | Fungi 3% |
|------------------------------------|-----------------------------------|---------------------|
| Staphylococcus epidemidis (43%) | Pseudomonas (8%) | Aspergillus |
| Streptococcus spp (20%) | Proteus (5%) | Fusarium |
| Staphylococcus aureus (15%) | Haemophilus influenzae (1%) | Cephalosporium spp. |
| Propionibacterium acnes | Klebsiella(0-1%) | |
| Bacillus cereus (1%) | Coliform spp (0-1%) | |

Exogenous Endophthalmitis

- 3 Main Types:
 - **Post operative (POE)**
 - Post traumatic
 - Bleb-Associated
- Micro-organisms (mainly bacterial) introduced directly from the outside environment into the ocular interior.
- **Vitreous and aqueous – primary site of involvement**
 - Ease of initial colonization
- Retina and uvea – secondary site of involvement



Post Operative Endophthalmitis (POE)

- MC among all types: 49-76%
- Incidence of POE with intraocular surgeries:

| Surgery | Bascom Palmer Eye Institute (1984-1994) | Katten et al (1984-1989) |
|-----------------------------|--|---------------------------------|
| ECCE with and without PCIOL | 0.08% | 0.072% |
| Secondary PCIOL | 0.37% | 0.3% |
| PPV | 0.05% | 0.05% |
| PK | 0.18% | 0.11% |
| Glaucoma filtration surgery | 0.12% | 0.06% |

Risk Factors (POE)

- Pre-operative
 - Active ocular surface infections / colonization (blepharitis, acute conjunctivitis)
 - Lacrimal drainage system infection or obstruction
 - Contaminated eye drops
- Operative
 - Wound abnormalities
 - PC rent, vitreous loss
 - Prolonged / combined surgery
 - Contaminated irrigating solutions

Presentations of POE

- Acute Post-Operative

- Mild

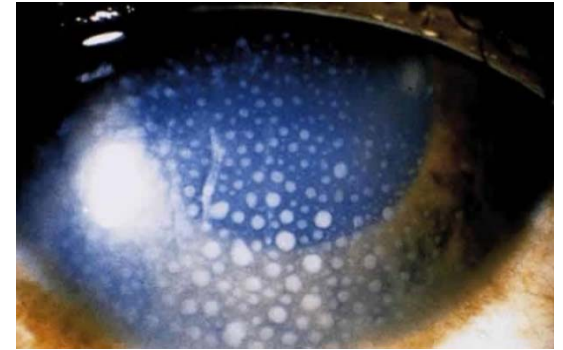
- (Photophobia, floaters) (Mild vitritis, fundus visible, slow progression)
 - Usually Staph epidermidis, presents anytime in first 6 weeks

- Severe

- (Pain, decreased vision) (Marked vitritis, fundus obscured, fast)
 - Usually Staph aureus, Strep spp, Gram neg, presents 1-4 days after surgery

- Chronic Post-Operative

- (Photophobia, hazy vision, persistent/recurrent uveitis)
 - (Mild/moderate vitritis, capsular plaque, can be granulomatous KP)
 - (6 weeks to 2 years after surgery)
 - P. acnes, S. epi, Fungus



Mechanism of Tissue Damage

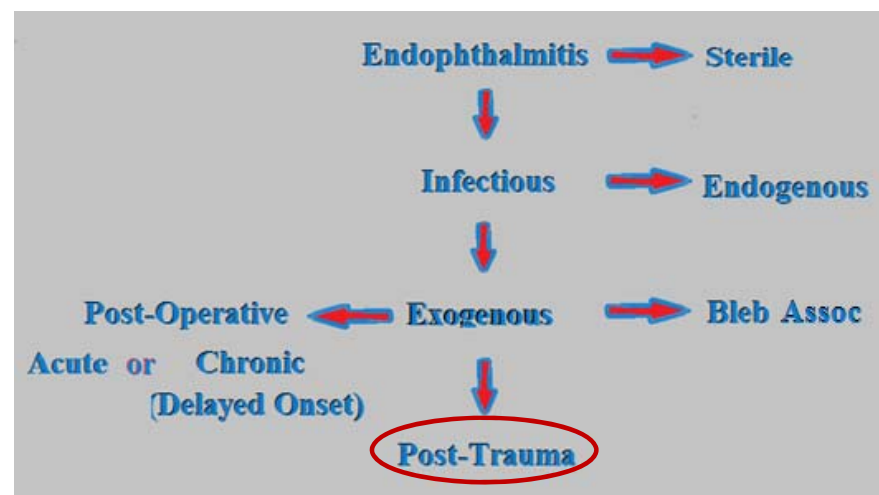


Tissue destruction at all levels

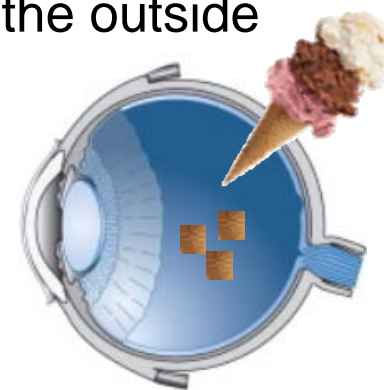
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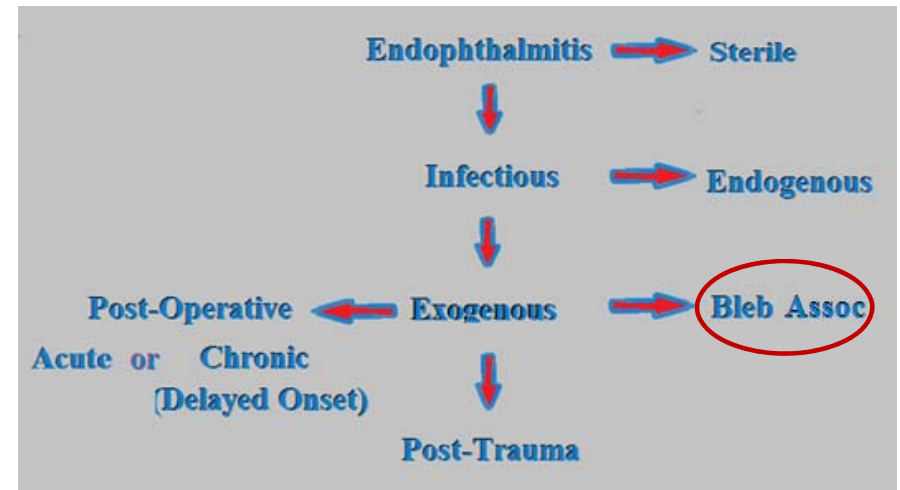
Post Traumatic (2-7%) Endophthalmitis

- More common in rural settings:
 - Due to retained intraocular foreign body (access to care)
- Removal of IOFB within 24 hours reduces risk
- **Causative Organisms:**
 - Fulminant (1-3 days) – *B. cereus* (MC), *Strep. Spp*
 - Acute (3-7 days) – *S. epidermidis* (MC), Gram negatives
 - Chronic (> 6 weeks) – fungi, *fusarium*

Exogenous Endophthalmitis

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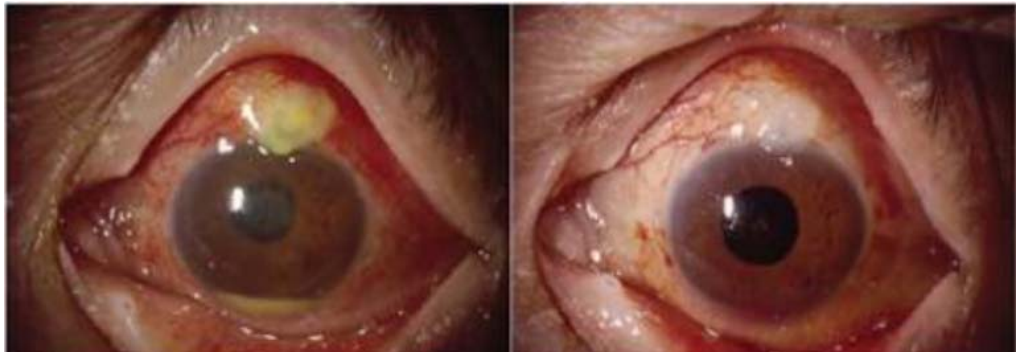


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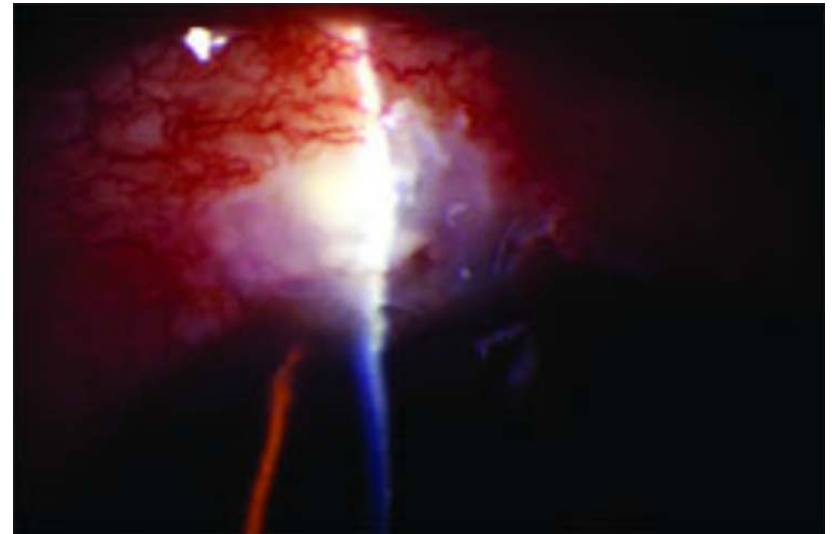
Bleb Associated Endophthalmitis (4-18% of all cases)

- May occur at any time (months-years) after glaucoma filtration surgery
- Most of the time through **intact** bleb via conjunctival flora
- Poor prognosis as organisms are more virulent
 - Streptococci (MC) faecalis, viridans, pneumoniae
 - H influenza
 - Staph are rare
- Clinical signs
 - Infected white bleb (milky with pus)
 - Severe anterior uveitis (often with hypopyon)
 - Vitritis (poor red reflex)



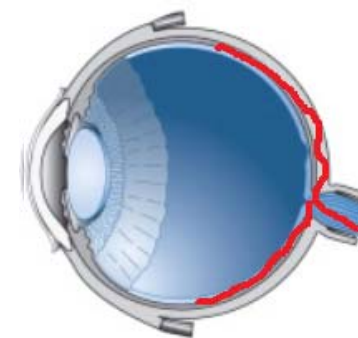
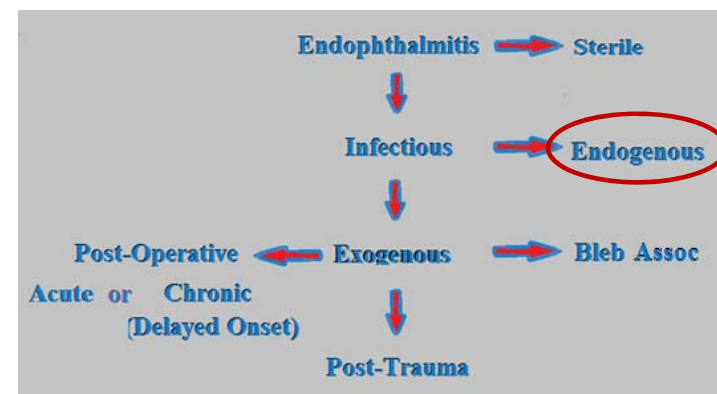
Bleb Associated Endophthalmitis

- Risk factors:
 - Local antimetabolite therapy → creates a thin walled drainage bleb
 - Inferior (or nasal) blebs,
 - Conjunctivitis, periorcular infections (blepharitis)
 - Contact lens
 - Bleb leaks
- Differentiate from **Blebitis**
(infection limited primarily to bleb)
 - Still can have white bleb
 - No / very little anterior uveitis
 - Low virulence organism
 - Normal red reflex (No vitritis)
 - Treatment
 - Topical fluoroquinolone & Vancomycin
 - Oral Augmentin (500/125mg TID) or oral Cipro (750mg BID) x 5 days



Endogenous (Metastatic) Endophthalmitis (2-15%)

- Hematogenous spread of organisms from distant source
 - **No structural defect in globe**
- **Retina and choroid primarily involved**
(due to high vascularity)
- Fungi > Bacteria
 - Candida (MC) > Aspergillus
- Predisposing factors
 - Immunosuppression (Diabetes, AIDS, Malignancies, meds)
 - Recent major abdominal surgery
 - Prolong indwelling catheter (intravenous, TPN)
 - IV drug abuser
 - Distant infection (Endocarditis, meningitis, septicemia, etc)



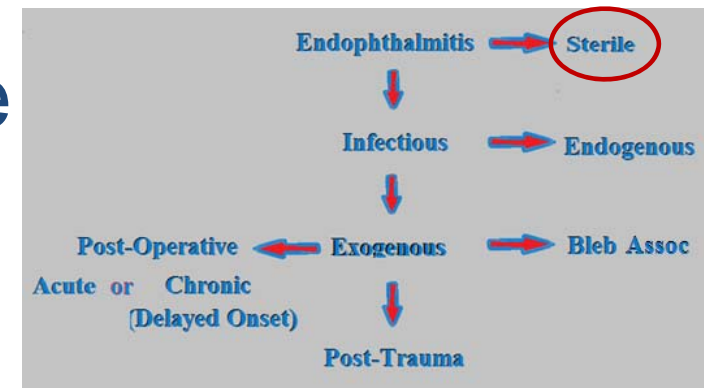
Fungal Endophthalmitis

- **Causative Agents** – candida albicans, aspergillus, fusarium etc
- **Creates:**
 - Delayed post operative endophthalmitis (classically)
 - Endogenous endophthalmitis (immunocompromised patients)
- Minimal pain, mild external ocular involvement
- Progressive iridocyclitis, vitritis (string of pearls)
- Yellow white choroidal lesion (single or multiple)



Toxic Anterior Segment Syndrome

- Acute, post-operative anterior segment inflammation following any anterior segment surgery which is **Sterile / noninfectious**
- Caused by a substance that enters the anterior segment either during or immediately after surgery, resulting in toxic damage to intraocular tissues
- **Symptoms:** blurred vision (MC), pain usually minimal / absent, redness
- **Signs:** “Limbus to limbus” diffuse corneal edema, marked A/S inflammation (hypopyon, fibrin)



Toxic Anterior Segment Syndrome

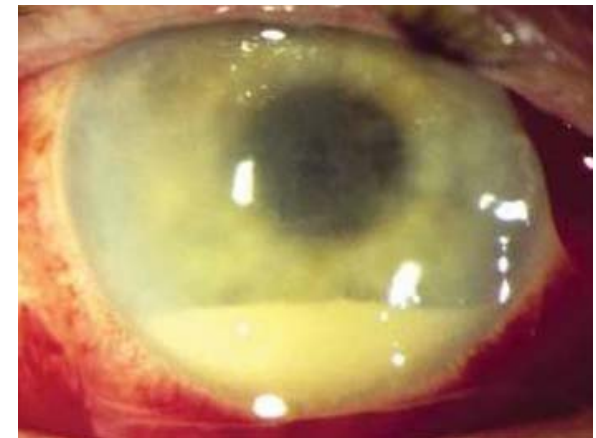
- May damage iris (thinning of stroma) → permanently dilated /irregular pupil
- May have associated trabecular meshwork damage → secondary glaucoma
- **How to differentiate from infectious endophthalmitis:**
 - Signs appearing within the first 12-48 hours
 - Symptoms: no pain
 - Signs: diffuse corneal edema
 - Good response to steroids

Endophthalmitis Clinical Approach

- **Pain, Photophobia, Floaters**
- **Fever**
- **Decreased visual acuity** (Initial VA has Prognostic significance)
- **Ocular motility** (sign of orbital inflammation)
- **Eyelid** - Edema/Erythema, blepharospasm

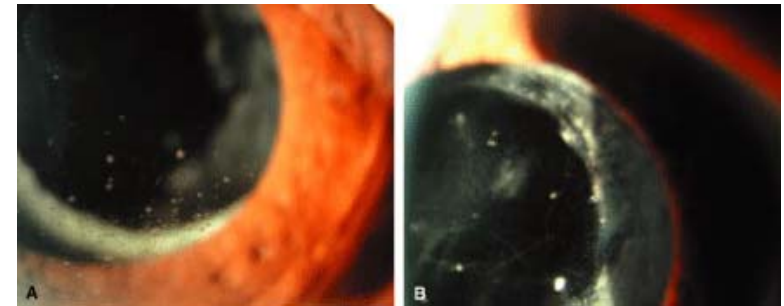
Endophthalmitis Clinical Approach

- **Conjunctiva** - Hyperemia, chemosis, bleb examination if present
- **Cornea** - Edematous, opacification DM folds
 - Keratic precipitate(low grade in delayed onset), infiltrates, occult penetration
- **Anterior Chamber** - Cells, flare, fibrinous exudates and hypopyon
- **Iris** – Muddy, Boggy, resistant to dilation, post synechiae
- **Pupil** – absent or sluggish reaction to light



Endophthalmitis Clinical Approach

- **Lens** – membrane, exudates around IOL / capsular plaque (delayed)
- **Vitreous** – vitritis, exudates, yellowish appearance
- **Fundus examination**
 - Absent red reflex and no fundal view (due to vitritis)
 - Papilitis
 - White lesion in retina / choroid
 - Scattered Retinal hemorrhage and periphlebitis
- **IOP** – usually low, may be high in early cases
- **Evidence** of penetrating injury and intraocular foreign body
- **Wound dehiscence**



Endophthalmitis Diagnosis

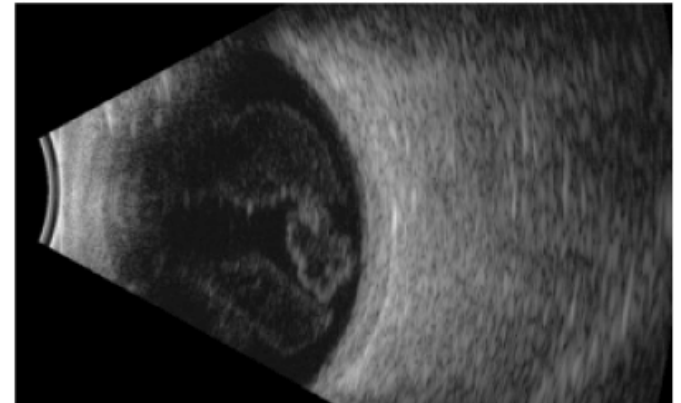
- **Clinically** (early recognition and suspicion is critical)
- **Tap for Culture and Sensitivities**
 - AC TAP (0.1mL) or Vitreous Tap (0.2mL)

| | |
|---|--|
| Gram's stain Giemsa stain Culture | Standard Media |
| | Blood agar (most aerobic bacteria) |
| | Chocolate (aerobic , Neisseria , Haemophilus) |
| | Thioglycolate broth (aerobic ,anaerobic bacteria) |
| PCR | SDA (fungi) |
| | Specialized Media |
| | Lowenstein –Jensen (mycobacterium , nocardia) |
| | Non- nutrient agar E.coli enriched |

Endophthalmitis Diagnostic Tests

- **Ancillary studies**

- **Ultrasound (B-Scan)** – (if anterior segment media opacity)
 - Vitreous membrane and opacities
 - Anatomical status of retina
 - Extent of inflammation
 - Choroidal detachment
 - IOFB presence and localization
 - Retained lens material (may be sterile / lens inflammation)
- Not of much use:
 - CT Scan – mainly to detect IOFB
 - ERG – poor prognosis if grossly abnormal



Laboratory Tests

- Suspected Endogenous Endophthalmitis:
 - **CBC** (WBC elevation - signs of infection)
 - **ESR** (Malignancy, chronic infections, rheumatic diseases)
 - **Cultures** (For detection of source of infection)
 - Blood culture
 - Urine culture
 - Throat swab
 - CSF
 - Stool
 - Indwelling catheter's tip
 - **CXR**
 - Other necessary investigation according to suspicion like HIV

Endophthalmitis Medical Treatment

- **Intravitreal injection**

- Preferred route in all types of endophthalmitis (direct administration)
- Bypasses blood ocular barrier

- **Antibiotics**

- **Gram + coverage** → Vancomycin (1.0 mg in 0.1 mL)
- **Gram – coverage** → Amikacin (400 ug in 0.1 mL) or Ceftazidime (2.25 mg/0.1 mL)
- Optional: Dexamethasone 400 ug in 0.1mL

- **Antifungals**

- Intravitreal amphotericin B or Voriconazole, oral fluconazole/ketoconazole (vitreal penetration)
- Steroids in any form are contraindicated

Endophthalmitis Surgical Treatment - Vitrectomy

- **Advantages (diagnostic / therapeutic)**

- More material for culture (esp important for fungus)
- Removal of:
 - source of inflammation (organisms, toxins)
 - inflammatory mediators
- Better dispersion of antibiotics in the vitreous
- Clears the media for better posterior segment visualization
- Removes vitreous membrane (may be a source of late traction & subsequent detachment)

- **Guided by Endophthalmitis Vitrectomy Study (EVS)**

Endophthalmitis Vitrectomy Study (EVS)

- Multicenter randomized trial carried out at 24 centers in US (1990 – 1994)
 - Arch Ophthalmol. 1995 Dec; 113(12):1479-96
- **Purpose:** (to determine for bacterial post operative endophthalmitis)
 - Role of immediate vitrectomy
 - Role of IV antibiotics
- **Patients:**
 - N=420 patients having clinical evidence of POE within 6 weeks of cataract surgery

EVS Intervention

- Random assignment to either:
 - **Immediate vitrectomy (VIT) or vitreous biopsy (TAP)**
and
 - **Treatment with IV antibiotics or no IV antibiotics**
- After initial VIT or TAP, **all patients** received:
 - **Intravitreal injection** of amikacin (0.4mg) + vanco(1mg)
 - Dexamethasone (6mg in 0.25 mL) administered subconjunctivally

(For those patients receiving IV treatment)

Ceftazidime (2g every 8 hours) + amikacin (6mg / kg every 12 hours) for 5-10 days

Main outcome measures

- Evaluation at 3, 9, and 12 months of:
 - **Visual Acuity (ETDRS acuity chart)**
 - **Clarity of Ocular Media** (assessed clinically and photographically)
- **Results:**
 - In all Patients:
 - **No difference** (in above) with or without the use of **systemic antibiotics** (Amikacin, Ceftazidime)
 - In patients with initial vision:
 - **LP or worse** - Much better results in **immediate PPV**
 - **HM or better** - **No difference** between **immediate vitrectomy** (with Intravit Abx)
and
vitreous tap (with Intravit Abx)

Results & limitations

- **LP or worse** - Much better results in **immediate PPV**
 - Threefold increase in frequency of achieving 20/40 or better VA
 - Twofold increased chance of achieving 20/100 or better VA
 - 50% reduction in severity of vision loss
- **Conclusion:**
 - 1. **Systemic ABx** were of **no benefit** to anyone in this study (poor penetration?)
 - 2. **Immediate vitrectomy** had:
 - **Substantial benefit in patients with LP or worse.**
 - **No benefit in patients with better than LP.**
- EVS Limitation → Only acute post operative endophthalmitis after CatSx

Prevention

- **Pre-Operative**

- Careful assessment & treatment of external ocular surface for pre-existing conditions
 - e.g. blepharitis, conjunctivitis, dacryocystitis, infected contra-lateral socket
- Povidone iodine (Betadine) drops
- Meticulous draping
- Topical antibiotic prior to surgery
- Systemic antibiotic prophylaxis (high risk cases)
 - severely uncontrolled diabetes, cancer patients, low immune systems

Prevention

- **Intra-operative**

- Sterile draping to exclude eyelids & lashes from operative field
- 5% povidone iodine to prepare ocular surface & lid margin, surrounding skin
- Irrigation of IOLs before insertion & Minimum exposure time of IOL
- Careful wound closure
- Irrigation of A/C or intravitreal injection of antibiotics

- **Post-Operative**

- Anterior sub-tenon antibiotic / sub conj. Antibiotic
- Postoperative instillation of topical povidone iodine drops and/or antibiotic drops
- Closer postoperative follow up for at risk patients (diabetes / immunocompromised, prolonged surgery, vitreous loss)

Thank You!

Sight Gags by Scott Lee, O.D.



Book on Amazon.com

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