Post operative Endophthalmitis
Endophthalmitis

- Endophthalmitis is the clinical term used to describe the inflammatory response of the eye to ocular infection.
Classification

Endophthalmitis can be classified according to the

• Mode of entry

• Type of etiological agent
According to mode of entry

<table>
<thead>
<tr>
<th>Exogenous</th>
<th>Endogenous</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Micro-org directly introduced from environment</td>
<td>• Haematogenous spread of organisms as a metastatic infection</td>
</tr>
<tr>
<td>• Usually occurs following surgery: i.e. post-operative endophthalmitis or trauma i.e. post-traumatic or keratitis</td>
<td>• Structural defect of eye is not necessary</td>
</tr>
<tr>
<td>• Mainly bacterial</td>
<td>• Common predisposing factors are immunocompromised status, septicemia or IV drug abuse</td>
</tr>
<tr>
<td></td>
<td>• Mainly fungal</td>
</tr>
</tbody>
</table>
Infective –

- Bacterial /fungal/ parasitic

Non-infective (Sterile uveitis) –

- Left over lens fragments / glove powder
- Toxic reaction to drugs/irrigating solutions.
- Operative trauma
- Exacerbation of preexisting uveitis
- Phacolytic glaucoma/phacoanaphylaxis
• **Panophthalmitis**

Inflammation of all coats of the eye including intraocular structures
Endophthalmitis

- Post operative
- Bleb associated
Post operative endophthalmitis

Severe inflammation of the eye involving both posterior and anterior segment of the eye secondary to an infectious agent
• May occur after any surgical procedure.

• **All unexpected inflammatory response following I/O surgery be considered endophthalmitis unless proved otherwise**

• Possibility must be considered after any surgical procedure that breaches the integrity of the corneo-scleral wall of the eye, no matter how ‘minor’ the breach may be
Incidence after various ocular surgeries (%)
Incidence of Endophthalmitis

- Worldwide, the reported incidence of Post-op endophthalmitis is 0.04-4%.
  - Post cataract surgery 0.265% (more with clear corneal incision)
  - Post keratoplasty 0.382%
  - Post Vitrectomy 0.05%.
  - Bleb associated 0.2%-9.6%
  - Post traumatic 2.4%-8%, retained IOFB 30%
Cataract surgery: most frequently performed intraocular surgery

Constitutes 90% of postoperative endophthalmitis

Recent estimates: 0.08% to 0.68%
   0.087% in the 1990s and 0.265% after 2000. Rates high due to CCI (three to fourfold risk)

Risk factors:
   • Incision – site, size, suture
   • Application of 2% lidnocaine before povidine–iodine preparation
   • IOL type, prolene haptics – additional risk
   • Hydrophilic materials and acrylic are better compared to silicone and PMMA
### Keratoplasty and Keratoprosthesis

<table>
<thead>
<tr>
<th>Period</th>
<th>cataract</th>
<th>PK</th>
<th>RR for cataract vs PK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1964-2003</td>
<td>0.128</td>
<td>0.382</td>
<td>0.34</td>
</tr>
<tr>
<td>1964-1999</td>
<td>0.109</td>
<td>0.392</td>
<td>0.28</td>
</tr>
<tr>
<td>2000-2003</td>
<td>0.265</td>
<td>0.200</td>
<td>1.33</td>
</tr>
</tbody>
</table>


- 1992 breakpoint year: introduction of CCI
- Widespread use of povidone-iodine
- The evolution of eye-banking techniques
Endophthalmitis secondary to retina surgery

- Incidence: 0.039% - 0.05%
  
  
  *(MF Shuler et. al Wills eye institute Invest Ophthalmol Vis Sci 2002;43.)*

- Streptococcus and staphylococcus: MC cause
- Incidence: low but the visual acuity outcomes generally poor
- 20 v/s 23G: which predisposes more??

  Francesca Menchini et.al: *Meta-analysis* *(Invest Ophthalmol Vis Sci 2011;52)*
  
  - Microincisional straight approach 2.5 times > incidence
  - Beveled approach same as 20G

  Tae Gon Lee et.al: no significant difference *(Invest Ophthalmol Vis Sci 2011;52)*
Endophthalmitis in eyes following vitrectomy

- Flat A.C. in gas filled eyes phakic eyes along with severe orbital inflammatory reaction in immediate P.O. period should be an ominous sign of infective endophthalmitis.

- Post vitrectomy endophthalmitis more common in diabetics than in non diabetics.

Dr TARUN SHARMA, DR LINGAM GOPAL, Lily Therese (Ophthalmic surgery & lasers OCT 98 vol 29 No 10 857-859)
POE: A potentially blinding condition

• Though rare, it is potentially the most devastating complication of intraocular procedures and can lead to a permanent, complete loss of vision.

• Endophthalmitis has been associated with severe visual loss in 20% of patients.

_Surv Ophthalmol 2004, 49(2), S53-S54_
POE: Aetiological Agents

• Most common potential source of infection is the periocular flora of the patient

• 75% of conjunctive cultures from normal eyes harbour *Staph. epidermidis*, *Staph. aureus* and various *streptococci*

• Similar pattern has been found in eyes with post-operative endophthalmitis

• Role of external ocular bacterial flora in the pathogenesis of post-op endophthalmitis has been proven by DNA studies
Post-op Endophthalmitis: Etiology

• Periocular flora gain access into eye during surgery

• Organisms may be carried into the eye as surface fluid refluxes through the wound during surgery

• IOL contamination if it touches the ocular surface or with the air of the operating room

• Contaminated irrigation solutions
Risk Factors

**Bacterial**
- Defects in sterilization of instruments.
- **Contamination of fluids and drugs**
- Complicated surgery (rupture of posterior capsule), tissue damage
- Lacrimal drainage obstruction

**Fungal**
- Contaminated irrigating solutions.
- Contaminated IOLs, **viscoelastics**, poor OT hygiene, hospital construction activity.
POE: Clinical Aspects

• Three forms of clinical presentation can be distinguished
  – Acute form, usually fulminant, occurs 2-4 days post-op, most commonly due to *S.aureus* or streptococci or Gram negative bacilli
  – Delayed form, moderately severe, occurs 5-7 days post-op, due to *S.epidermidis*, rarely fungal.
  – Chronic form, occurs as early as 1 month post-op, due to *Propionibacterium acnes*, *S.epidermidis* or fungal.
In most cases, infection occurs in immediate post-op period,
### Most common organisms responsible for endophthalmitis

<table>
<thead>
<tr>
<th>Gram positive bacteria 75%-85%</th>
<th>Gram negative bacteria 10%-15%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Staphylococcus epidemidis</strong> 43%</td>
<td><strong>Pseudomonas</strong> 8%</td>
</tr>
<tr>
<td><strong>Streptococcus spp</strong> 20%</td>
<td><strong>Proteus</strong> 5%</td>
</tr>
<tr>
<td><strong>Staphylococcus aureus</strong> 15%</td>
<td><strong>Haemophilus influenzae</strong> 0-1%</td>
</tr>
<tr>
<td><strong>Propionibacterium acnes</strong> 5%</td>
<td><strong>Klebsiella</strong> 0-1%</td>
</tr>
<tr>
<td><strong>Bacillus cereus</strong> 1%</td>
<td><strong>Coliform spp</strong> 0-1%</td>
</tr>
<tr>
<td><strong>Fungi (rare)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Candida parapsilosis</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Aspergillus</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Cephalosporium spp.</strong></td>
<td></td>
</tr>
</tbody>
</table>
Endophthalmitis: Microbiology

Post Operative-

Acute onset
- Staph. epi.
- Staph. aureus
- Gram negative
- Streptococcus
- Fusarium (Filamentous Fungi)

Late onset
- P. acne
- Fungus (Candida)
- Staph. epidermidis
- Anaerobic streptococci
- Actenomyces
- Nocardia asteroids
Patient presents with symptoms most commonly on the **second day** after surgery

**Symptoms:**
- Pain: absent in 25% (EVS group)
- Diminished vision

**Signs:**
- Upper lid edema
- Conjunctival hyperemia
- Intense chemosis
- Corneal edema
- Anterior chamber inflammation & Hypopyon
- Endothelial precipitates
Acute Bacterial Endophthalmitis
BACTERIAL ENDOPHTHALMITIS

Fundus-

- Decreased/ yellowish/ absent glow
- Vitreous debri/fluffy exudates
- Retinitis/ retinal periphlebitis
- Retina may/may not be visible
BACTERIAL ENDOPHTHALMITIS

Fundus-

• Decreased/ yellowish/ absent glow
• Vitreous debri/fluffy exudates
• Retinitis/ retinal periphlebitis
• Retina may/may not be visible
P. Acne Endophthalmitis

- Anaerobic, pleomorphic, Gram +ve bacilli normally found in conj. sac
- Stimulate/provoke immune response with residual lens matter
- May follow retained lens matter/ Nd-YAG capsulotomy
P. Acne Endophthalmitis

- Mutton fat KPs on - endothelium / IOL
- Beaded fibrin strands in AC/ minimal hypopyon
- PCO/ sequestrated plaques within the capsular bag/ post. Cap / IOL
- Vitritis but usually healthy retina
- Optic disc edema/Visual field loss
P. Acnes Endophthalmitis
FUNGAL ENDOPHTHALMITIS

- Onset: days / weeks (can be rapid onset)
- Diminution of vision/Mild pain
- Waxing/waning course
- Ant. Seg.: Corneal abscess/section infiltration
  - Hypopyon, iridocyclitis
FUNGAL ENDOPHTHALMITIS

- Fundus: Localized vitreous opacity (snow ball)
  white string of pearls appearance

Vitreous exudation / diffuse haze
Candida endophthalmitis
BLEB RELATED

• Blebitis- A microbial bacterial infection of the bleb **without vitreous involvement**, may complicate the postoperative course months to years after filtering surgery

• R - **redness** (conjunctival injection or ciliary flush),
• S - **sensitivity** to light (photophobia)
• V - **vision change** (decreased central visual acuity); or
• P - **pain** (ciliary body spasm)
Presenting features:

- Abrupt onset pain & redness
- Thin, avascular & leaky bleb
- "white on red" appearance
Thin wall of the bleb
There is a chronic exposure of intraocular contents to the tear film, and in some cases, endophthalmitis can develop years after the original surgery.
• Significant high morbidity

  – 5-year probability with mitomycin:

    \[(Peter W. DeBry et. al Arch Ophthalmol. 2002;120:297-300)\]

    • Bleb leak – 17.9%
    • Blebitis – 6.3%
    • Endophthalmitis – 7.5%

  – Its higher with 5 FU: more bleb leak

• Concluded that: incidence of endophthalmitis is approximately 1.3% per year
Organisms:
- MC: *Staphylococcus* and more so Coagulase - ve
- *Streptococcus*
- *Enterococcus* species
- *Moraxella* species
- *Pseudomonas aeruginosa*

Treatment: most Gram +ve responded to Vancomycin

Outcome: Poor prognosis
Role of Real time USG

- Ultrasound evaluation:
  - Significant media opacification
  - Dispersed vitreous opacities associated with vitritis and
  - Advanced cases, chorioretinal thickening
  - R/O associated retinal or choroidal detachment, dislocated lens material, or
    retained foreign bodies, which may influence management
  - Also to know the response of the treatment.
• **Top:** Severe intravitreal infiltrates and thickening of the choroid. “T-sign” due to increased fluid in the sub-Tenon space, which indicates beginning of panophthalmitis

• **Middle:** 1 day later the situation has worsened in spite of intravitreal antibiotics, beginning of retinal detachment

• **Bottom:** 5 days later diffuse panophthalmic infiltration is present
Diagnosis

• Clinical picture can be confirmed by smear and culture of the organisms

• The most important samples to culture are **aspirates from the aqueous and vitreous cavity**

• Possibility of isolating an organism from vitreous 56-70% while from aqueous 36-40%

www.aios.org
Obtaining intraocular specimens
Obtaining aqueous samples

- Aqueous fluid is obtained by paracentesis
- About 0.1 ml fluid is aspirated
- Innoculated on culture media
Obtaining vitreous samples

• Sample of vitreous is a very important source to know the causative organisms
• Aspiration may not provide adequate sample as vitreous is denser and contain inflammatory membranes in endophthalmitis
• There is also chance of retinal detachment.
• Safest method is vitreous biopsy (0.2-0.3 ml)
• Lost volume of vitreous replaced by saline

www.arios.com
EVS:

• Vitreous samples > aqueous samples in isolating organism

• Aqueous samples sole source: 4.2% of eyes

• No significant difference in yield: needle tap = vitreous biopsy = PPV techniques
Technique...

• Eye is surgically prepped : povidone-iodine 5% solution
• A/C tap: A 30-gauge needle attached to a tuberculin syringe is inserted through the limbus. 0.1 mL of aspirate.

• Vitreous specimen: vitreous needle tap / vitreous biopsy with a cutter
  – vitrectomy probe attached to a 5 ml syringe through sclerotomy incision
  – Approximately 0.1– 0.3 mL of vitreous (slow, manual aspiration)
  – Alternative : vitreous needle tap with 27- to 22-gauge
  – No fluid vitreous: vitreous biopsy better choice
  – Intravitreal antibiotics mandated
A/C tap as good as Vitreous Tap???

- Anterior Chamber and Vitreous Concordance in Endophthalmitis -
  - The AC lacks concordance with vitreous
  - AC culture: did not aid in predicting vitreous findings
  - Topical therapy achieving therapeutic levels in the AC may not prevent or treat endophthalmitis

<table>
<thead>
<tr>
<th>Media Types</th>
<th>Organisms Suspected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chocolate agar</td>
<td>Bacteria (H. influenzae)</td>
</tr>
<tr>
<td>Blood agar</td>
<td>Bacteria (Streptococci)</td>
</tr>
<tr>
<td>Sabouraud's agar</td>
<td>Fungi</td>
</tr>
<tr>
<td>Thioglycolate Broth</td>
<td>Bacteria (Aerobic &amp; Anaerobic)</td>
</tr>
<tr>
<td>Anaerobic media</td>
<td><em>Propionibacterium acnes</em> and other anaerobes</td>
</tr>
</tbody>
</table>
Quantitative PCR

• Quantitative broad-range PCR of bacterial 16S rDNA

• Advantages of PCR:
  – Early diagnosis: recognition and susceptibility
  – Identifying atypical organism
  – High sensitivity but low specificity

• Gustavo B. Melo et.al Invest Ophthalmol Vis Sci 2011;52:

• PCR better than conventional
  – Conventional : (Gram + culture) identify 68% of vitreous samples, 50% of aqueous samples (50%) and 61% of the patients with infectious endophthalmitis
  – Real time PCR assays was positive in 82% of the vitreous samples and in 100% of the aqueous samples. endophthalmitis in 86%
  – Specificity was 100% for the vitreous and 96% for the aqueous samples
**Differential Diagnosis**

Marked postoperative inflammation:

- **Hypopyon uveitis** - Behcet’s disease or rifabutin toxicity

Pre-existing Uveitis

Blebitis Or Keratitis - Anterior segment infection of contiguous structures

Pseudohypopyon may be simulated by RBC, Debris, Pigments, Tumor cells

Retained lens material cause sterile post op inflammation

Toxic anterior segment syndrome (TASS): causes hypopyon without infection
Differential diagnosis - TASS
Etiology

- TASS: marked sterile inflammation
  - Noninfectious, toxic substances: gain access in A/C
  - Bacterial toxins,
  - preservatives,
  - detergents, or
  - cleaning compounds as well as intraocular solutions
  - Early postoperative migration of externally applied ointment
## Differentiating the Two

<table>
<thead>
<tr>
<th>Features</th>
<th>TASS</th>
<th>Endophthalmitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>1 day or even earlier</td>
<td>2 to 5 day (EVS – with exceptions)</td>
</tr>
<tr>
<td>Pain</td>
<td>Rare (&lt; 25%)</td>
<td>Common (75% - EVS)</td>
</tr>
<tr>
<td>Conjunctiva &amp; Lid</td>
<td>Uneventfull</td>
<td>Chemosis &amp; Congestion</td>
</tr>
<tr>
<td>Corneal edema</td>
<td>Limbal to Limbal</td>
<td>Very very rare</td>
</tr>
<tr>
<td>Iris</td>
<td>Dilated pupil</td>
<td>Constricted</td>
</tr>
<tr>
<td>IOP</td>
<td>Extremely high</td>
<td>Low, Normal or High</td>
</tr>
<tr>
<td>Therapeutic response</td>
<td>Very good to topical steroid</td>
<td>Worsening</td>
</tr>
<tr>
<td>Tap</td>
<td>Negative</td>
<td>Usually Positive (65 to 70% - EVS)</td>
</tr>
</tbody>
</table>
Phacoanaphylactic glaucoma
Progressive vitritis out of proportion to other anterior segment findings = Endophthalmitis

When doubt manage as infection
DISCUSSION CONTINUES........

- Management – EVS & ESCRS guidelines
- Controversies in Management
- Recent Advances in Management

THANK YOU.