Endophthalmitis

?  ?  ?
Endophthalmitis

- Posttraumatic
- Postoperative
- Endogenous
Endophthalmitis

Posttraumatic  Postoperative  Endogenous

?  ?
Endophthalmitis

- Posttraumatic
- Postoperative
- Endogenous
  - Acute
  - Chronic
Endophthalmitis

Posttraumatic (U8)

Postoperative

Endogenous

Acute

Chronic

(Cataract surgery--L2)
(Filtering surgery--G6)

(Posttraumatic and postoperative endophthalmitis are discussed in the slide-sets listed above. The remainder of this slide-set will address endogenous endophthalmitis)
Endogenous Endophthalmitis

Is endogenous endophthalmitis a common entity?
Is endogenous endophthalmitis a common entity? No, it is quite rare, accounting for less than $\%$ of all cases of endophthalmitis.
Endogenous Endophthalmitis

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*What factors place an individual at increased risk of endogenous endophthalmitis?*
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--Chronic and/or repeated breaching of the body’s outer barrier
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What factors place an individual at increased risk of endogenous endophthalmitis?
There are many, but they can be grouped as follows:

- **Impaired immune status**
  - HIV/AIDS
  - Chronic disease (e.g., DM; malignancy; sickle-cell disease; lupus)
  - On immunosuppressive/modulatory meds (e.g., organ transplant patients)
  - Chemotherapy patients
  - Neonates
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What sorts of conditions are associated with impaired immune status?
- HIV/AIDS
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  - Neonates

Why are neonates on this list?
The immune system does not fully mature until an infant is at least 6 months old. Until it does, they are immunocompromised to a degree.
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*Virtually any invasive medical procedure could result in endogenous endophthalmitis, but the BCSC Uveitis book mentions three by name. What are they?*
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--Bowel surgery
--Endoscopy
--Dental work
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Important examples of chronic and/or repeated breaching of the body’s outer barrier include:
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Important examples of chronic and/or repeated breaching of the body’s outer barrier include:
--Indwelling catheters
--IV drug use
--Intravenous access lines
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*What is the mechanism of infection; ie, how do the organisms reach the interior of the globe?*
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*What is the mechanism of infection; ie, how do the organisms reach the interior of the globe?*
The route is hematogenous, with subsequent breakdown of the blood-eye barrier
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What is the mechanism of infection; ie, how do the organisms reach the interior of the globe?
The route is hematogenous, with subsequent breakdown of the blood-eye barrier.

The fact that the route is hematogenous suggests the organisms are traveling from a nidus elsewhere, ie, that the endophthalmitis is an ocular sequelae of an infection elsewhere. Is this usually the case?
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Yes; it is estimated that a specific extraocular nidus is present in at least 90% of cases
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Which extraocular locations are frequently implicated as the source in endogenous endophthalmitis?

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*Which extraocular locations are frequently implicated as the source in endogenous endophthalmitis?*
-- Lungs
-- Bladder
-- Liver
-- Sinuses
-- Skin
-- CNS (ie, meningitis)
-- Heart
Endogenous Endophthalmitis

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**What if no nidus can be identified?**
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What if no nidus can be identified?
Keep looking! Don’t rely on labs and/or imaging studies to find it; rather, take a more careful and detailed history and ROS, and perform a more thorough PE. (Remember the old maxim: ‘When all else fails, examine the pt.’) That lower-extremity pain might actually be osteomyelitis. That ‘common cold’ might actually be bacterial sinusitis.
Endogenous Endophthalmitis

The organisms causing endogenous endophthalmitis come from one of two groups. What are they?
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Bacteria, and fungi
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Which is more common, bacterial or fungal endogenous endophthalmitis?
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Which is more common, bacterial or fungal endogenous endophthalmitis? Estimates vary, but it's probably in the ballpark of 50:50
Endophthalmitis

Endogenous Endophthalmitis

Bacterial

Fungal

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Which three culture media should be employed?
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--Anaerobic
--Fungal
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Which two stains should be used?

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Which two stains should be used?
--Gram
--Giemsa
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Which is of greater utility--cultures, or stains?
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Which is of greater utility—cultures, or stains?
Stains, definitely. Remember, these pathogens are slow-growing and fastidious; thus, it could be weeks before they reveal themselves via culturing. On the other hand, staining has the potential to identify the culprit instantly.
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What about the potential nidus of infection?
Endogenous Endophthalmitis

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Which is of greater utility--cultures, or stains? Stains, definitely. Remember, these pathogens are slow-growing and fastidious; thus, it could be weeks before they reveal themselves via culturing. On the other hand, staining has the potential to identify the culprit instantly.

What about the potential nidus of infection? The H&P should guide the obtaining of nonocular specimens for cultures and stains. If in doubt, blood, urine and sputum C&S should probably be checked. Imaging studies should be considered as well, with consideration given to percutaneous or even open biopsies as the clinical situation warrants.
Endogenous Endophthalmitis

- Bacterial
- Fungal

*How does endogenous bacterial endophthalmitis present?*
How does endogenous bacterial endophthalmitis present?
With both systemic and ocular findings
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With both systemic and ocular findings

What systemic findings are common?
How does endogenous bacterial endophthalmitis present?
With both systemic and ocular findings

What systemic findings are common?
Those associated with infection: fever, elevated white count, malaise
Endogenous Endophthalmitis

- **Bacterial**
- **Fungal**

*How does endogenous bacterial endophthalmitis present?*
With both systemic and ocular findings

*What systemic findings are common?*
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*What ocular complaints are typically associated with endogenous bacterial endophthalmitis?*
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What systemic findings are common?
Those associated with infection: fever, elevated white count, malaise

What ocular complaints are typically associated with endogenous bacterial endophthalmitis?
The acute onset of pain, redness and decreased vision
Endogenous Endophthalmitis

Bacterial

Fungal

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The acute onset of pain, redness and decreased vision

What ocular signs are typically found?
--Periorbital/lid edema
--A red, angry eye
--A fibrinous AC +/- hypopyon
--Vitreous inflammation
--Retinal microabscesses may be present, or white-centered hemorrhages (aka Roth spots)
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Bacteria are frequently classified with respect to a basic microbiologic property. What is it? Whether they are G(+) or G(-)
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Which three G(+) bugs are most commonly implicated in endogenous bacterial endophthalmitis?
Endogenous Endophthalmitis

Bacterial

Gram(+)  Gram(-)
- Strep
- Staph
- Bacillus

Fungal

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Endogenous Endophthalmitis

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Gram(+) - Strep
- Staph
- Bacillus

Gram(-) - ?
- ?
- ?
- ?

Fungal

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Which three G(+) bugs are most commonly implicated in endogenous bacterial endophthalmitis?

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Which bacterial cause of endogenous endophthalmitis is classically associated with: --Endocarditis?
Which bacterial cause of endogenous endophthalmitis is classically associated with: --Endocarditis? Strep
Which bacterial cause of endogenous endophthalmitis is classically associated with:

--Endocarditis? Strep
--Skin infections?

Gram (+):
- Strep
- Staph
- Bacillus

Gram (-):
- N meningitidis
- H flu
- E coli
- Klebsiella
Which bacterial cause of endogenous endophthalmitis is classically associated with:
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Endogenous Endophthalmitis

Bacterial

- Gram(+) Strep
- Gram(+) Staph
- Gram(+) Bacillus

- Gram(-) N meningitidis
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- Gram(-) E coli
- Gram(-) Klebsiella

Which bacterial cause of endogenous endophthalmitis is classically associated with:

--Endocarditis? Strep
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--IVDU?
Which bacterial cause of endogenous endophthalmitis is classically associated with:

- **Endocarditis?** Strep
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**Endogenous Endophthalmitis**

**Bacterial**
- Gram(+) 
  - Strep
  - Staph
  - Bacillus
- Gram(-) 
  - *N meningitidis*
  - *H flu*
  - *E coli*
  - *Klebsiella*

**Fungal**

*Which bacterial cause of endogenous endophthalmitis is classically associated with:*

-- *Endocarditis*? Strep
-- *Skin infections*? Staph
-- *IVDU*? Bacillus
-- *Liver abscess*?
Endogenous Endophthalmitis

- **Bacterial**
  - Gram(+):
    - Strep
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    - *E. coli*
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Which bacterial cause of endogenous endophthalmitis is classically associated with:
- Endocarditis? Strep
- Skin infections? Staph
- IVDU? Bacillus
- Liver abscess? Klebsiella (this is the #1 cause of endogenous endophthalmitis in Asia)
Which bacterial cause of endogenous endophthalmitis is classically associated with:
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How is endogenous bacterial endophthalmitis treated?
**Endogenous Endophthalmitis**

**Bacterial**
- Gram(+)
  - Strep
  - Staph
  - Bacillus
- Gram(-)
  - *N. meningitidis*
  - *H. flu*
  - *E. coli*
  - *Klebsiella* (this is the #1 cause of endogenous endophthalmitis in Asia)

**Fungal**

*Which bacterial cause of endogenous endophthalmitis is classically associated with:*
- Endocarditis? Strep
- Skin infections? Staph
- IVDU? Bacillus
- Liver abscess? Klebsiella (this is the #1 cause of endogenous endophthalmitis in Asia)

*How is endogenous bacterial endophthalmitis treated?*
With vitrectomy and intravitreal antibiotics. Consideration should be given to IV abx as well. Additionally, the extraocular nidus of infection should be managed by the appropriate service.
How does the presentation of endogenous **fungal** endophthalmitis differ from the bacterial form?
How does the presentation of endogenous fungal endophthalmitis differ from the bacterial form? The onset of symptoms (pain, redness decreased vision) is generally more insidious.
**Endogenous Endophthalmitis**

- Bacterial
- Fungal

*How does the presentation of endogenous fungal endophthalmitis differ from the bacterial form?*

The onset of symptoms (pain, redness, decreased vision) is generally more insidious.

*What ocular signs are typically found?*
**Endogenous Endophthalmitis**

- **Bacterial**
- **Fungal**

*How does the presentation of endogenous fungal endophthalmitis differ from the bacterial form?*

The onset of symptoms (pain, redness decreased vision) is generally more insidious.

*What ocular signs are typically found?*

Endogenous fungal endophthalmitis generally progresses in a particular fashion. First, isolated choroidal metastatic lesions appear. With time, these break through Bruch’s membrane to involve the retina. Eventually, the bug reaches the vitreous, and (if still unchecked) the anterior segment.
Fungi are frequently classified with respect to a basic microbiologic property. What is it?
Fungi are frequently classified with respect to a basic microbiologic property. What is it? Whether they are yeast, molds or dimorphic
Endogenous Endophthalmitis

- Bacterial
- Fungal
  - Yeast
  - Molds
  - Dimorphic

What's the difference between a yeast and a mold?

Fungi are frequently classified with respect to a basic microbiologic property. What is it? Whether they are yeast, molds or dimorphic
**Endogenous Endophthalmitis**

- Bacterial
- Fungal
  - Yeast
  - Molds
  - Dimorphic

*What’s the difference between a yeast and a mold?* Yeasts are fungi that exist mainly as unicellular entities, whereas molds are multicellular organisms organized as structures called **hyphae** (the fancy term for the long, branching filaments molds form as they grow).

*Fungi are frequently classified with respect to a basic microbiologic property. What is it?* Whether they are **yeast**, **molds** or **dimorphic**
**Endogenous** Endophthalmitis

**Bacterial**

**Fungal**

- Yeast
- Molds

**Dimorphic**

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What does it mean to say a fungus is dimorphic? It means the organism exists as a yeast in the body, but as a mold in the environment.

Fungi are frequently classified with respect to a basic microbiologic property. What is it? Whether they are yeast, molds or dimorphic.
*Endogenous* Endophthalmitis

- **Bacterial**
- **Fungal**
  - **Yeast**
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*Which two yeasts are most commonly implicated in endogenous fungal endophthalmitis?*
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Endogenous Endophthalmitis

Bacterial

Fungal

Yeast
- Candida
- Cryptococcus

Molds
- Aspergillus

Dimorphic
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Is Candida a common cause of endogenous fungal endophthalmitis?

- **Fungal**
  - **Yeast**
    - Candida
      - Cryptococcus
  - **Molds**
    - Aspergillus
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Generally speaking, who is at risk?

- Hospitalized, debilitated individuals
- History of major GI surgery
- Chronic lines/catheters (Classic story: Patient s/p GI surgery is NPO and receiving TPN)
- Systemic antibiotics (think sepsis patient)

How about being immunocompromised? This does not seem to be a risk factor (e.g., HIV/AIDS is not a risk factor for Candida endophthalmitis).

If a patient is found to have candidemia, what should the primary team do (besides treat it)? They should consult ophthalmology for an urgent DFE, and the patient should be followed closely for at least two weeks to ensure Candida endophthalmitis doesn’t develop.
**Endogenous Endophthalmitis**

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Is there anything in particular that puts them at risk? -- -- --

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How does Candida endophthalmitis present?
Like other fungal entities, it starts with choroidal lesions. Pts will c/o decreased VA if one of the lesions affects the macular region.

Specifically, the choroidal lesions are bilateral, multiple, white and small (<1DD).

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What about the vitreous?

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This depends upon what ‘phase’ the disease is in.--If the infection is limited to the choroid (ie, there is no vitreal involvement), it can be treated with PO fluconazole + voriconazole.--Once the infection involves the vitreous, intravitreal antifungals (Ampho B; voriconazole) +/- dexamethasone should be used; vitrectomy should be considered.--Severe cases require PPV, intravenous Ampho B, and oral voriconazole (+/- other agents).
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Is being immunocompromised a risk factor for Cryptococcus endophthalmitis?

**Endogenous Endophthalmitis**

**Fungal**

**Yeast**
- Candida
- Cryptococcus

**Molds**
- Aspergillus

**Dimorphic**
- Coccidioides

Bacterial

- Is being immunocompromised a risk factor for Cryptococcus endophthalmitis?

Definitely. Cryptococcus is a common fungal ocular infection in HIV/AIDS.

Cryptococcus is notorious for causing what nonocular condition in HIV/AIDS pts?

Fungal meningitis

Who is at risk for Cryptococcus endophthalmitis?

An HIV/AIDS pt with cryptococcal meningitis

How does Cryptococcus endophthalmitis present?

As with Candida, it starts with choroidal lesions, and pts will c/o decreased VA if one of the lesions affects the macular region. Unlike Candida, the choroidal lesions tend to be larger and fewer in number.

The ONH may be edematous—why?

Because of concomitant meningitis and increased ICP

How is Cryptococcus endophthalmitis managed?

Intravenous Ampho B is the mainstay of treatment
**Endogenous Endophthalmitis**

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**Fungal**

- Yeast
  - *Candida*
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- Molds
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- Dimorphic
  - *Coccidioides*
**Endogenous Endophthalmitis**

Is Aspergillus a common cause of endogenous fungal endophthalmitis?

- **Fungal**
  - **Molds**
    - Aspergillus
  - **Dimorphic**
    - Coccidioides

**Bacterial**

**Is** Aspergillus a common cause of endogenous fungal endophthalmitis? **No, it is quite rare.**

Generally speaking, who is at risk? Very debilitated individuals—those with chronic severe lung dz, cancer, endocarditis, or severely immunocompromised. One group particularly at risk are those who have undergone liver transplantation.

How does **Aspergillus** endophthalmitis present? Unlike other fungal entities, the onset of pain and vision loss is fairly acute. The choroidal lesions are large, macular, and often accompanied by hemorrhagic choroidal and/or retinal lesions. (Unlike the other fungal pathogens discussed, Aspergillus has a propensity for invading blood vessels.)

What about the vitreous? Unlike Candida endophthalmitis (in which vitreous inflammation may be prominent), the vitreous reaction in **Aspergillus** endophthalmitis tends to be mild. This dz focuses on the choroid and retina.

How is **Aspergillus** endophthalmitis managed? It is an aggressive dz, so aggressive management is the norm. PPV, intravitreal and IV Ampho B, PO antifungals—the whole shebang.

Despite aggressive management, VA outcomes are generally poor.
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**Endogenous Endophthalmitis**

*Is Aspergillus a common cause of endogenous fungal endophthalmitis?*
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Fungal
Molds
Aspergillus
Coccidioides
Dimorphic
Cryptococcus
Yeast
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Mycoplasma
Clostridium
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Its tendency to invade blood vessels leads to ischemic maculopathy.

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Is Coccidioides a common cause of endogenous endophthalmitis?

No, it is VERY rare. It is vastly more likely to cause diseases of the ocular surface (eg, conjunctivitis).

What is the classic geographic location for this organism?
The San Joaquin Valley of central California. It is also found in the Southwest, Mexico and Argentina.

How does Aspergillus endophthalmitis present?
Unlike other fungal entities, the anterior segment tends to be as affected as the posterior. Pts typically present with a granulomatous uveitis (including large iris granulomas), accompanied by chorioretinal lesions of the sort seen in Candida endophthalmitis.

How is Coccidioides endophthalmitis managed?
PO itraconazole unless very severe (in which case Ampho B). Severe cases may require PPV, and iris granulomas may need to be surgically debulked.
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Bacterial

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