Endophthalmitis

?  ?  ?
Endophthalmitis

- Posttraumatic
- Postoperative
- Endogenous
Endophthalmitis

Posttraumatic

Postoperative

Endogenous

? ?
Endophthalmitis

- Posttraumatic
- Postoperative
- Endogenous
  - Acute
  - Chronic
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?
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No, it is quite rare, accounting for less than 10% of all cases of endophthalmitis.
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*What factors place an individual at increased risk of endogenous endophthalmitis?*
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--Impaired immune status
--Recent invasive medical procedure
--Chronic and/or repeated breaching of the body’s outer barrier
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--- Impaired immune status
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--- Chronic and/or repeated breaching of the body's outer barrier

*What sorts of conditions are associated with impaired immune status?*

--- HIV/AIDS
--- Chronic disease (e.g., DM; malignancy; sickle-cell disease; lupus)
--- On immunosuppressive/modulatory meds (e.g., organ transplant pts)
--- Chemotherapy pts
--- Neonates
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What sorts of conditions are associated with impaired immune status?
--HIV/AIDS
--Chronic disease (eg, four conditions)
--On immunosuppressive/modulatory meds (eg, two words)
--Chemotherapy pts
--Neonates
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   - On immunosuppressive/modulatory meds (e.g., organ transplant pts)
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   What sorts of conditions are associated with impaired immune status?
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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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*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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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? Yes; it is estimated that a specific extraocular nidus is present in at least [percentage] of cases.
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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
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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.
The organisms causing endogenous endophthalmitis come from one of two groups. What are they?
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Bacteria, and fungi
Endogenous Endophthalmitis

Bacterial

Fungal

The organisms causing endogenous endophthalmitis come from one of two groups. What are they?
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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.
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If the identity of the organism is in question, how should the clinician proceed?
By obtaining aqueous (and vitreous, if PPV is performed) samples for culture and stains
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Which two stains should be used?
--Gram
--Giemsa


**Endogenous Endophthalmitis**

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

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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.
Endogenous Endophthalmitis

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What about the potential nidus of infection?
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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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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?
Those associated with infection: fever, elevated white count, malaise

What ocular complaints are typically associated with endogenous bacterial endophthalmitis?
Endogenous Endophthalmitis

Bacterial

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What systemic findings are common?
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The acute onset of pain, redness and decreased vision
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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)
Endogenous Endophthalmitis

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Bacterial endophthalmitis
Bacteria are frequently classified with respect to a basic microbiologic property. What is it?
Bacteria are frequently classified with respect to a basic microbiologic property. What is it? Whether they are G(+) or G(-)
Bacteria are frequently classified with respect to a basic microbiologic property. What is it?
Whether they are G(+) or G(-)

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

Bacterial

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

- Gram(-) Bacteria

Fungal

Bacteria are frequently classified with respect to a basic microbiologic property. What is it? Whether they are G(+) or G(-)

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

Strep 'Chains'  

Bacillus 'G+ rods'
Bacteria are frequently classified with respect to a basic microbiologic property. What is it? Whether they are G(+) or G(-)

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

Which four G(-) bugs are most commonly implicated in endogenous bacterial endophthalmitis?
**Endogenous Endophthalmitis**

**Bacterial**

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

- Gram(-) Bacteria
  - *N meningitidis*
  - *H flu*
  - *E coli*
  - *Klebsiella*

**Fungal**

_Bacteria are frequently classified with respect to a basic microbiologic property. What is it? Whether they are G(+) or G(-)_

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

_Which four G(-) bugs are most commonly implicated in endogenous bacterial endophthalmitis?_
*N. meningitidis*: ‘Diplococci in PMNs’

*H. flu*: ‘Short rods’

*E. coli*: ‘Nothing special’

*Klebsiella*: ‘Very large capsule’
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?
Endogenous Endophthalmitis

Bacterial

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

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

Bacterial

- Gram(+):
  - Strep
  - Staph
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Fungal

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

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**Endogenous Endophthalmitis**

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

**Fungal**

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

--Endocarditis? Strep
--Skin infections? Staph
--IVDU? Bacillus

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Fungal
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Bacterial

<table>
<thead>
<tr>
<th>Gram(+)</th>
<th>Gram(-)</th>
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<tbody>
<tr>
<td>Strep</td>
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<td>Staph</td>
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<tr>
<td></td>
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Which bacterial cause of endogenous endophthalmitis is classically associated with:

- Endocarditis? Strep
- Skin infections? Staph
- IVDU? Bacillus
- Liver abscess?
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? Klebsiella (this is the #1 cause of endogenous endophthalmitis in continent)
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How is endogenous bacterial endophthalmitis treated?
Endogenous Endophthalmitis

Bacterial

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  - 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? 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?
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The onset of symptoms (pain, redness decreased vision) is generally more insidious.
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?*
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?
Endogenous Endophthalmitis

- Bacterial
- Fungal
  - Yeast
  - Molds
  - Dimorphic

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

What's the difference between a yeast and a mold?
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
Yeast vs Molds (vs bacteria)
Endogenous Endophthalmitis

Bacterial

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What does it mean to say a fungus is 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.
Yeast vs Molds (vs bacteria)
Fungi are frequently classified with respect to a basic microbiologic property. What is it?
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Which two yeasts are most commonly implicated in endogenous fungal endophthalmitis?
Fungi are frequently classified with respect to a basic microbiologic property. What is it?
Whether they are **yeast**, **molds** or **dimorphic**

*Which two yeasts are most commonly implicated in endogenous fungal endophthalmitis?*
Candida: ‘Budding’

Cyptococcus: ‘India ink’
Fungi are frequently classified with respect to a basic microbiologic property. What is it?

Whether they are yeast, molds or dimorphic

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Which mold is most commonly implicated in endogenous fungal endophthalmitis?
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Which mold is most commonly implicated in endogenous fungal endophthalmitis?
Aspergillus: ‘Broad hyphae’
Endogenous Endophthalmitis

Bacterial

Fungal

Yeast
- Candida
- Cryptococcus

Molds
- Aspergillus

Dimorphic

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Which **dimorphic fungus** is most commonly implicated in endogenous fungal endophthalmitis?
Coccidioides: ‘Spherules’
Is Candida a common cause of endogenous fungal endophthalmitis?

Fungal

Yeast
- Candida
  - Cryptococcus

Molds
- Aspergillus

Dimorphic
- Coccidioides
Is Candida a common cause of endogenous fungal endophthalmitis? Yes—indeed, it is the most common cause in both adults and children.

**Endogenous Endophthalmitis**

- **Fungal**
  - **Yeast**
    - *Candida*
    - Cryptococcus
  - **Molds**
    - Aspergillus
  - **Dimorphic**
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Generally speaking, who is at risk? Hospitalized, debilitated individuals. Is there anything in particular that puts them at risk?—Hx major GI surgery—Chronic lines/catheters (Classic story: Pt s/p GI surgery is NPO and receiving TPN)—Systemic antibiotics (think sepsis pt). How about being immunocompromised? This does not seem to be a risk factor (eg, HIV/AIDS is not a risk factor for Candida endophthalmitis).

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

*Is Candida a common cause of endogenous fungal endophthalmitis?*
Yes—in fact, it is the most common cause in both adults and children

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Cryptococcus

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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 (<1 DD).
- What about the vitreous? The classic finding is inflammatory aggregates arranged like a 'string of pearls'.
- Can the anterior segment be involved? Yes. And if it is, the pain is usually severe.

How is Candida endophthalmitis treated?
- 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.
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Candida endophthalmitis: ‘String of pearls’
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**Fungal**

**Yeast**
- *Candida*
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Candida endophthalmitis: Pre- and post-tx
Is being immunocompromised a risk factor for Cryptococcus endophthalmitis?

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

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
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Fungal

Yeast
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Is Aspergillus a common cause of endogenous fungal endophthalmitis?

Fungal

Molds

Aspergillus

Dimorphic

Coccidioides

Endogenous Endophthalmitis

Aspergillus is quite rare. Generally speaking, individuals at risk are very debilitated, such as those with chronic severe lung disease, cancer, endocarditis, or severely immunocompromised. One group particularly at risk are those who have undergone liver transplantation.

Aspergillus endophthalmitis presents with acute pain and vision loss. 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.

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

Aspergillus endophthalmitis is managed aggressively. PPV, intravitreal and IV Ampho B, PO antifungals—this is the whole shebang. Despite aggressive management, VA outcomes are generally poor.
Endogenous Endophthalmitis

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

Fungal

Molds

Aspergillus

Dimorphic

Cryptococcus

Yeast

Aspergillus

Ischemic

Candida

Aspergillus

Yeast

Molds

Aspergillus

Yeast

Candida

Endophthalmitis

Bacterial

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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?
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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.

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**Endogenous Endophthalmitis**

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![Diagram of fungal agents](image)
Is Aspergillus a common cause of endogenous fungal endophthalmitis?
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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 major medical procedure (two words)

Fungal

Molds

Aspergillus

Dimorphic

Coccidioides
**Endogenous Endophthalmitis**

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Aspergillus after liver transplant
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Aspergillus endophthalmitis
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While technically incorrect, it is helpful to think of it this way:
--Candida endophthalmitis is a dz of the vitreous, whereas
--Aspergillus endophthalmitis is a dz of the retina/choroid
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*Aspergillus*
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Aspergillus endophthalmitis: Pre- and post tx
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Why are visual outcomes poor in Aspergillus endophthalmitis? 
Its tendency to invade blood vessels leads to ischemic maculopathy

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**Endogenous Endophthalmitis**

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

  - Molds
    - Aspergillus
  - Dimorphic
    - *Coccidioides*
  - Yeast
    - *Candida*
  - Cryptococcus

**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 (e.g., conjunctivitis).

The classic geographic location for this organism is 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. Patients typically present with a granulomatous uveitis (including large iris granulomas), accompanied by choroidal 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.
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)

**Endogenous Endophthalmitis**

- **Bacterial**
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  - **Molds**
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**Endogenous Endophthalmitis**

**Bacterial**

**Fungal**

- **Molds**
- **Aspergillus**
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Coccidioides endophthalmitis
Endogenous Endophthalmitis

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How is Coccidioides endophthalmitis managed?
**Endogenous Endophthalmitis**

Fungal

- **Candida**
- **Cryptococcus**
- **Aspergillus**
- **Dimorphic**
  - **Coccidioides**

**Bacterial**

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