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?
Is endogenous endophthalmitis a common entity? No, it is quite rare, accounting for less than % of all cases of endophthalmitis.
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--Chronic and/or repeated breaching of the body’s outer barrier
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*What sorts of conditions are associated with impaired immune status?*

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

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What about the potential nidus of infection?
Endogenous Endophthalmitis

Bacterial

Fungal

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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.
How does endogenous bacterial endophthalmitis present?
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With both systemic and ocular findings
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What systemic findings are common?
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What systemic findings are common?
Those associated with infection: fever, elevated white count, malaise
Endogenous Endophthalmitis

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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)
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Bacteria are frequently classified with respect to a basic microbiologic property. What is it?
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*Which three G(+) bugs are most commonly implicated in endogenous bacterial endophthalmitis?*
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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’
What are the five classic clinical scenarios associated with endogenous endophthalmitis?

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Endogenous Endophthalmitis

Bacterial

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

Gram(-)

N. meningitidis
- H. influenzae (H flu)
- E. coli
- Klebsiella

Fungal

What are the five classic clinical scenarios associated with endogenous endophthalmitis?

- Endocarditis
- Skin infection
- IVDU
- Liver abscess
- UTI
Endophthalmitis

Bacterial

Gram(+)  
- Strep  
- Staph  
- Bacillus

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

Fungal

What are the five classic clinical scenarios associated with endogenous endophthalmitis?
Which bacterial cause above is classically associated with each?
--Endocarditis?
--Skin infection
--IVDU
--Liver abscess
--UTI
Endogenous Endophthalmitis

Bacterial

Gram(+)  
- Strep  
- Staph  
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Gram(-)  
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Endogenous Endophthalmitis

Bacterial

<table>
<thead>
<tr>
<th>Gram(+)</th>
<th>Gram(-)</th>
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<tbody>
<tr>
<td>Strep</td>
<td>N meningitidis</td>
</tr>
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<td>Staph</td>
<td>H flu</td>
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<tr>
<td>Bacillus</td>
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<td></td>
<td>Klebsiella</td>
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Which is the most common in North America?
What are the five classic clinical scenarios associated with endogenous endophthalmitis? Which bacterial cause above is classically associated with each?

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**Endocarditis?** *Strep*

---

Skin infection? *Staph*

---

IVDU? *Bacillus*

---

Liver abscess? *Klebsiella*

---

UTI? *E coli*

---

Which is the most common in North America? Endocarditis accounts for ___% here
What are the five classic clinical scenarios associated with endogenous endophthalmitis? Which bacterial cause above is classically associated with each?

- **Endocarditis?** *Strep*
- Skin infection? *Staph*
- IVDU? *Bacillus*
- Liver abscess? *Klebsiella*
- UTI? *E coli*

*Which is the most common in North America?* Endocarditis accounts for 40% here.
Endogenous Endophthalmitis

Bacterial

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         Staph
         Bacillus

Gram(-)

N meningitidis
H flu
E coli
Klebsiella

Fungal

What are the five classic clinical scenarios associated with endogenous endophthalmitis? Which bacterial cause above is classically associated with each?

--Endocarditis? Strep
--Skin infection? Staph
--IVDU? Bacillus
--Liver abscess? Klebsiella
--UTI? E coli

Which is the most common in North America? Endocarditis accounts for 40% here

Which cause is in second place here?
What are the five classic clinical scenarios associated with endogenous endophthalmitis? Which bacterial cause above is classically associated with each?

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Which is the most common in North America?
Endocarditis accounts for 40% here

Which cause is in second place here?
UTI, accounting for about % of cases
Endogenous Endophthalmitis

Bacterial

Gram(+)
- Strep
- Staph
- Bacillus

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

Fungal

What are the five classic clinical scenarios associated with endogenous endophthalmitis?
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Which is the most common in North America?
Endocarditis accounts for 40% here

Which cause is in second place here?
UTI, accounting for about 1/3 of cases
Endogenous Endophthalmitis

Bacterial

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

- Gram(-):
  - N meningitidis
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Fungal

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Which is the most common in Asia?
What are the five classic clinical scenarios associated with endogenous endophthalmitis? Which bacterial cause above is classically associated with each?

- Endocarditis? *Strep*
- Skin infection? *Staph*
- IVDU? *Bacillus*
- Liver abscess? *Klebsiella*
- UTI? *E coli*

Which is the most common in Asia? 60% of endogenous endophthalmitis is associated with *Klebsiella* liver abscesses!
Endogenous Endophthalmitis

Bacterial

Gram (+)
- Strep
- Staph
- Bacillus

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

Fungal

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Which is the most common in Asia?

60% of endogenous endophthalmitis there is associated with Klebsiella liver abscesses!
What are the five classic clinical scenarios associated with endogenous endophthalmitis?
Which bacterial cause above is classically associated with each?
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How is endogenous bacterial endophthalmitis treated?
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*How is endogenous bacterial endophthalmitis treated?*
With vitrectomy and intravitreal antibiotics. Consideration should be given to IV abx as well.
What are the five classic clinical scenarios associated with endogenous endophthalmitis?
Which bacterial cause above is classically associated with each?

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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?
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
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?
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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? Whether they are yeast, molds or 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).

What does it mean to say a fungus is dimorphic?
What's the difference between a yeast and a mold?
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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)
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Which two yeasts are most commonly implicated in endogenous fungal endophthalmitis?
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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

Which two yeasts are most commonly implicated in endogenous fungal endophthalmitis?

Which mold is 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?

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

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

**Endogenous Endophthalmitis**

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

Yes--in fact, it is the most common cause in both adults and children.

Generally speaking, who is at risk?
- Hospitalized, debilitated individuals
- 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.
Is Candida a common cause of endogenous fungal endophthalmitis?  
Yes--in fact, it is the most common cause in both adults and children.
**Endogenous Endophthalmitis**

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

Fungal

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**Fungal**

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  - *Candida*
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Endogenous Endophthalmitis

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**Endogenous Endophthalmitis**

**How does Candida endophthalmitis present?**

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- **Bacterial**
**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.
Endogenous Endophthalmitis

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).

Fungal

Yeast
- Candida
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Severe cases require PPV, intravenous Ampho B, and oral voriconazole (+/- other agents).
Candida endophthalmitis
**Endogenous Endophthalmitis**

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*What about the vitreous?*

[Diagram showing fungal types: Candida, Cryptococcus, Aspergillus, Coccidioides, etc., and their interactions.]
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What about the vitreous?
The classic finding is inflammatory aggregates arranged like a 'three words'.

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What about the vitreous?
The classic finding is inflammatory aggregates arranged like a ‘string of pearls’

Fungal

Yeast
  - Candida
  - Cryptococcus

Molds
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Endogenous Endophthalmitis

*Candida* endophthalmitis: ‘String of pearls’
Endogenous Endophthalmitis

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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.
--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).

When you hear ‘string of pearls’ regarding vitreous cell, three conditions should come to mind. One is Candida endophthalmitis; what are the other two?
--Primary vitreoretinal lymphoma (PVRL)
--Sarcoid uveitis

specific dz uveitis
Endogenous Endophthalmitis

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Endogenous Endophthalmitis

‘String of pearls’ vitritis in PVRL
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-- Primary vitreoretinal lymphoma (PVRL)
-- Candida endophthalmitis

What type of lymphoma is most common in PVRL?

Virtually all PVRLs are non-Hodgkin B-cell lymphomas.

Who is the typical PVRL pt? An adult in their 50s-60s.

What systemic status increases the risk of developing PVRL? Being immunocompromised.

What eye complaint(s) do these pts present with? Decreased vision and/or floaters.

In addition to visual complaints, what other signs/symptoms may clue the astute clinician to the possibility of PVRL? Those due to CNS involvement (eg, confusion, weakness, memory loss).
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What type of lymphoma is most common in PVRL?
Virtually all PVRLs are non-Hodgkin B-cell lymphomas

Who is the typical PVRL pt?
An adult in their 50s-60s

What systemic status increases the risk of developing PVRL?
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What eye complaint(s) do these pts present with?

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PVRL: Typical creamy-yellow subretinal infiltrates
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For more on PVRL, see slide-set U26
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Polypoidal choroidal vasculopathy (PCV).

In a nutshell, what is PCV?
A dz of the choroidal vasculature characterized by serosanguinous RPE detachments that are recurrent and multifocal and related to Type 1 MNV.

Is there a gender and/or racial predilection?
Tough question. The original cohort was largely women of Asian and African-American heritage, and there's likely a legit skew in those directions.

That said, for sure both men and other races get it as well.

What is the typical age cohort—children, young adult, middle-aged, or elderly?
Middle-aged to 'young elderly' (EyeWiki gives a range of 50 to 65).
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What type of PED
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Polypoidal choroidal vasculopathy (PCV) is a condition characterized by chronic, multiple, recurrent serosanguinous retinal pigment epithelium detachments secondary to an abnormal network of underlying choroidal vessels. Multiple areas of subretinal hemorrhage are visible in these photos. They are surrounded by areas of yellow subretinal material (which likely represents old hemorrhage).
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In a nutshell, what is PCV?
A dz of the choroidal vasculature characterized by serosanguinous RPE detachments that are recurrent and multifocal and related to Type

What does MNV stand for in this context?
MNV
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Specifically, the choroidal lesions are bilateral, multiple, white and small (<1DD).

What about the vitreous?
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Can the anterior segment be involved?
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How is Candida endophthalmitis treated?
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What does MNV stand for in this context?
'Macular neovascularization' (the Academy is phasing it in as a replacement for choroidal neovascularization, CNV)

What type of lymphoma is most common in PVRL?
Virtually all PVRLs are non-Hodgkin B-cell lymphomas.

Who is the typical PVRL pt?
An adult in their 50s-60s

What systemic status increases the risk of developing PVRL?
Being immunocompromised

What eye complaint(s) do these pts present with?
Decreased vision and/or floaters

In addition to visual complaints, what other signs/symptoms may clue the astute clinician to the possibility of PVRL?
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Not familiar with the three types of PED? See slide-set R48.
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OK, but how does the term 'string of pearls' fit into all this?

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**Being immunocompromised**
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PCV. FA/ICG demonstrating a branching vascular network with polypoidal lesions arranged in a “string of pearls” pattern.
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Candida endophthalmitis: Pre- and post-tx
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.
Is being immunocompromised a risk factor for Cryptococcus endophthalmitis? Definitely. Cryptococcus is a common fungal ocular infection in HIV/AIDS.

Fungal

Yeast
- Candida
- Cryptococcus

Molds
- Aspergillus

Dimorphic
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Endogenous Endophthalmitis
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Fungal

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Is Aspergillus a common cause of endogenous fungal endophthalmitis?

Endogenous Endophthalmitis

- Fungal
  - Molds
    - Aspergillus
    - Coccidioides
  - Dimorphic
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Aspergillus is a common cause of endogenous fungal endophthalmitis. 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.
Is Aspergillus a common cause of endogenous fungal endophthalmitis?
No, it is quite rare.
Endogenous Endophthalmitis

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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 major medical procedure (two words)

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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 liver transplantation.

Aspergillus after liver transplant

Aspergillus

Molds

Dimorphic

Candida

Cryptococcus

Yeast

Aspergillus

Coccidioides

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

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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.

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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

Is Coccidioides a common cause of endogenous endophthalmitis?

- Bacterial
- Fungal
  - Molds
    - Aspergillus
  - Dimorphic
    - Coccidioides

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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**Endogenous Endophthalmitis**

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Coccidioides endophthalmitis
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