Fungal pathogens come in two very basic flavors—what are they?
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What forms the basis for this distinction, i.e., what characteristic of the organisms led us to divvy them up into these classes?
Fungal pathogens come in two very basic flavors—what are they?

What forms the basis for this distinction, ie, what characteristic of the organisms led us to divvy them up into these classes?

Their appearance
Fungal pathogens come in two very basic flavors—what are they?

What forms the basis for this distinction, ie, what characteristic of the organisms led us to divvy them up into these classes?

**Their appearance**

What do yeasts look like?
Fungal pathogens come in two very basic flavors—what are they?

What forms the basis for this distinction, ie, what characteristic of the organisms led us to divvy them up into these classes?

**Their appearance**

*What do yeasts look like?*
Round, single-celled organisms
Fungal pathogens come in two very basic flavors—what are they?

What forms the basis for this distinction, ie, what characteristic of the organisms led us to divvy them up into these classes?

**Their appearance**

*What do yeasts look like?*
Round, single-celled organisms

*What do molds look like?*
Fungal pathogens come in two very basic flavors—what are they?

What forms the basis for this distinction, ie, what characteristic of the organisms led us to divvy them up into these classes?

**Their appearance**

*What do yeasts look like?*
Round, single-celled organisms

*What do molds look like?*
Multicellular, filamentous organisms
Common Ocular Fungal Pathogens

Yeast vs Molds
Fungal pathogens come in two very basic flavors—what are they?

What forms the basis for this distinction, ie, what characteristic of the organisms led us to divvy them up into these classes?

**Their appearance**

What do yeasts look like?
Round, single-celled organisms

What do molds look like?
Multicellular, filamentous organisms

What’s the formal term for the filaments formed by molds?
Common Ocular Fungal Pathogens

Fungal pathogens come in two very basic flavors—what are they?

What forms the basis for this distinction, ie, what characteristic of the organisms led us to divvy them up into these classes?

**Their appearance**

What do yeasts look like?
Round, single-celled organisms

What do molds look like?
Multicellular, filamentous organisms

*What’s the formal term for the filaments formed by molds?*
Hyphae
Yeast vs Molds (vs bacteria for scale)
Molds are further divided into two broad categories—what are they?
Fungal pathogens

Yeast

Molds

Septate

Nonseptate

Molds are further divided into two broad categories—what are they? Based on the appearance of their hyphae, they are classified as either septate or nonseptate.
Common Ocular Fungal Pathogens

Fungal pathogens

Yeasts

Molds

Septate

Nonseptate

Molds are further divided into two broad categories—what are they? Based on the appearance of their hyphae, they are classified as either septated or nonseptated.

What are septa?
Molds are further divided into two broad categories—what are they? Based on the appearance of their hyphae, they are classified as either **septated** or **nonseptated**.

*What are septa?* Cross-walls within hyphae that subdivide them into a series of individual compartments.
Common Ocular Fungal Pathogens

Fungal pathogens

Yeast

Molds

Septate

Nonseptate

Molds are further divided into two broad categories—what are they?
Based on the appearance of their hyphae, they are classified as either septated or nonseptated.

What are septa?
Cross-walls within hyphae that subdivide them into a series of individual compartments.
Septate molds have these cross-walls; nonseptate molds do not.
Common Ocular Fungal Pathogens

Molds

Septate

Nonseptate
Two species account for the majority of yeast-mischief involving the eyes—what are they?
Common Ocular Fungal Pathogens

Fungal pathogens

Yeast

- Candida
- Cryptococcus

Molds

- Septate
- Nonseptate

Two species account for the majority of yeast-mischief involving the eyes—what are they?
*Candida.* The ‘budding’ appearance is typical, and is a good field mark for the species

*Cryptococcus.* Note the ‘India ink’ look—this is a good way to identify this species

**Yeast**
Common Ocular Fungal Pathogens

Fungal pathogens

- **Yeast**
  - *Candida*
  - *Cryptococcus*

- **Molds**
  - Septate
  - Nonseptate

Two species account for the majority of septated-mold eye issues—what are they?
Two species account for the majority of septated-mold eye issues—what are they?
Common Ocular Fungal Pathogens

Fusarium

Aspergillus. Note the blue-bulb looking whatchamacallits

Sepated molds
A high-mag *Aspergillus* photo may demonstrate ‘broad hyphae,’ a classic descriptor of the bug
Two species account for the majority of non-septated-mold eye issues—what are they?
Common Ocular Fungal Pathogens

Fungal pathogens

- Yeasts
  - Candida
  - Cryptococcus

- Molds
  - Septate
    - Fusarium
    - Aspergillus
  - Nonseptate
    - Mucor
    - Rhizopus

Two species account for the majority of non-septated-mold eye issues—what are they?
No pic of *Mucor/Rhizopus*, as I don’t think you’ll be asked to ID it. Caveat emptor.
Fungal pathogens

Yeast
- Candida
- Cryptococcus

Molds
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

What is the go-to stain for fungi?
Common Ocular Fungal Pathogens

Fungal pathogens

Yeasts
- Candida
- Cryptococcus

Molds
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

What is the go-to stain for fungi?
Gomori methenamine (many others work as well)
Common Ocular Fungal Pathogens

Aspergillus

Cryptococcus

Gomori methenamine stain
What is the go-to stain for fungi?
Gomori methenamine (many others work as well)

Which is the only fungus that will take a Gram stain?
What is the go-to stain for fungi?
Gomori methenamine (many others work as well)

Which is the only fungus that will take a Gram stain?
Candida
Common Ocular Fungal Pathogens

Candida: Gram stain
What is the go-to stain for fungi?
Gomori methenamine (many others work as well)

When working up a suspected fungal keratitis, what culture medium should you use?
Common Ocular Fungal Pathogens

Fungal pathogens

- Yeasts
  - Candida
  - Cryptococcus

- Molds
  - Septate
    - Fusarium
    - Aspergillus
  - Nonseptate
    - Mucor
    - Rhizopus

What is the go-to stain for fungi?
Gomori methenamine (many others work as well)

When working up a suspected fungal keratitis, what culture medium should you use?
Sabouraud
Common Ocular Fungal Pathogens

*Candida* growing on Sabouraud
Certain fungi have a strong association with particular climates.
Certain fungi have a strong association with particular climates. When you hear the following climate descriptions, which fungi should come to mind?

**Cool, northern climes:**

- *Candida*
- *Cryptococcus*
- *Fusarium*
- *Aspergillus*
- *Mucor*
- *Rhizopus*
Certain fungi have a strong association with particular climates. When you hear the following climate descriptions, which fungi should come to mind?

**Cool, northern climes:** Yeasts, especially Candida, Cryptococcus.
Certain fungi have a strong association with particular climates. When you hear the following climate descriptions, which fungi should come to mind?

Cool, northern climes: Yeasts, especially Candida
Certain fungi have a strong association with particular climates. When you hear the following climate descriptions, which fungi should come to mind?

Cool, northern climes: Yeasts, especially Candida

Warm, humid climes:
Certain fungi have a strong association with particular climates. When you hear the following climate descriptions, which fungi should come to mind?

- **Cool, northern climes:** Yeasts, especially *Candida*
- **Warm, humid climes:** Septated molds, especially *Fusarium* and *Aspergillus*
Certain fungi have a strong association with particular climates. When you hear the following climate descriptions, which fungi should come to mind?

- **Cool, northern climes:** Yeasts, especially Candida
- **Warm, humid climes:** Septated molds, especially Fusarium
Certain fungi have a strong association with particular climates. When you hear the following climate descriptions, which fungi should come to mind?

- **Cool, northern climes**: Yeasts, especially *Candida*
- **Warm, humid climes**: Septated molds, especially *Fusarium*

**These are the associations to bear in mind**

- Cool, northern climes: Yeasts, especially *Candida*
- Warm, humid climes: Septated molds, especially *Fusarium*

No question—proceed when ready
Final basic-science topic: Some fungi exist as yeast in the body, but as mold in the environment. What is the term for such fungi?
Final basic-science topic: Some fungi exist as yeast in the body, but as mold in the environment. What is the term for such fungi?
Two species account for the majority of dimorphic fungi issues—what are they?
Common Ocular Fungal Pathogens

Fungal pathogens

Yeast
- Candida
- Cryptococcus

Mold
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

Dimorphic
- Coccidiodes
- Histoplasma

Two species account for the majority of dimorphic fungi issues—what are they?
Coccidioides and Histoplasma have definite geographic preponderances in the United States. What are they?
Coccidioides: ?
Histoplasma: ?
Two species account for the majority of dimorphic fungi issues—what are they?

Coccidioides and Histoplasma have definite geographic preponderances in the United States. What are they?

Coccidioides: The Southwest, particularly the San Joaquin Valley in California.

Histoplasma: The Midwest, particularly around the Mississippi River Delta.
Coccidiodes and Histoplasma have definite geographic preponderances in the United States. What are they?

Coccidiodes: The Southwest, particularly the San Joaquin Valley in California

Histoplasma: Eastern United States, particularly the Ohio River Valley
Coccidiodes and Histoplasma have definite geographic preponderances in the United States. What are they?

**Coccidiodes:** The Southwest, particularly the San Joaquin Valley in California.

**Histoplasma:** ?
Common Ocular Fungal Pathogens

Fungal pathogens

Yeast
- Candida
- Cryptococcus

Molds
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

Dimorphic
- Coccidiodes
- Histoplasma

Coccidiodes and Histoplasma have definite geographic preponderances in the United States. What are they?
- Coccidiodes: The Southwest, particularly the San Joaquin Valley in California
- Histoplasma: The Ohio and Mississippi River valleys
Two species account for the majority of dimorphic fungi issues—what are they?

Coccidiodes and Histoplasma have definite geographic preponderances in the United States. What are they?

Coccidiodes: The Southwest, particularly the San Joaquin Valley in California.

Histoplasma: The Ohio and Mississippi River valleys.
Common Ocular Fungal Pathogens

*H capsulatum*: Mold (filamentous) form

*H capsulatum*: Yeast form
Common Ocular Fungal Pathogens

*Histoplasma*, yeast form, in a macrophage  
*Coccidioides*: Note the ‘spherule’ shape

Dimorphic pathogens
These eight species account for most of the fungal issues addressed in the BCSC

No question—review slide
**Common Ocular Fungal Pathogens**

**Fungal pathogens**

- Yeasts
  - *Candida*
  - *Cryptococcus*

- Molds
  - Septate
    - *Fusarium*
    - *Aspergillus*
  - Nonseptate
    - *Mucor*
    - *Rhizopus*

**Dimorphic**

- *Coccidioides*
- *Histoplasma*

**Head’s up:**
The *Neuro* book states that *Coccidioides* and *Histoplasma* are yeasts. This is incorrect; both are dimorphic.
Fungal pathogens

Yeast
- Candida
- Cryptococcus

Molds
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

Dimorphic
- Coccidioides
- Histoplasma

Head’s up:
The *Neuro* book states that *Coccidioides* and *Histoplasma* are yeasts. This is incorrect; both are dimorphic. What is true is that it is the yeast form which is infectious in humans.
Common Ocular Fungal Pathogens

Fungal pathogens

Yeast
- Candida
- Cryptococcus

Molds
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

Dimorphic
- Coccidiodes
- Histoplasma

Head’s up part deaux:
The *Neuro* book states that *Candida* is dimorphic. This is incorrect; it is a yeast.

No question yet
Head’s up part deaux:
The *Neuro* book states that *Candida* is dimorphic. This is incorrect; it is a yeast. What *is* true is that *Candida* can form pseudohyphae, which give it the appearance of having a mold phase and thus being dimorphic.
Common Ocular Fungal Pathogens

Fungal pathogens

Yeast

- Candida
- Cryptococcus

Molds

- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

Dimorphic

- Coccidioides
- Histoplasma

Head’s up part deaux:
The *Neuro* book states that *Candida* is dimorphic. This is incorrect; it is a yeast. What is true is that *Candida* can form pseudohyphae, which give it the appearance of having a mold phase and thus being dimorphic.
Common Ocular Fungal Pathogens

*Candida*. This pic was shown earlier in the set. The ‘budding’ structure that was remarked upon then is a pseudohyphae.

*Candida*
Common Ocular Fungal Pathogens

Fungal pathogenic **conditions**

Next we’ll shift gears and talk about the **fungal conditions** you need to know in order to do well on the OKAP (oh sure, and to take care of pts too)
Fungal pathogens cause six general conditions—what are they?
Fungal pathogens cause six general conditions—what are they?
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

- Keratitis
- Orbital disease
- Chorioretinitis

arrowing:

These conditions are not thrown up here rando. As we will see, the conditions on the right are often (in some cases always) caused by the condition on the left.

No question
Important foreshadowing: These conditions are not thrown up here rando. As we will see, the conditions on the right are often (in some cases always) caused by the condition on the left. Committing the diagram to memory in the manner it’s presented above will help you hang on to that key fact.
In terms of presentation, how does fungal keratitis differ from bacterial?
In terms of presentation, how does fungal keratitis differ from bacterial? Bacterial tends to be **fulminant**, whereas fungal tends to be **insidious**.
In terms of presentation, how does fungal keratitis differ from bacterial? Bacterial tends to be fulminant, whereas fungal tends to be insidious.
In terms of presentation, how does fungal keratitis differ from bacterial? Bacterial tends to be fulminant, whereas fungal tends to be insidious.

With respect to keratitis, fungi have a capacity that renders them arguably more dangerous than bacteria—what is it?
In terms of presentation, how does fungal keratitis differ from bacterial? Bacterial tends to be fulminant, whereas fungal tends to be insidious.

With respect to keratitis, fungi have a capacity that renders them arguably more dangerous than bacteria—what is it? Unlike (most) bacteria, fungi can breach Descemet’s to enter the AC.
In terms of presentation, how does fungal keratitis differ from bacterial? Bacterial tends to be fulminant, whereas fungal tends to be insidious.

With respect to keratitis, fungi have a capacity that renders them arguably more dangerous than bacteria—what is it? Unlike (most) bacteria, fungi can breach Descemet’s to enter the AC.

There are three main risk factors for fungal keratitis—what are they?
--?
--?
--?
Fungal pathogenic conditions

Keratitis
- Orbital disease
- Chorioretinitis
- Endophthalmitis
- Sceritis
- Optic neuropathy

In terms of presentation, how does fungal keratitis differ from bacterial? Bacterial tends to be fulminant, whereas fungal tends to be insidious.

With respect to keratitis, fungi have a capacity that renders them arguably more dangerous than bacteria—what is it? Unlike (most) bacteria, fungi can breach Descemet’s to enter the AC.

There are three main risk factors for fungal keratitis—what are they?
- Trauma, especially involving vegetative matter
- ?
- ?

Common Ocular Fungal Pathogens
Fungal pathogenic conditions

- Orbital disease
- Keratitis
- Chorioretinitis
- Sclerosis
- Optic neuropathy
- Endophthalmitis

There are three main risk factors for fungal keratitis—what are they?
--Trauma, especially involving vegetative matter
--?
--?

With respect to keratitis, fungi have a capacity that renders them arguably more dangerous than bacteria—what is it?

Unlike (most) bacteria, fungi can breach Descemet’s to enter the AC

Bacterial tends to be fulminant, whereas fungal tends to be insidious
There are three main risk factors for fungal keratitis—what are they?
--Trauma, especially involving vegetative matter
--Chronic eydrop use
--?

With respect to keratitis, fungi have a capacity that renders them arguably more dangerous than bacteria—what is it?
Unlike (most) bacteria, fungi can breach Descemet’s to enter the AC
**Common Ocular Fungal Pathogens**

**Fungal pathogenic conditions**

- Keratitis
- Orbital disease
- Chorioretinitis
- Scleritis
- Optic neuropathy
- Endophthalmitis

*There are three main risk factors for fungal keratitis—what are they?*

-- Trauma, especially involving vegetative matter
-- Chronic topical steroid use

*With respect to keratitis, fungi have a capacity that renders them arguably more dangerous than bacteria—what is it?*

Unlike (most) bacteria, fungi can breach Descemet’s to enter the AC.
Fungal pathogenic conditions

Keratitis

Orbital disease

Sceritis

Optic neuropathy

Chorioretinitis

Endophthalmitis

There are three main risk factors for fungal keratitis—what are they?

--Trauma, especially involving vegetative matter
--Chronic topical steroid use
--Contact lens wear

With respect to keratitis, fungi have a capacity that renders them arguably more dangerous than bacteria—what is it?

Unlike (most) bacteria, fungi can breach Descemet’s to enter the AC
In terms of presentation, how does fungal keratitis differ from bacterial?

Bacterial tends to be fulminant, whereas fungal tends to be insidious.

With respect to keratitis, fungi have a capacity that renders them arguably more dangerous than bacteria—what is it?

Unlike (most) bacteria, fungi can breach Descemet’s to enter the AC.

There are three main risk factors for fungal keratitis—what are they?

--Trauma, especially involving vegetative matter

--Chronic topical steroid use

--Contact lens wear

Common Ocular Fungal Pathogens

Fungal pathogen ic conditions

Keratitis

Orbital disease

Chorioretinitis

Sceritis

Optic neuropathy

Endophthalmitis
Common Ocular Fungal Pathogens

**Fungal pathogenic conditions**

- Keratitis
- Orbital disease
- Chorioretinitis
- Sceritis
- Optic neuropathy
- Endophthalmitis

Which two species are responsible for the vast majority of fungal keratitis cases?
Which two species are responsible for the vast majority of fungal keratitis cases? The septated molds—Aspergillus and (especially) Fusarium.
Orbital disease
Keratitis
Chorioretinitis
Endophthalmitis
Fungal pathogenic conditions
Optic neuropathy

For more of fungal keratitis, see slide-set K32

Fusarium
Aspergillus

Which two species are responsible for the vast majority of fungal keratitis cases? The septated molds—Aspergillus and (especially) Fusarium

Fungal pathogens
Yeasts
- Candida
- Cryptococcus

Molds
- Septate
  - Fusarium
  - Aspergillus
- Nonseptate
  - Mucor
  - Rhizopus

Dimorphic
- Coccioides
- Histoplasma
Is fungal scleritis common, or rare?
Orbital disease
Endophthalmitis
Fungal pathogenic conditions
Keratitis
Scleritis
Orbital disease
Optic neuropathy
Chorioretinitis
Endophthalmitis

Is fungal scleritis common, or rare?
It is very rare
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

- Keratitis
- Orbital disease
- Chorioretinitis
- Optic neuropathy
- Endophthalmitis
- Scleritis

Is fungal scleritis common, or rare?
It is very rare

How do most cases of fungal scleritis start?
Orbital disease

Fungal pathogenic conditions

Keratitis

Scleritis

Sceritis

Optic neuropathy

Common Ocular Fungal Pathogens

Is fungal scleritis common, or rare?
It is very rare

How do most cases of fungal scleritis start?
As a keratitis that crosses the limbus
Orbital disease

Common Ocular Fungal Pathogens

Fungal pathogenic conditions

Keratitis

Scleritis

Chorioretinitis

Optic neuropathy

Endophthalmitis

Three fungi cause orbital disease— which ones?

--?

--?

--?
Three fungi cause orbital disease—
which ones?
--Aspergillus
--Mucor
--Rhizopus
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

Keratitis
Scleritis
Optic neuropathy
Endophthalmitis

Orbital disease

Chorioretinitis

Aspergillosis

Three fungi cause orbital disease— which ones?
--Aspergillus
--Mucor
--Rhizopus

Aspergillus is responsible for three forms of orbital disease that all fall under the umbrella term aspergillosis, aka sino-orbital aspergillosis. (We will unpack the three forms in detail shortly.)
Fungal pathogenic conditions

Orbital disease
- Keratitis
- Scleritis
- Optic neuropathy
- Endophthalmitis
- Chorioretinitis
- Aspergillosis

Three fungi cause orbital disease— which ones?
- Aspergillus
- Mucor
- Rhizopus

In contrast, Mucor and Rhizopus both cause the same clinical condition.
Three fungi cause orbital disease— which ones?

-- Aspergillus

-- *Mucor*

-- *Rhizopus*

In contrast, *Mucor* and *Rhizopus* both cause the same clinical condition. Because of this, the condition is named after the class of organism (Zygomycetes) to which both species belong.
Three fungi cause orbital disease—Aspergillus, Mucor, and Rhizopus.

In contrast, Mucor and Rhizopus both cause the same clinical condition. Because of this, the condition is named after the class of organism (Zygomycetes) to which both species belong.

You may be more familiar with the older (but still acceptable) name for this condition: Mucormycosis.
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality?

Zygomycosis
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

Zygomycosis
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence?

Zygomycosis
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality?
It is the most common

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence?
It is the most virulent
Common Ocular Fungal Pathogens

Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality?
It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence?
It is the most virulent.

So, these are highly virulent pathogens?

Zygomycosis
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality?
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Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence?
It is the **most virulent**

**So, these are highly virulent pathogens?**
Actually no—they are ubiquitous, and normally pose little or no threat
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence? It is the most virulent.

So, these are highly virulent pathogens? Actually no—they are ubiquitous, and normally pose little or no threat.

So then, under what circumstance are they highly virulent?

Zygomycosis
Common Ocular Fungal Pathogens

Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence? It is the most virulent.

So, these are highly virulent pathogens?
Actually no—they are ubiquitous, and normally pose little or no threat.

So then, under what circumstance are they highly virulent?
When the individual is debilitated.
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

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So, these are highly virulent pathogens? Actually no—they are ubiquitous, and normally pose little or no threat.

So then, under what circumstance are they highly virulent? When the individual is debilitated.

What is the classic debilitating factor/scenario?
Common Ocular Fungal Pathogens

Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

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So then, under what circumstance are they highly virulent? When the individual is debilitated.

Zygomycosis

What is the classic debilitating factor/scenario? A pt in DKA.
Common Ocular Fungal Pathogens

Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence? It is the most virulent.

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So then, under what circumstance are they highly virulent? When the individual is debilitated.

What is the classic debilitating factor/scenario? A pt in DKA.

What other scenarios do the BCSC books mention? --?
--?
--?
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

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Zygomycosis

What is the classic debilitating factor/scenario?
A pt in DKA

What other scenarios do the BCSC books mention?
--A pt with extensive burns
--Malignancy
--Neutropenic pts

So then, under what circumstance are they highly virulent?
When the individual is debilitated.

ouch
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

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So, these are highly virulent pathogens? Actually no—they are ubiquitous, and normally pose little or no threat.

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So, these are highly virulent pathogens? Actually no—they are ubiquitous, and normally pose little or no threat.

So then, under what circumstance are they highly virulent? When the individual is debilitated.

*What is the classic debilitating factor/scenario?* A pt in DKA

*What other scenarios do the BCSC books mention?*--A pt with extensive burns
--Malignancy
--Neutropenic pts (especially if they’re on abx)
Common Ocular Fungal Pathogens

Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence? It is the most virulent.

So, these are highly virulent pathogens? Actually no—they are ubiquitous, and normally pose little or no threat.

So then, under what circumstance are they highly virulent? When the individual is debilitated.

**Zygomycosis**

*What is the classic debilitating factor/scenario?* A pt in DKA.

*What other scenarios do the BCSC books mention?* --A pt with extensive burns  
--Malignancy  
--Neutropenic pts (especially if they’re on abx)
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality?
It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence?
It is the most virulent.

How does the organism get into orbit?

Zygomycosis
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence? It is the most virulent.

How does the organism get into orbit? Via direct extension of infection from an adjacent sinus.

Zygomycosis
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality?
It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence?
It is the most virulent.

How does the organism get into orbit?
Via direct extension of infection from an adjacent sinus.

How does the organism get into the sinus?
Via fungemia.

Zygomycosis
Among fungal causes of orbital disease, where does zygomycosis rank in terms of commonality? It is the most common.

Among fungal causes of orbital disease, where does zygomycosis rank in terms of virulence? It is the most virulent.

How does the organism get into orbit? Via direct extension of infection from an adjacent sinus.

How does the organism get into the sinus? Via fungemia.

Zygomycosis
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

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How does the organism get into orbit? Via direct extension of infection from an adjacent sinus.

How does the organism get into the sinus? Via fungemia.

How does the organism get into the body in the first place? Zygomycosis.
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence? It is the most virulent.

How does the organism get into orbit? Via direct extension of infection from an adjacent sinus.

How does the organism get into the sinus? Via fungemia.

How does the organism get into the body in the first place? The lungs, ie, inhalation.

Zygomycosis
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence? It is the most virulent.

How does the organism get into orbit? Via direct extension of infection from an adjacent sinus.

The organism has a strong predilection for a particular sort of anatomic structure—what is it?

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How does the organism get into orbit? Via direct extension of infection from an adjacent sinus.

The organism has a strong predilection for a particular sort of anatomic structure—what is it? Blood vessels. This is a key fact to remember about zygomycosis—all of the badness stems from derangements of blood flow.

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How does the organism get into orbit? Via direct extension of infection from an adjacent sinus

The organism has a strong predilection for a particular sort of anatomic structure—what is it? Blood vessels. This is a key fact. What specific derangements of blood flow are involved?

Zygomycosis
Common Ocular Fungal Pathogens

Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence? It is the most virulent.

How does the organism get into orbit? Via direct extension of infection from an adjacent sinus.

The organism has a strong predilection for a particular sort of anatomic structure—what is it? Blood vessels. This is a key fact.

What specific derangements of blood flow are involved? The most common is thrombosis, which leads to infarction, which in turn produces tissue necrosis. Another is hemorrhage, which can lead to ischemic or compressive insults.

Zygomycosis
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The most common is thrombosis, which leads to

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**Zygomycosis**

What specific derangements of blood flow are involved? The most common is thrombosis, which leads to infarction, which in turn produces two words.
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**Derangements of blood flow.**

What specific derangements of blood flow are involved? The most common is thrombosis, which leads to infarction, which in turn produces tissue necrosis. Another is

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The most common is thrombosis, which leads to infarction, which in turn produces tissue necrosis. Another is hemorrhage, which can lead to ischemic or compressive insults.
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How does the organism get into orbit?
Via direct extension of infection from an adjacent sinus

The organism has a strong predilection for a particular sort of anatomic structure—what is it?
Blood vessels. This is a key fact derangements of blood flow.

What specific derangements of blood flow are involved?
The most common is thrombosis, which leads to infarction, which in turn produces tissue necrosis. Another is hemorrhage, which...

In addition to its myriad deleterious effects on tissue, this thrombosing vasculitis can produce a misleading general clinical picture. In what way?
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Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence? It is the most virulent.

How does the organism get into orbit? Via direct extension of infection from an adjacent sinus.

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Zygomycosis

What specific derangements of blood flow are involved? The most common is thrombosis, which leads to infarction, which in turn produces tissue necrosis. Another is hemorrhage.

In addition to its myriad deleterious effects on tissue, this thrombosing vasculitis can produce a misleading general clinical picture. In what way? If the ‘right’ vessels become thrombosed, the eye and orbit will be deceptively quiet in appearance, giving the impression that the process is milder than it actually is.
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence? It is the most virulent.

How does the organism get into orbit? Via direct extension of infection from an adjacent sinus.

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How do these pts typically present?

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How do these pts typically present? With proptosis and orbital apex syndrome.

Zygomycosis
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How do these pts typically present? With proptosis and orbital apex syndrome.

What are the exam findings in orbital apex syndrome? --? --? --? --?

Zygomycosis

Common Ocular Fungal Pathogens
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality?
It is the most common.

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How does the organism get into orbit?
Via direct extension of infection from an adjacent sinus.

The organism has a strong predilection for a particular sort of anatomic structure—what is it?
Blood vessels. This is a key fact to remember about zygomycosis—all of the badness stems from derangements of blood flow.

How do these pts typically present?
With proptosis and **orbital apex syndrome**.

What are the exam findings in orbital apex syndrome?
--Complete lid finding
--?
--?
--?
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence? It is the most virulent.

How does the organism get into orbit? Via direct extension of infection from an adjacent sinus.

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How do these pts typically present? With proptosis and orbital apex syndrome.

What are the exam findings in orbital apex syndrome? --Complete ptosis
--?
--?
--?
Common Ocular Fungal Pathogens

Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence? It is the most virulent.

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The organism has a strong predilection for a particular sort of anatomic structure—what is it? Blood vessels. This is a key fact to remember about zygomycosis—all of the badness stems from derangements of blood flow.

How do these pts typically present? With proptosis and [orbital apex syndrome].

What are the exam findings in orbital apex syndrome?
--Complete ptosis
--Ophthalmoplegia (both [and []
--?
--?
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality?
It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence?
It is the most virulent.

How does the organism get into orbit?
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The organism has a strong predilection for a particular sort of anatomic structure—what is it?
Blood vessels. This is a key fact to remember about zygomycosis—all of the badness stems from derangements of blood flow.

How do these pts typically present?
With proptosis and orbital apex syndrome.

What are the exam findings in orbital apex syndrome?
--Complete ptosis
--Ophthalmoplegia (both internal and external)
--?
--?
Common Ocular Fungal Pathogens

Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality?
It is the most common.

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Blood vessels. This is a key fact to remember about zygomycosis—all of the badness stems from derangements of blood flow.

How do these pts typically present?
With proptosis and orbital apex syndrome.

What are the exam findings in orbital apex syndrome?
---Complete ptosis
---Ophthalmoplegia (both internal and external)
---?
---What is an external ophthalmoplegia?
Common Ocular Fungal Pathogens

Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

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How do these pts typically present? With proptosis and orbital apex syndrome.

What are the exam findings in orbital apex syndrome?
-- Complete ptosis
-- Ophthalmoplegia (both internal and external)
--?

What is an external ophthalmoplegia?
Paralysis of the extraocular muscles.

Zygomycosis
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? 
It is the most common

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How does the organism get into orbit? 
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Zygomycosis

What are the exam findings in orbital apex syndrome? 
--Complete ptosis 
--Ophthalmoplegia (both internal and external ) 
--?

What is an external ophthalmoplegia? Internal? 
Paralysis of the extraocular muscles.
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality?
It is the most common.

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Blood vessels. This is a key fact to remember about zygomycosis—all of the badness stems from derangements of blood flow.

How do these pts typically present?
With proptosis and orbital apex syndrome.

Zygomycosis

What are the exam findings in orbital apex syndrome?
--Complete ptosis
--Ophthalmoplegia (both internal and external)
--?

What is an external ophthalmoplegia? Internal?
Paralysis of the extraocular muscles. Paralysis of the muscles inside the eye, ie, the pupillary and ciliary muscles.
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

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How does the organism get into orbit? Via direct extension of infection from an adjacent sinus.

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How do these pts typically present? With proptosis and orbital apex syndrome.

What are the exam findings in orbital apex syndrome?
--Complete ptosis
--Ophthalmoplegia (both internal and external)
--Corneal sensation is?
--?
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

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How do these pts typically present? With proptosis and orbital apex syndrome.

Zygomycosis

What are the exam findings in orbital apex syndrome?

--Complete ptosis
--Ophthalmoplegia (both internal and external)
--Corneal sensation is decreased
--?
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

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How do these pts typically present? With proptosis and orbital apex syndrome.

Zygomycosis

What are the exam findings in orbital apex syndrome?
--Complete ptosis
--Ophthalmoplegia (both internal and external)
--Corneal sensation is decreased
--Vision is affected vs unaffected
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence? It is the most virulent.

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How do these pts typically present? With proptosis and **orbital apex syndrome**.

Zygomycosis

What are the exam findings in orbital apex syndrome?
--Complete ptosis
--Ophthalmoplegia (both internal and external )
--Corneal sensation is decreased
--Vision is decreased
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

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How do these pts typically present? With proptosis and orbital apex syndrome.

Zygomycosis

What is the classic finding on exam that makes you say ‘Holy crap, I think this is mucormycosis!’? (Note: It’s not ophthalmic.)
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence? It is the most virulent.

How does the organism get into orbit? Via direct extension of infection from an adjacent sinus.

The organism has a strong predilection for a particular sort of anatomic structure—what is it? Blood vessels. This is a key fact to remember about zygomycosis—all of the badness stems from derangements of blood flow.

How do these pts typically present? With proptosis and orbital apex syndrome.

Zygomycosis

What is the classic finding on exam that makes you say ‘Holy crap, I think this is mucormycosis!’? (Note: It’s not ophthalmic.) Spotting a black eschar on the nasopharyngeal mucosa.
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

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How do these pts typically present? With proptosis and orbital apex syndrome.

**Zygomycosis**

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How do these pts typically present?
With proptosis and orbital apex syndrome

Zygomycosis

What is the classic finding on exam that makes you say ‘Holy crap, I think this is mucormycosis!’? (Note: It’s not ophthalmic.) How is the diagnosis confirmed?
Spotting a black eschar on the nasopharyngeal mucosa. By biopsying the eschar and finding nonseptated hyphae on it.
Zygomycosis: Necrotic sinus tissue with eschar
A, A patient with zygomycosis eroding the hard palate

Zygomycosis
A, A patient with zygomycosis eroding the hard palate
B, Biopsy specimen demonstrates typical nonseptate hyphae

Zygomycosis
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Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence? It is the most virulent.

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How is zygomycosis managed? --?
--?
--?
Three things have to happen… --?
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How do these pts typically present?
With proptosis and orbital apex syndrome

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Spotting a black eschar on the nasopharyngeal mucosa. By biopsying the eschar and finding nonseptated hyphae on it.

How is zygomycosis managed?
--? [what got the pt in this mess in the first place]
Common Ocular Fungal Pathogens

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How do these pts typically present?
With proptosis and orbital apex syndrome

Zygomycosis

What is the classic finding on exam that makes you say ‘Holy crap, I think this is mucormycosis!’?
(Note: It’s not ophthalmic.) How is the diagnosis confirmed?
Spotting a black eschar on the nasopharyngeal mucosa. By biopsying the eschar and finding nonseptated hyphae on it.

How is zygomycosis managed?
--The underlying debilitating condition must be reversed—get IM to resolve the DKA
--? [this surgical goal is pretty obvious]
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence? It is the most virulent.

How does the organism get into orbit? Via direct extension of infection from an adjacent sinus.

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How do these pts typically present? With proptosis and orbital apex syndrome.

Zygomycosis

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How is zygomycosis managed? --The underlying debilitating condition must be reversed—get IM to resolve the DKA --The infected tissue must be debrided—get ENT and Oculoplastics involved --? [this medical step is pretty obvious too]
Among fungal causes of orbital dz, where does zygomycosis rank in terms of commonality? It is the most common.

Among fungal causes of orbital dz, where does zygomycosis rank in terms of virulence? It is the most virulent.

How does the organism get into orbit? Via direct extension of infection from an adjacent sinus.

The organism has a strong predilection for a particular sort of anatomic structure—what is it? Blood vessels. This is a key fact to remember about zygomycosis—all of the badness stems from derangements of blood flow.

How do these pts typically present? With proptosis and orbital apex syndrome.

Zygomycosis

What is the classic finding on exam that makes you say ‘Holy crap, I think this is mucormycosis!’? (Note: It’s not ophthalmic.) How is the diagnosis confirmed? Spotting a black eschar on the nasopharyngeal mucosa. By biopsying the eschar and finding nonseptated hyphae on it.

How is zygomycosis managed? --The underlying debilitating condition must be reversed—get IM to resolve the DKA
--The infected tissue must be debrided—get ENT and Oculoplastics involved
--Get Ampho B on board
Zygomycosis in a patient with DKA. A, Complete right upper eyelid ptosis and ophthalmoplegia are present.
Zygomycosis in a patient with DKA. A, Complete right upper eyelid ptosis and ophthalmoplegia are present. B, Wide surgical debridement consisting of orbital exenteration and sinus surgery was life-saving.
Zygomycosis in a patient with DKA. 

A, Complete right upper eyelid ptosis and ophthalmoplegia are present. 

B, Wide surgical debridement consisting of orbital exenteration and sinus surgery was life-saving. 

CT (C) and MRI (D) axial scans show orbital and sinus involvement as well as cavernous sinus thrombosis (arrow).
Orbital disease

Common Ocular Fungal Pathogens

Fungal pathogenic conditions

- Keratitis
- Scleritis
- Optic neuropathy
- Endophthalmitis
- Chorioretinitis
- Zygomycosis

Aspergillosis

Aspergillosis can produce orbital dz via three distinct mechanisms:
--?
--?
--?
Common Ocular Fungal Pathogens

Fungal pathogenicic conditions

- Keratitis
- Sceritis
- Optic neuropathy
- Endophthalmitis
- Chorioretinitis

Orbital disease

- Zygomycosis
- Aspergillosis

Aspergillosis can produce orbital dz via three distinct mechanisms:
--By orbital tissue
--?
--?
Aspergillosis can produce orbital dz via three distinct mechanisms:
--By infecting orbital tissue
--?
--?
Aspergillosis can produce orbital dz via three distinct mechanisms:
--By infecting orbital tissue. The BCSC refers to this as invasive aspergillosis.
--?
--?
Aspergillosis can produce orbital dz via three distinct mechanisms:
--By infecting orbital tissue. The BCSC refers to this as invasive aspergillosis.
--By eliciting an allergic reaction in orbital tissue
--?
Aspergillosis can produce orbital dz via three distinct mechanisms:

--By infecting orbital tissue. The BCSC refers to this as invasive aspergillosis.
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Aspergillosis can produce orbital dz via three distinct mechanisms:

--By infecting orbital tissue. The BCSC refers to this as invasive aspergillosis.
--By eliciting an allergic reaction in orbital tissue. This is called allergic aspergillosis.
--?
**Common Ocular Fungal Pathogens**

**Fungal pathogenic conditions**

**Orbital disease**

- Keratitis
- Scleritis
- Optic neuropathy
- Endophthalmitis
- Chorioretinitis

**Zygomycosis**

**Aspergillosis**

- Invasive
- Allergic

*Aspergillosis can produce orbital dz via three distinct mechanisms:*

-- By infecting orbital tissue. The BCSC refers to this as *invasive aspergillosis.*
-- By eliciting an allergic reaction in orbital tissue. This is called *allergic aspergillosis.*
-- By forming a *three words* in the orbit
Aspergillosis can produce orbital dz via three distinct mechanisms:

--By infecting orbital tissue. The BCSC refers to this as invasive aspergillosis.

--By eliciting an allergic reaction in orbital tissue. This is called allergic aspergillosis.

--By forming a space-occupying mass in the orbit.
Aspergillosis can produce orbital dz via three distinct mechanisms:
--By infecting orbital tissue. The BCSC refers to this as invasive aspergillosis.
--By eliciting an allergic reaction in orbital tissue. This is called allergic aspergillosis.
--By forming a space-occupying mass in the orbit. This is noninvasive aspergillosis.
What is the chief predisposing factor in invasive aspergillosis?

Being immunocompromised/debilitated

How does the fungus gain access to the orbit?

By direct spread from adjacent sinusitis

How does it present?

It is highly variable—it can be fulminant, or chronic. Fulminant cases present with severe pain, proptosis and decreased VA. Intracranial spread is common, and results in a high mortality rate. Chronic cases mimic malignancy—less pain, more gradual proptosis and loss of function. The mortality rate is lower, but still significant. (Note: The Plastics book reserves the term invasive aspergillosis for fulminant cases, and refers to chronic cases as chronic necrotizing aspergillosis.)
What is the chief predisposing factor in invasive aspergillosis?
Being immunocompromised/debilitated
What is the chief predisposing factor in invasive aspergillosis? Being immunocompromised/debilitated.

How does the fungus gain access to the orbit? By direct spread from adjacent sinusitis.
Fungal pathogenic conditions

**Orbital disease**
- Keratitis
- Scleritis
- Optic neuropathy
- Sceritis
- Choroiditis

**Critical Ocular Fungal Pathogens**
- Zygomycosis
- Invasive aspergillosis
- Noninvasive aspergillosis
  - Allergic

*What is the chief predisposing factor in invasive aspergillosis?*
Being immunocompromised/debilitated

*How does the fungus gain access to the orbit?*
By direct spread from adjacent sinusitis

Aspergillosis
Orbital disease

Fungal pathogenic conditions

- Keratitis
- Sclerosis
- Conjunctivitis

Zygomycosis

Aspergillosis

What is the chief predisposing factor in invasive aspergillosis?
- Being immunocompromised/debilitated

How does the fungus gain access to the orbit?
- By direct spread from adjacent sinusitis

How does it present?
- It is highly variable—it can be fulminant, or chronic. Fulminant cases present with severe pain, proptosis and decreased VA. Intracranial spread is common, and results in a high mortality rate. Chronic cases mimic malignancy—less pain, more gradual proptosis and loss of function. The mortality rate is lower, but still significant.

(Note: The Plastics book reserves the term invasive aspergillosis for fulminant cases, and refers to chronic cases as chronic necrotizing aspergillosis.)
What is the chief predisposing factor in invasive aspergillosis? Being immunocompromised/debilitated

How does the fungus gain access to the orbit? By direct spread from adjacent sinusitis

How does it present? It is highly variable—it can be fulminant, or chronic
Orbital disease

**Fungal pathogenic conditions**

- Keratitis
- Scleritis
- Chorioretinitis

**Zygomycosis**

- **What is the chief predisposing factor in invasive aspergillosis?**
  - Being immunocompromised/debilitated

- **How does the fungus gain access to the orbit?**
  - By direct spread from adjacent sinusitis

**Aspergillosis**

- **How does it present?**
  - It is highly variable—it can be fulminant, or chronic. Fulminant cases present with severe pain, proptosis and decreased VA. Intracranial spread is common, and results in a high mortality rate.
What is the chief predisposing factor in invasive aspergillosis?
Being immunocompromised/debilitated

How does the fungus gain access to the orbit?
By direct spread from adjacent sinusitis

How does it present?
It is highly variable—it can be fulminant, or chronic. Fulminant cases present with severe pain, proptosis and decreased VA. Intracranial spread is common, and results in a high mortality rate. Chronic cases mimic malignancy—less pain, more gradual proptosis and loss of function. The mortality rate is lower, but still significant.
**Common Ocular Fungal Pathogens**

**Fungal pathogenic conditions**

- Keratitis
- Scleritis
- Optic neuropathy

**Orbital disease**

- Sceritis
- Keratitis
- Zygomyositis
- Aspergillosis

**What is the chief predisposing factor in invasive aspergillosis?**
Being immunocompromised/debilitated

**How does the fungus gain access to the orbit?**
By direct spread from adjacent sinusitis

**How does it present?**
It is highly variable—it can be fulminant, or chronic. Fulminant cases present with severe pain, proptosis and decreased VA. Intracranial spread is common, and results in a high mortality rate. **Chronic cases mimic malignancy—less pain, more gradual proptosis and loss of function. The mortality rate is lower, but still significant.** (Note: The *Plastics* book reserves the term *invasive aspergillosis* for fulminant cases, and refers to chronic cases as *chronic necrotizing aspergillosis*.)
This 82-year-old woman presented with a 6-week history of left brow and orbital pain. \textbf{A}, 4 weeks before evaluation, she suddenly lost vision in her left eye, and ptosis and proptosis developed 1 week later.
This 82-year-old woman presented with a 6-week history of left brow and orbital pain. A, 4 weeks before evaluation, she suddenly lost vision in her left eye, and ptosis and proptosis developed 1 week later. B, CT scan revealed a destructive lesion at the orbital apex.
This 82-year-old woman presented with a 6-week history of left brow and orbital pain. A, 4 weeks before evaluation, she suddenly lost vision in her left eye, and ptosis and proptosis developed 1 week later. B, CT scan revealed a destructive lesion at the orbital apex. C, Biopsy of the lesion showed septate hyphae consistent with aspergillosis.
Who is the typical allergic aspergillosis pt?

- An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis.

What would a blood draw reveal?

- The usual atopic/allergic findings: Lots of eos and high levels of IgE.

Fundamentally, allergic aspergillosis is a garden-variety IgE-mediated hypersensitivity reaction of the sort often seen in atopic pts.

OK, so these pts have a stuffy nose. Why is this worth talking about?

- Because this inflammatory sinus-mucosa response can spread to the mucosa of the orbit. (This is especially the case if the sphenoid sinus is involved.)

- Further, the mucosal inflammatory response is severe enough to erode bone, allowing the fungus access to the intracranial space.

How is allergic aspergillosis diagnosed?

- Via sinus biopsy

How is it treated?

- Via surgical debridement of the sinuses, and steroids
Who is the typical allergic aspergillosis pt?

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis.

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How is allergic aspergillosis diagnosed?
Via sinus biopsy

How is it treated?
Via surgical debridement of the sinuses, and steroids
Who is the typical allergic aspergillosis pt?
An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

Keratitis

Orbital disease

Chorioretinitis

Zygomycosis

Aspergillosis

Invasive

Allergic

Who is the typical allergic aspergillosis pt? An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

Do they tend to be immunocompromised, like invasive aspergillosis pts?
Who is the typical allergic aspergillosis pt?
An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

Do they tend to be immunocompromised, like invasive aspergillosis pts?
No, just the opposite—these pts are almost always immunocompetent (the condition requires the mounting of a robust immune response)
Who is the typical allergic aspergillosis pt?
An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

What would a blood draw reveal?
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**Common Ocular Fungal Pathogens**

Fungal pathogenic conditions

Keratitis

Orbital disease

Zygomycosis

Aspergillosis

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- **How is it treated?**
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Aspergillosis

Orbital disease

Keratitis

Zygomycosis

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Common Ocular Fungal Pathogens

Fungal pathogenic conditions

Keratitis
Orbital disease
Chorioretinitis
Zygomycosis
Aspergillosis
Invasive
Allergic
CT demonstrating allergic aspergillosis involving the left posterior ethmoid and sphenoid sinus with bony expansion and compression of the left optic nerve
Who is the typical allergic aspergillosis pt?
An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

What would a blood draw reveal?
The usual atopic/allergic findings: Lots of eosinophils and high levels of IgE.
Fundamentally, allergic aspergillosis is a garden-variety IgE-mediated hypersensitivity reaction of the sort often seen in atopic pts.

OK, so these pts have a stuffy nose. Why is this worth talking about?
Because this inflammatory sinus-mucosa response can spread to the mucosa of the orbit (This is especially the case if the sphenoid sinus is involved.)

When this occurs, how does it manifest clinically, ie, what S/S will be present?
In effect, the inflammation will act like a space-occupying mass near the orbital apex, thereby producing some combination of proptosis, ophthalmoplegia, and optic neuropathy, as well as pain localizing to the retrobulbar region.
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

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**Common Ocular Fungal Pathogens**

**Fungal pathogenic conditions**

- **Endophthalmitis**
- **Fungal pathogen**
- **ic conditions**

**Zygomycosis**

**Chorioretinitis**

**Sceritis**

**Keratitis**

**Optic neuropathy**

- **Common Ocular Fungal Pathogens**
  - **Zygomycosis**
  - **Chorioretinitis**
  - **Sceritis**
  - **Keratitis**
  - **Optic neuropathy**

**Orbital disease**

**Zygomycosis**

- **Invasive**
  - **Allergic**

**Who is the typical allergic aspergillosis pt?**

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

**What would a blood draw reveal?**

The usual atopic/allergic findings: Lots of eos and high levels of IgE.
Fundamentally, allergic aspergillosis is a garden-variety IgE-mediated hypersensitivity reaction of the sort often seen in atopic pts.

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**When this occurs, how does it manifest clinically, ie, what S/S will be present?**

In effect, the inflammation will act like a space-occupying mass near the orbital apex, thereby producing some combination of proptosis, ophthalmoplegia, and optic neuropathy.
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

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Orbital disease

Keratitis

Zygomycosis

Invasive
Who is the typical allergic aspergillosis pt?
An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

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OK, so these pts have stuffy noses. Why is this worth talking about?
Because this inflammatory sinus-mucosa response can spread to the mucosa of the orbit. (This is especially the case if the sphenoid sinus is involved.)

When this occurs, how does it manifest clinically, ie, what S/S will be present?
In effect, the inflammation will act like a space-occupying mass near the orbital apex, thereby producing some combination of proptosis, ophthalmoplegia, and optic neuropathy, as well as pain localizing to the retrobulbar region.
Who is the typical allergic aspergillosis pt?
An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

What would a blood draw reveal?
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Fundamentally, allergic aspergillosis is a garden-variety IgE-mediated hypersensitivity reaction of the sort often seen in atopic pts.

OK, so these pts have a stuffy nose. Why is this worth talking about?
Because this inflammatory sinus-mucosa response can spread to the mucosa of the orbit. (This is especially the case if the sphenoid sinus is involved.) Further, the mucosal inflammatory response is severe enough to erode bone, allowing the fungus access to the intracranial space.
Allergic aspergillosis: Bony destruction
Who is the typical allergic aspergillosis pt?
An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

What would a blood draw reveal?
The usual atopic/allergic findings: Lots of eos and high levels of IgE.
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Because this inflammatory sinus-mucosa response can spread to the mucosa of the orbit. (This is especially the case if the sphenoid sinus is involved.) Further, the mucosal inflammatory response is severe enough to erode bone, allowing the fungus access to the intracranial space.

How is allergic aspergillosis diagnosed?

How is allergic aspergillosis treated?
Via surgical debridement of the sinuses, and steroids

Orbital disease

Aspergillosis

Invasive

Zygomycosis

Common Ocular Fungal Pathogens

Keratitis

Chorioretinitis

Endophthalmitis

Fungal pathogenic conditions

Allergic

Invasive
**Common Ocular Fungal Pathogens**

**Fungal pathogenic conditions**

- Endophthalmitis
- Fungal pathogen
- Invasive conditions

**Keratitis**

- Sceritis
- Keratitis

**Orbital disease**

- Chorioretinitis
- Zygomycosis

**Aspergillosis**

- Invasive
- Allergic

**Who is the typical allergic aspergillosis pt?**

An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis.

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**How is allergic aspergillosis diagnosed?**

Via sinus biopsy.

**How is it treated?**

Via surgical debridement of the sinuses, and steroids.
Endophthalmitis
Fungal pathogen
IC conditions

Common Ocular Fungal Pathogens

Fungal pathogenic conditions

Aspergillosis

Who is the typical allergic aspergillosis pt?
An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

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What does the biopsy reveal?
Thick mucus (the classic description is ‘peanut-butter like’) containing fungal hyphae

Orbital disease

Zygomycosis

Invasive

Keratitis

Optic neuropathy

Sceritis

Common Ocular Fungal Pathogens

Aspergillosis

Allergic

Orbital disease

Invasive

Zygomycosis

Keratitis

Optic neuropathy

Sceritis

Common Ocular Fungal Pathogens

Aspergillosis

Allergic

Orbital disease

Invasive

Zygomycosis

Keratitis

Optic neuropathy

Sceritis
Fungal pathogenic conditions

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Aspergillosis

via sinus biopsy

Allergic

Invasive

Zygomycosis

Orbital disease

Chorioretinitis

Keratitis
**Common Ocular Fungal Pathogens**

**Fungal pathogenic conditions**

- **Endophthalmitis**
- **Fungal pathogen**
- **ic conditions**
- **Sceritis**
- **Keratitis**
- **Optic neuropathy**

**Common Ocular Fungal Pathogens**

- **Zygomycosis**
- **Chorioretinitis**
- **Invasive**
- **Noninvasive**

**Who is the typical allergic aspergillosis pt?**
An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

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Thick mucus (the classic description is ‘peanut-butter like’) containing fungal hyphae

**Aspergillosis**

**Orbital disease**

**Keratitis**

**Zygomycosis**

**Invasive**

**Allergic**

**How is allergic aspergillosis diagnosed?**
Via sinus biopsy

**How is it treated?**
Via surgical debridement of the sinuses, and steroids
Common Ocular Fungal Pathogens

Allergic aspergillosis: Biopsy specimen plated on whole-wheat agar
**Common Ocular Fungal Pathogens**

**Fungal pathogenic conditions**

- **Endophthalmitis**
- **Fungal pathogen**
- **ic conditions**

**Keratitis**

**Orbital disease**

- **Zygomycosis**
  - Invasive

**Aspergillosis**

- **Allergic**

**Who is the typical allergic aspergillosis pt?**
An individual with a PMHx of **atopy**, chronic **sinusitis**, and nasal **polyposis**

**What would a blood draw reveal?**
The usual atopic/allergic findings: Lots of **eos** and high levels of **IgE**.
Fundamentally, allergic aspergillosis is a garden-variety IgE-mediated hypersensitivity reaction of the sort often seen in atopic pts.

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Via sinus biopsy

**How is it treated?**
Via surgical debridement of the sinuses, and steroids
**Common Ocular Fungal Pathogens**

**Fungal pathogenic conditions**

- **Endophthalmitis**
- **Fungal pathogen**
- **ic conditions**

**Sceritis**

**Keratitis**

**Optic neuropathy**

**Zygomycosis**

**Chorioretinitis**

**Orbital disease**

1. **Aspergillosis**
   - **Invasive**
   - **Allergic**

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Via surgical debridement of the sinuses, and steroids
**Common Ocular Fungal Pathogens**

**Fungal pathogenic conditions**

- **Keratitis**
- **Orbital disease**
  - **Zygomycosis**
  - **Aspergillosis**
    - Invasive
    - Allergic

**Who is the typical allergic aspergillosis pt?**
- An individual with a PMHx of atopy, chronic sinusitis, and nasal polyposis

**What would a blood draw reveal?**
- The usual atopic/allergic findings: Lots of eos and high levels of IgE.
- Fundamentally, allergic aspergillosis is a garden-variety IgE-mediated hypersensitivity reaction of the sort often seen in atopic pts.

**OK, so these pts have a stuffy nose. Why is this worth talking about?**
- Because this inflammatory sinus-mucosa response can spread to the mucosa of the orbit. (This is especially the case if the sphenoid sinus is involved.)
- Further, the mucosal inflammatory response is severe enough to erode bone, allowing the fungus access to the intracranial space.

**How is allergic aspergillosis diagnosed?**
- Via sinus biopsy

**How is it treated?**
- Via surgical debridement of the sinuses, and steroids

**You forgot to say ‘antifungals.’ And antifungals, right?**
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

Endophthalmitis
Keratitis
Orbital disease
Zygomycosis
Invasive

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Aspergillosis
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**Common Ocular Fungal Pathogens**

**Fungal pathogenic conditions**

- **Endophthalmitis**
- **Fungal pathogen**
- **ic conditions**

**Orbital disease**

- **Keratitis**
- **Chorioretinitis**

**Common Ocular Fungal Pathogens**

**Zygomycosis**

- **Invasive**
- **Noninvasive**

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**In a nutshell, what is the pathologic process in noninvasive aspergillosis?**

The fungus proliferates within the air space of the sinus—ie, not within the mucosa so much as upon it. This extramucosal proliferation eventually fills the air space and forms a 'fungal ball' that acts as a space-occupying lesion. If an aspergilloma forms near the orbital apex, it will produce the same signs and symptoms as any other mass—proptosis, decreased VA, ophthalmoplegia, and pain.

In addition to orbital S/S, what other complaints are typical?

Nasal congestion and rhinorrhea, and HA localizing to the periorbital region

How much inflammation is typically associated with noninvasive aspergillosis?

Little to none

How much bony erosion typically occurs?

Little to none

How is noninvasive aspergillosis managed?

Surgically
Fungal pathogenic conditions

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Orbital disease

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What is the formal name for an Aspergillus fungal ball?
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How is noninvasive aspergillosis managed? Surgically.

Which sinuses are adjacent to the orbital apex? The sphenoid and ethmoid.

Which sinuses are especially prone to hosting aspergillomas? The sphenoid and ethmoid.

Aspergillosis
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Zygomycosis

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Surgically

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The sphenoid and ethmoid
CT showing large aspergilloma invading the sphenoethmoid sinus and extending posteriorly with compression of the left optic nerve
**Fungal pathogenic conditions**

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**Orbital disease**

- Aspergillosis
  - Noninvasive

**Common Ocular Fungal Pathogens**

- Zygomycosis
- Invasive
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How is noninvasive aspergillosis managed? Surgically.

Are noninvasive aspergillosis pts immunocompromised like invasive aspergillosis pts, or immunocompetent like allergic aspergillosis pts? Unclear. The plastics book states that it occurs in immunocompetent individuals. The neuro book says it occurs in both immunocompetent and compromised individuals. Eyewiki says it occurs “primarily in immunocompetent pts.” FWIW, I think an OKAP/Boards pt would be presented as immunocompetent. Caveat emptor.
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**Orbital aspergillosis tl;dr**

- **Invasive**: Yes
- **Noninvasive**: Yes
- **Allergic**: No

- **Treat with surgery?**: Yes
- **Treat with antifungals?**: No
- **Mortality rate?**: Low
Orbital disease

Common Ocular Fungal Pathogens

**Orbital aspergillosis tl;dr**

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**Zygomycosis**

**Aspergillosis**

- Invasive
- Noninvasive
- Allergic

**Keratitis**

**Orbital disease**

**Chorioretinitis**
Common Ocular Fungal Pathogens

Orbital aspergillosis tl;dr

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Orbital disease

Zygomycosis

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#### Orbital aspergillosis tl;dr

- **Invasive aspergillosis**: Compromised
- **Allergic aspergillosis**: Competent
- **Noninvasive aspergillosis**: Competent

- **Bony erosions?**: Yes, Yes, No
- **Inflammation present?**: Yes, Yes, No
- **Treat with surgery?**: ?, ?, ?
### Orbital aspergillosis tl;dr

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- **Aspergillosis**
  - Invasive
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- **Keratitis**
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- **Sceritis**
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  - Bony erosions?: No
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  - Bony erosions?: Yes
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#### Orbital disease

- **Bony erosions?**
  - Yes: Treat with surgery
  - No: Treat with antifungals

#### Zygomyces
- **Immunostatus**
  - Compromised: Treat with antifungals
  - Competent: None

#### Compare
- **Mortality rate**
  - High: Invasive aspergillosis
  - Lower: Allergic aspergillosis
  - Lowest: Noninvasive aspergillosis
### Orbital aspergillosis tl;dr

<table>
<thead>
<tr>
<th></th>
<th>Invasive aspergillosis</th>
<th>Allergic aspergillosis</th>
<th>Noninvasive aspergillosis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Immunostatus</strong></td>
<td>Compromised</td>
<td>Competent</td>
<td>Competent</td>
</tr>
<tr>
<td><strong>Bony erosions?</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Inflammation present?</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Treat with surgery?</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Treat with antifungals?</strong></td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Mortality rate?</strong></td>
<td>?</td>
<td>?</td>
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</tr>
</tbody>
</table>

### Common Ocular Fungal Pathogens

- **Orbital disease**
  - **Aspergillosis**
    - Invasive
    - Noninvasive
    - Allergic
  - **Keratitis**
  - **Chorioretinitis**
  - **Zygomycosis**

**Immunostatus**
- Compromised
- Competent

**Bony erosions?**
- Yes
- No

**Inflammation present?**
- Yes
- No

**Treat with surgery?**
- Yes
- No

**Treat with antifungals?**
- Yes
- No

**Mortality rate?**
- ?
| Common Ocular Fungal Pathogens |

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- Zygomycosis
- Aspergillosis
- Invasive
- Noninvasive
- Allergic
- Keratitis
- Orbital disease
- Chorioretinitis
Fungal optic neuropathy can occur via several means:

- As we have seen in some detail, zygomycosis and aspergillosis can produce optic neuropathy by one of several mechanisms.
- The other fungal optic neuropathy addressed in the BCSC is papilledema due to cryptococcal meningitis in patients with HIV/AIDS.

Common Ocular Fungal Pathogens

Fungal pathogenicic conditions

- Keratitis
- Sceritis
- Orbital disease
- Optic neuropathy
- Chorioretinitis
- Endophthalmitis

Fungal optic neuropathy can occur via several means:
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The other fungal optic neuropathy addressed in the BCSC is papilledema secondary to cryptococcal meningitis in pts with HIV/AIDS.

**Common Ocular Fungal Pathogens**

- *Keratitis*
- *Scleritis*
- *Orbital disease*
- *Chorioretinitis*
- *Endophthalmitis*
- *Zygomycosis*
- *Aspergillosis* (Invasive, Noninvasive, Allergic)

**Fungal optic neuropathy** can occur via several means:

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Fungal optic neuropathy can occur via several means:

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--The other fungal optic neuropathy addressed in the *BCSC* is papilledema secondary to cryptococcal meningitis in pts with HIV/AIDS.
Is fungal chorioretinitis a common, or rare entity?
Fungal pathogenic conditions

- Keratitis
- Scleritis
- Orbital disease
- Optic neuropathy
- Chorioretinitis
- Endophthalmitis

Is fungal chorioretinitis a common, or rare entity?
It is quite rare
Is fungal chorioretinitis a common, or rare entity?
It is quite rare

*It occurs almost exclusively in one sort of pt—what sort is that?*
Is fungal chorioretinitis a common, or rare entity?
It is quite rare

*It occurs almost exclusively in one sort of pt—what sort is that?*
Debilitated via AIDS, malignancy, steroids, chronic illness, etc
Is fungal chorioretinitis a common, or rare entity?
It is quite rare

It occurs almost exclusively in one sort of pt—what sort is that?
Debilitated via AIDS, malignancy, steroids, chronic illness, etc

It occurs almost exclusively via one mechanism—what it is?
**Common Ocular Fungal Pathogens**

**Fungal pathogenic conditions**

- Keratitis
- Scleritis
- Orbital disease
- Optic neuropathy
- Endophthalmitis
- Chorioretinitis

*Is fungal chorioretinitis a common, or rare entity?*

It is quite rare

*It occurs almost exclusively in one sort of pt—what sort is that?*

Debilitated via AIDS, malignancy, steroids, chronic illness, etc

*It occurs almost exclusively via one mechanism—what it is?*

Fungemia, i.e., hematogenous spread from elsewhere
Which three species are responsible for the majority of fungal chorioretinitis cases?
Fungal pathogenic conditions

Keratitis
Orbital disease
Scleritis
Optic neuropathy
Endophthalmitis

Chorioretinitis
- Candida
- Aspergillus
- Cryptococcus

Common Ocular Fungal Pathogens

Which three species are responsible for the majority of fungal chorioretinitis cases?
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Orbital disease
Endophthalmitis
Fungal pathogen
ic conditions
Keratitis
Scleritis
Optic neuropathy
Chorioretinitis
Endophthalmitis
Common Ocular Fungal Pathogens

Candida
Aspergillus
Cryptococcus

Histoplasma?

What about Histoplasma, the causative agent in POHS? Why isn’t it on this list?

Histoplasma
Which three species are responsible for the majority of fungal chorioretinitis cases?

Orbital disease, Endophthalmitis, and Fungal pathogenic conditions

Keratitis, Sceritis, Optic neuropathy, Orbital disease, Endophthalmitis

Chorioretinitis

Candida, Aspergillus, Cryptococcus

Histoplasma?

Fungal pathogens

Yeasts, Molds

Septate, Nonseptate

Coccidioides, Histoplasma, Aspergillus, Fusarium, Mucor, Rhizopus

What about Histoplasma, the causative agent in POHS? Why isn’t it on this list?

Good question. The Path, Uveitis, and Retina books all acknowledge POHS is a chorioretinitis caused by Histoplasma, but none discuss it alongside other causes of fungal chorioretinitis.
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

- Keratitis
- Scleritis
- Optic neuropathy
- Orbital disease
- Endophthalmitis

Chorioretinitis

- Candida?
- Aspergillus?
- Cryptococcus?

Which three species are responsible for the majority of fungal chorioretinitis cases?

Of the three, which is the most common?
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Of the three, which is the most common? *Candida*
Common Ocular Fungal Pathogens

Fungal pathogenic conditions

- Keratitis
- Orbital disease
- Sceritis
- Optic neuropathy
- Endophthalmitis

Chorioretinitis

- Candida
- Aspergillus
- Cryptococcus

Which three species are responsible for the vast majority of fungal chorioretinitis cases?

- Candida
- Aspergillus
- Cryptococcus

Generally speaking, who is at risk for Candida chorioretinitis?

- Hospitalized, debilitated individuals
- Individuals with 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 chorioretinitis)

Of the three, which is the most common?

Candida
Fungal pathogenic conditions

Common Ocular Fungal Pathogens

- Keratitis
- Orbital disease
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**Chorioretinitis**

- **Candida**
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Which three species are responsible for the vast majority of fungal chorioretinitis cases?

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*Candida*

**Generally speaking, who is at risk for Candida chorioretinitis?**

Hospitalized, debilitated individuals

- Hospitalized
- Debilitated

Is there anything in particular that puts them at risk?

- Hx major GI surgery
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- Keratitis
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Candida, Aspergillus, Cryptococcus

Of the three, which is the most common?
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Common Ocular Fungal Pathogens

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- Keratitis
- Orbital disease
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Chorioretinitis
- Candida
- Aspergillus
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Orbital disease  
Scleritis  
Optic neuropathy

Chorioretinitis

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Aspergillus  
Cryptococcus

Endophthalmitis

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Candida
Fungal pathogenic conditions

- Keratitis
- Scleritis
- Orbital disease
- Optic neuropathy
- Chorioretinitis

Endophthalmitis

There are three subtypes of endophthalmitis—what are they?
There are three subtypes of endophthalmitis—what are they? Post-traumatic, post-surgical, and endogenous
There are three subtypes of endophthalmitis—what are they? **Post-traumatic, post-surgical, and endogenous**

Are post-traumatic and/or post-surgical endophthalmitis common entities?
There are three subtypes of endophthalmitis—what are they?
Post-traumatic, post-surgical, and endogenous

Are post-traumatic and/or post-surgical endophthalmitis common entities?
Not in the US, no
There are three subtypes of endophthalmitis—what are they?

Post-traumatic, post-surgical, and endogenous

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There is a country where fully 20% of post-surgical and post-traumatic endophthalmitis cases are fungal—which one?
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Post-traumatic, post-surgical, and endogenous

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There is a country where fully 20% of post-surgical and post-traumatic endophthalmitis cases are fungal—which one?

India
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How does endogenous endophthalmitis come to happen, ie, what’s the mechanism?
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Post-traumatic, post-surgical, and endogenous

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It develops when an endogenous chorioretinitis breaks through the ILM to enter the vitreous cavity
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We said these are the common causes of endogenous chorioretinitis.
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We said these are the common causes of endogenous chorioretinitis. It should follow that they are the common causes of endogenous fungal endophthalmitis. Are they?
How does endogenous endophthalmitis come to happen, ie, what’s the mechanism? It develops when an endogenous chorioretinitis breaks through the ILM to enter the vitreous cavity.

We said these are the common causes of endogenous chorioretinitis. It should follow that they are the common causes of endogenous fungal endophthalmitis. Are they? Indeed they are.
As noted earlier, Candida is the most common cause of fungal chorioretinitis. Is it also the most common cause of endogenous fungal endophthalmitis?
As noted earlier, Candida is the most common cause of fungal chorioretinitis. Is it also the most common cause of endogenous fungal endophthalmitis? Indeed it is
Recall that these are the two species responsible for most fungal keratitis cases.
Recall that these are the two species responsible for most fungal keratitis cases. The *Retina* book goes out of its way to state that fungal keratitis can progress to endophthalmitis. It also indicates that one of these two pathogens is particularly likely to do so. Which one?
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