Intravenous Drug Use & Endogenous Endophthalmitis

Dean Eliott
Associate Director, Retina Service
Massachusetts Eye & Ear Infirmary
Stelios Evangelos Gragoudas Associate Professor
Harvard Medical School
Boston, MA

Endophthalmitis

- Exogenous
  - Postoperative
  - Traumatic
- Endogenous

Endophthalmitis

- Exogenous
  - Postoperative
  - Traumatic
- **Endogenous**

Endogenous Endophthalmitis

Risk Factors

- intravenous drug use
- positive blood cultures
- extraocular site of infection
- chronic antibiotic use
- indwelling catheter
- immunosuppression
  - diabetes, iatrogenic

Endogenous Endophthalmitis

- Microbiology
  - Fungi (more common)
  - Bacteria

Endogenous Endophthalmitis

- Microbiology
  - Fungi (more common)
    - Candida albicans (most common organism)
  - Bacteria

Endogenous Endophthalmitis

- Microbiology
  - Fungi (more common)
    - Candida albicans (most common organism)
    - Aspergillus, Cryptococcus, Fusarium
  - Bacteria

Endogenous Endophthalmitis

- Microbiology
  - Fungi (more common)
    - Candida albicans (most common organism)
    - Aspergillus, Cryptococcus, Fusarium
  - Bacteria
    - gram (+) - Staphylococcus, Streptococcus, Listeria
    - gram (-) - N. meningitidis, H. influenzae, enteric organisms

Endogenous Endophthalmitis

- Fungi
  - Yeasts (single-celled)
    - Candida, Cryptococcus

Endogenous Endophthalmitis

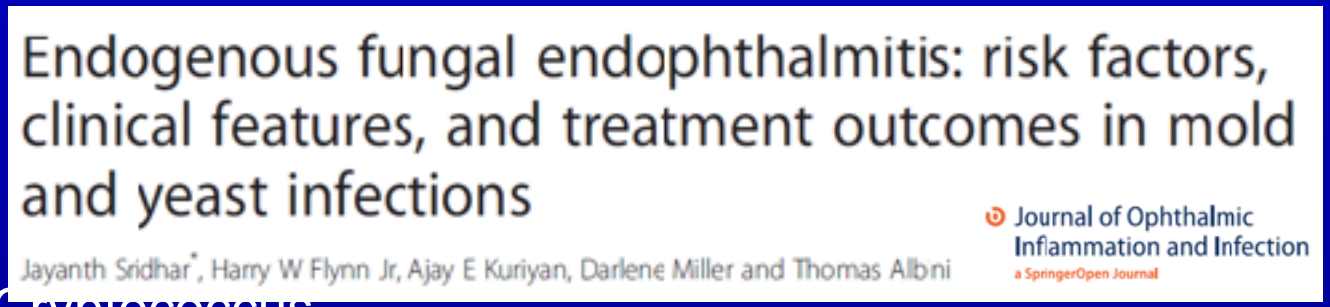
- Fungi
  - Yeasts (single-celled)
    - Candida, Cryptococcus
  - Molds (multicellular hyphae)
    - Aspergillus, Fusarium

Endogenous Endophthalmitis

- Fungi
  - Yeasts (single-celled)
    - Candida, Cryptococcus
  - Molds (multicellular hyphae)
    - Aspergillus, Fusarium
  - Dimorphic (both yeast and mold; grow as yeast in host)
    - Histoplasma, Coccidioides

Endogenous Endophthalmitis

- Fungi
  - Yeasts
    - Candida, Cryptococcus
  - Molds
    - Aspergillus, Fusarium
      - more likely to have history of organ transplantation or iatrogenic immunosuppression
      - more likely to present with short duration of symptoms, poor visual acuity, hypopyon
      - more likely to have poor visual outcome


Endogenous fungal endophthalmitis: risk factors, clinical features, and treatment outcomes in mold and yeast infections

Jayanth Sridhar*, Harry W Flynn Jr, Ajay E Kuriyan, Darlene Miller and Thomas Albini

Journal of Ophthalmic Inflammation and Infection
a SpringerOpen Journal

Endogenous Endophthalmitis

- Bacteria
  - Caucasians – endocarditis, septic joints
    - gram (+) organisms
    - recent increase in skin infections and MRSA
  - East Asians – hepatobiliary infection
    - Klebsiella

Endogenous Endophthalmitis

Risk Factors

- **intravenous drug use**
- positive blood cultures
- extraocular site of infection
- chronic antibiotic use
- indwelling catheter
- immunosuppression
  - diabetes, iatrogenic

Endogenous Endophthalmitis

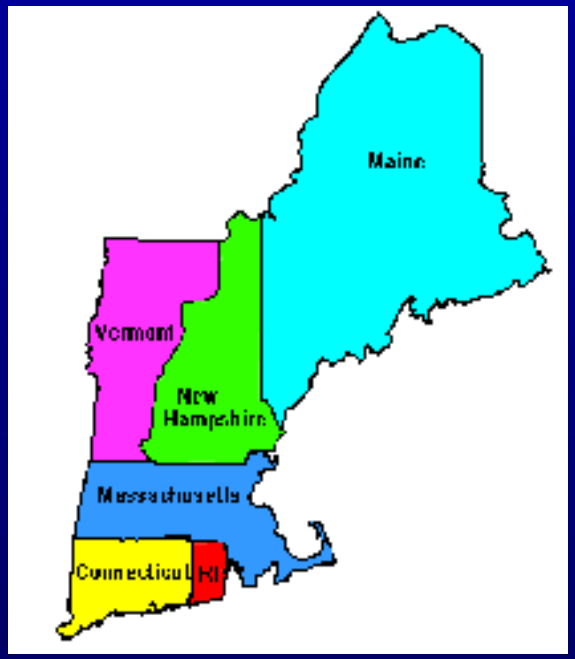
- Tripling of opioid overdose deaths 2000-2014

Endogenous Endophthalmitis

- Tripling of opioid overdose deaths 2000-2014
  - New England

Endogenous Endophthalmitis

- Tripling of opioid overdose deaths 2000-2014
  - New England highest rate 16.1/100,000



Endogenous Endophthalmitis

- Tripling of opioid overdose deaths 2000-2014
  - New England highest rate 16.1/100,000
    - New Hampshire highest state 26.2/100,000

Endogenous Endophthalmitis

Vision Loss Associated With the Opioid Epidemic

Preston M. Lhorg, BA
Edmund Tsui, MD
Nikhil Batra, MD
Christopher E. Chapman, MD
Michael F. Zegans, MD

An Outbreak of Endogenous Fungal Endophthalmitis Among Intravenous Drug Abusers in New England

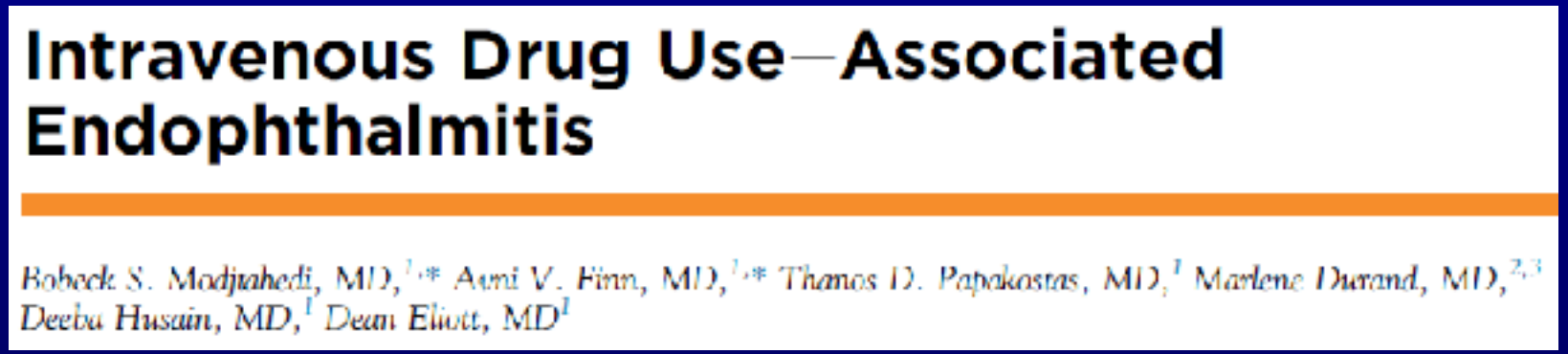
Aubrey R. Tirpack, MD; Jay S. Duker, MD; Caroline R. Baumal, MD

Intravenous Drug Use–Associated Endophthalmitis

Bobeck S. Modjtahedi, MD,[1,] Aemi V. Finn, MD,[1,*] Thanos D. Papakostas, MD,[1] Marlene Durand, MD,[2,3] Deeba Husain, MD,[1] Dean Eliott, MD[1]*

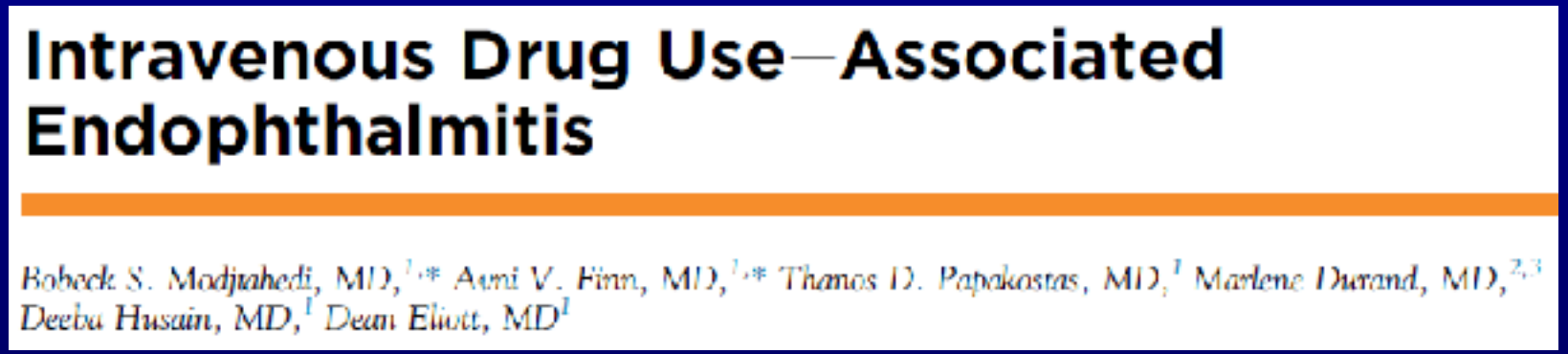
Endogenous Endophthalmitis

- Endophthalmitis 338 patients, 8 year period



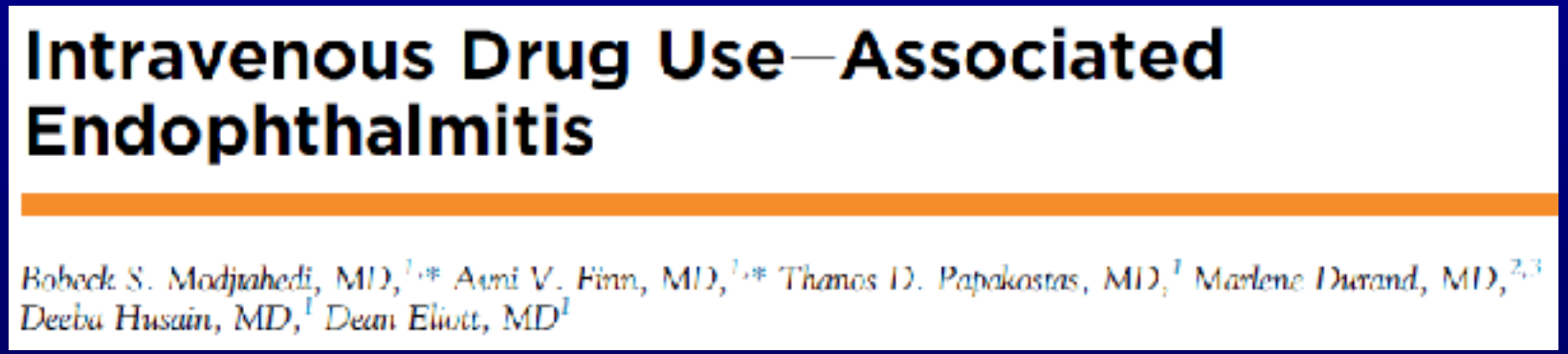
Endogenous Endophthalmitis

- Endophthalmitis 338 patients, 8 year period
  - Endogenous 63 patients (~20% versus 2-6% in the past)



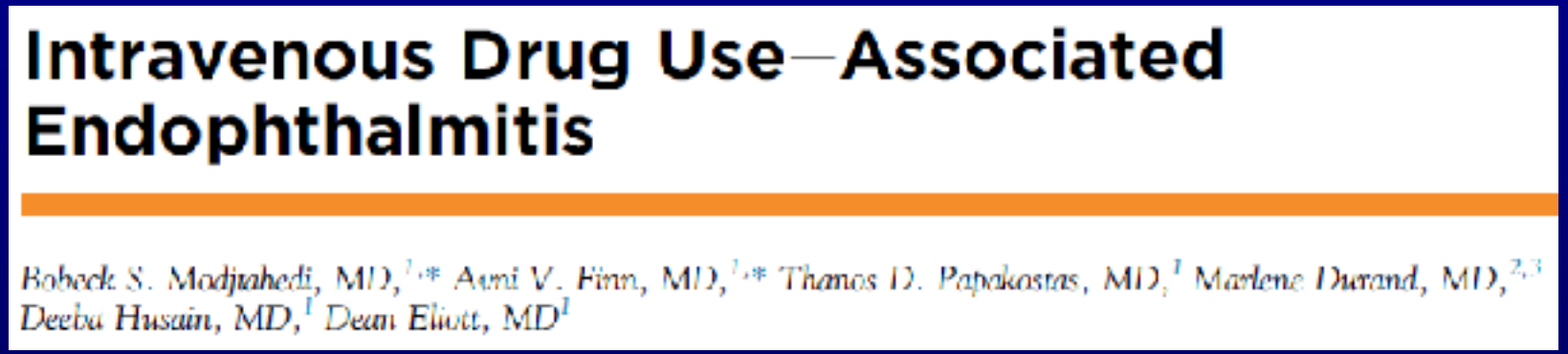
Endogenous Endophthalmitis

- Endophthalmitis 338 patients, 8 year period
  - Endogenous 63 patients (~20% versus 2-6% in the past)
    - **IVDU 30 patients (~50%) (~10% of all endophthalmitis cases)**



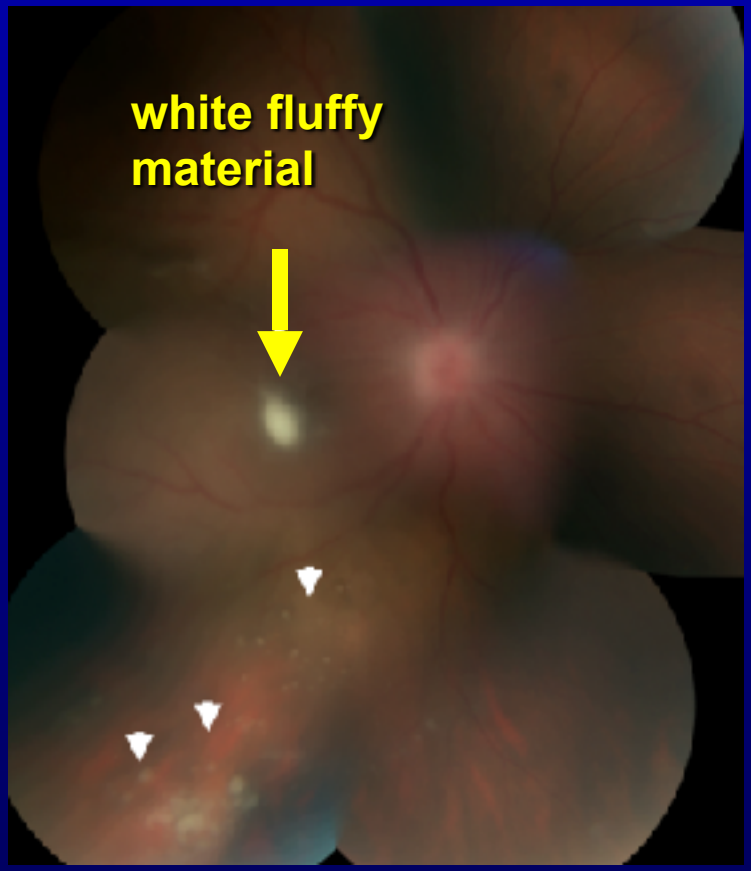
Endogenous Endophthalmitis

- Endophthalmitis 338 patients, 8 year period
  - Endogenous 63 patients (~20% versus 2-6% in the past)
    - **IVDU 30 patients (~50%) (~10% of all endophthalmitis cases)**
      - culture positivity: 59% fungal, 16% bacterial



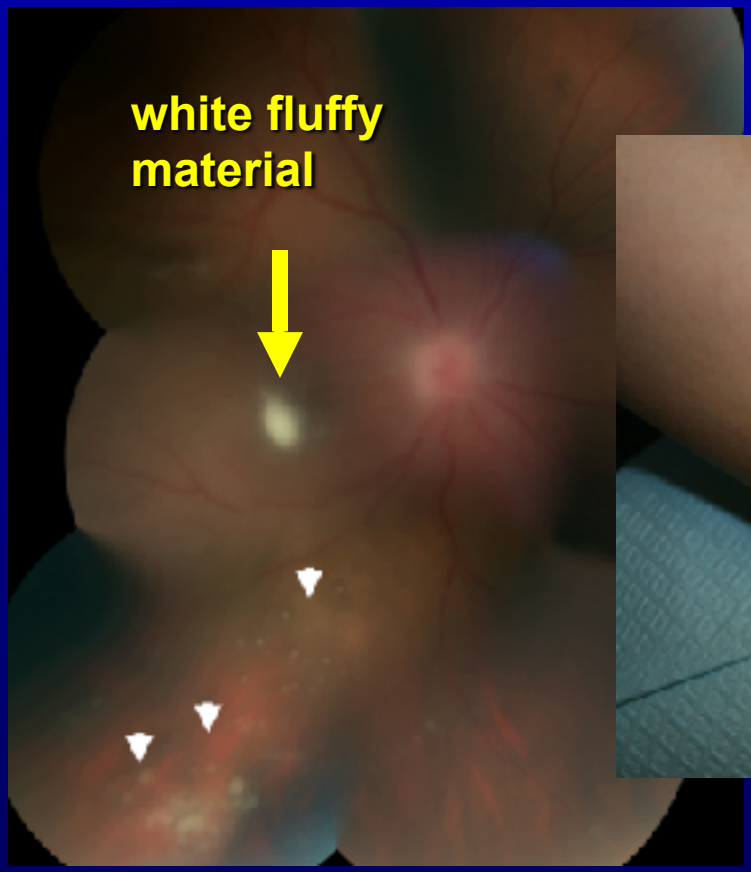
Endogenous Endophthalmitis

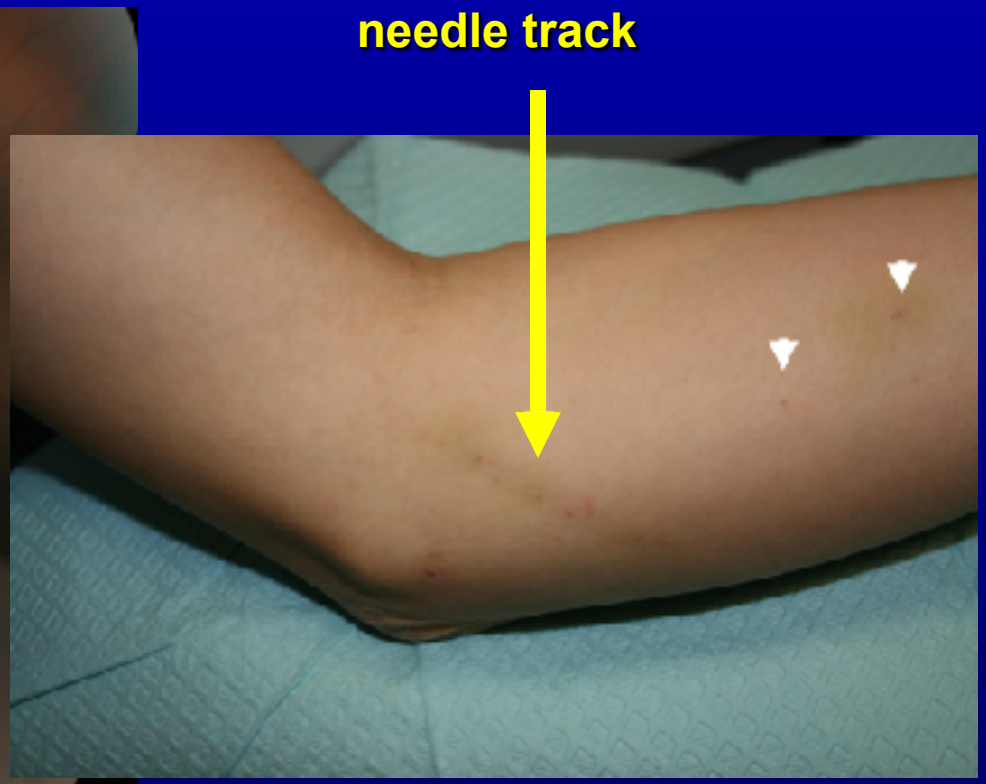
- Intravenous drug use



Endogenous Endophthalmitis

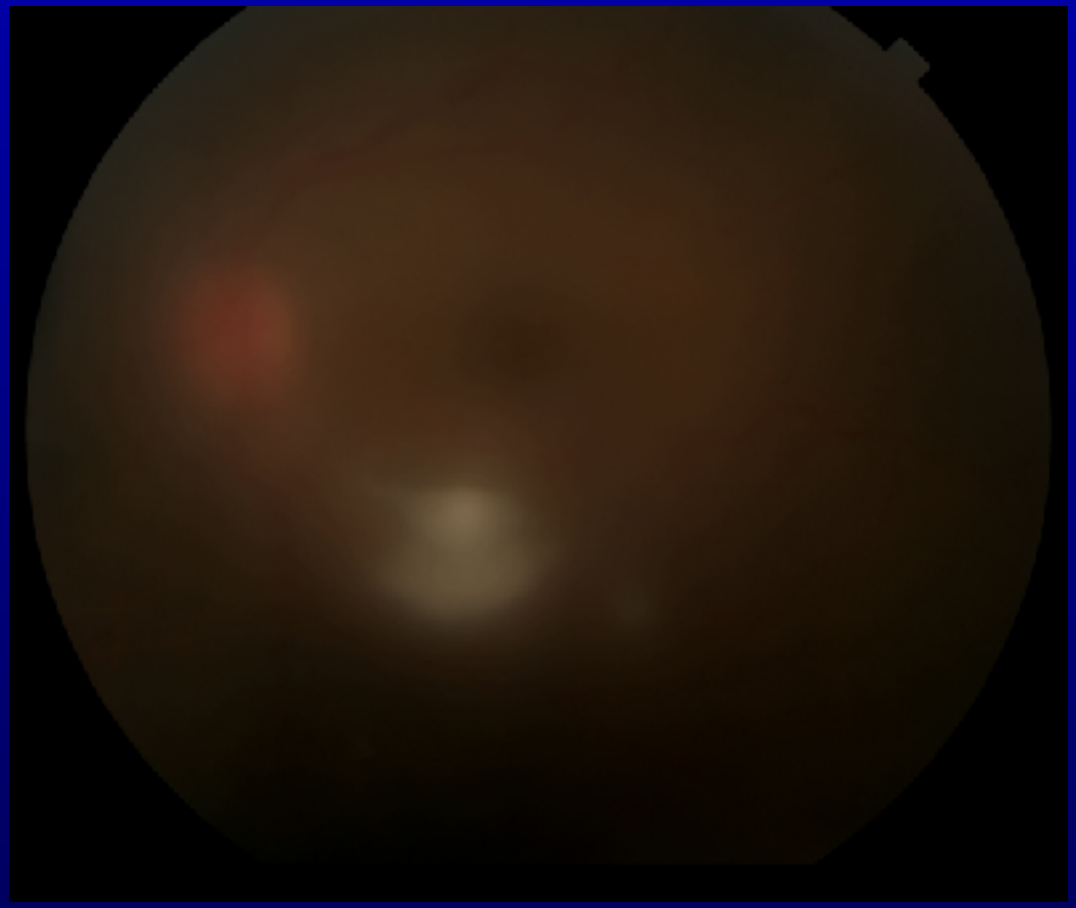
- Fungal endophthalmitis - **Candida**





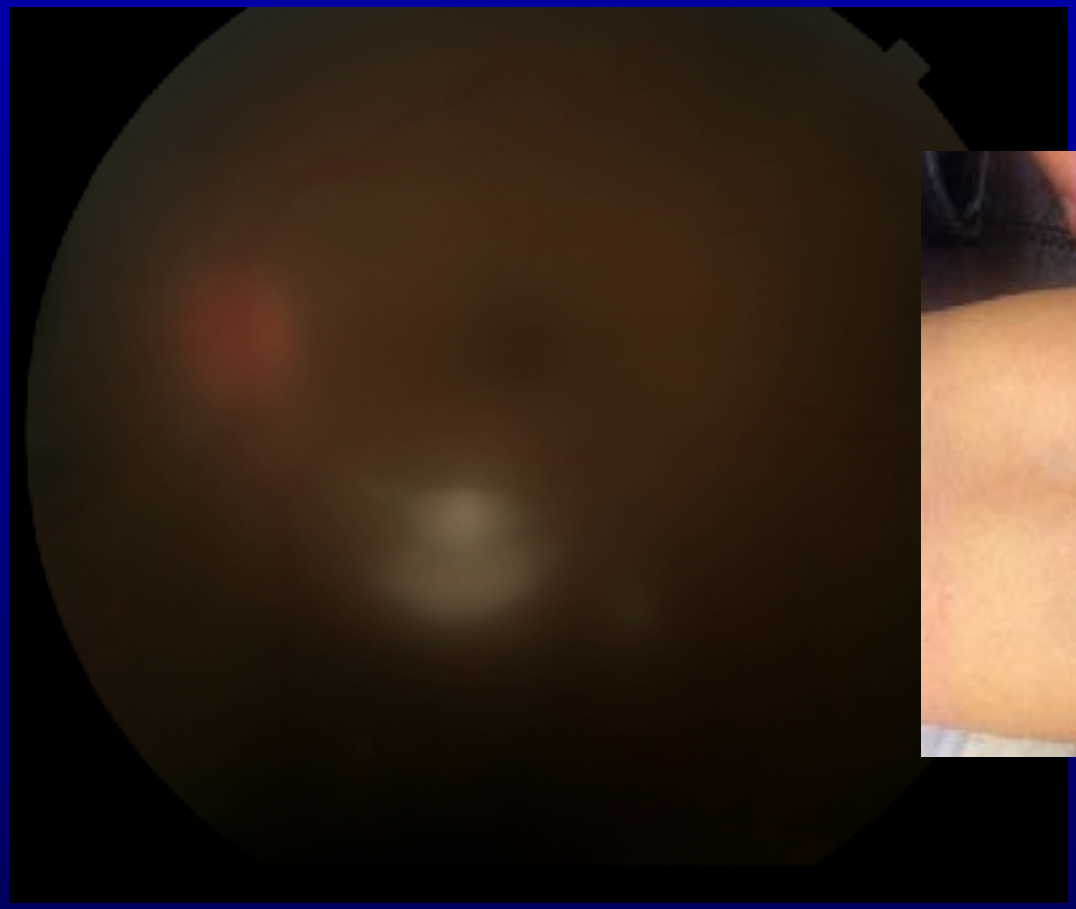
Endogenous Endophthalmitis

- Intravenous drug use



Endogenous Endophthalmitis

- Fungal endophthalmitis - **Candida**



Endogenous Endophthalmitis

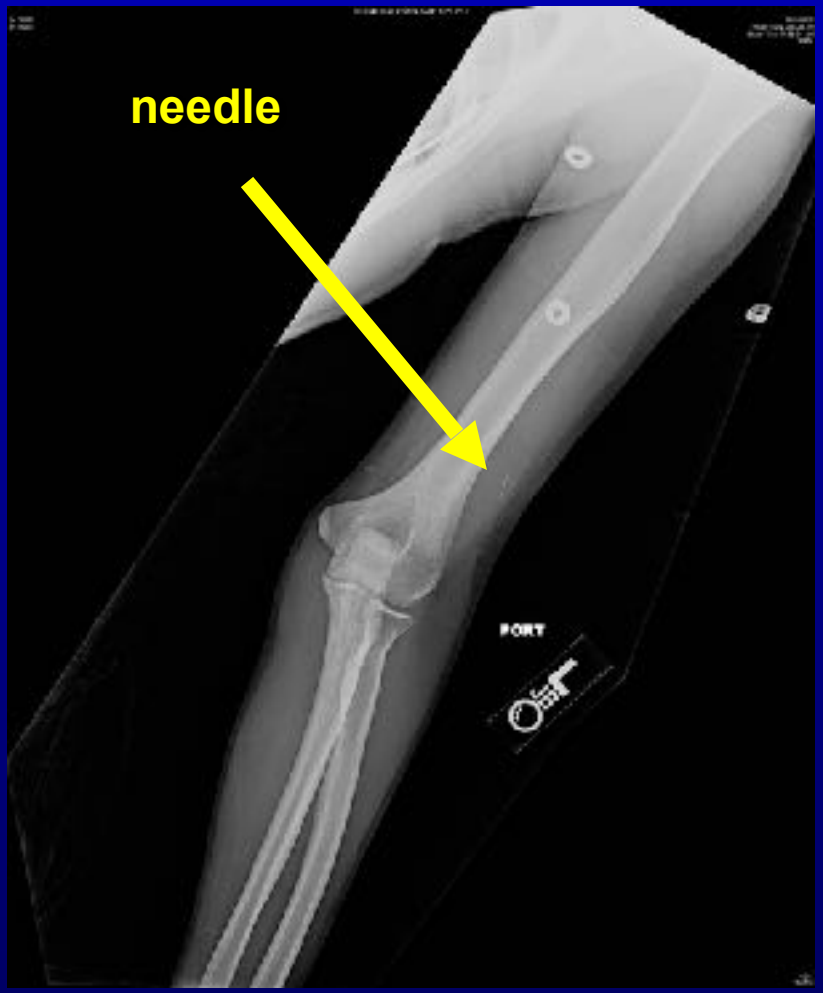
- Intravenous drug use

Courtesy of Jennifer Chao

Endogenous Endophthalmitis

- Fungal endophthalmitis

  Candida



Courtesy of Jennifer Chao

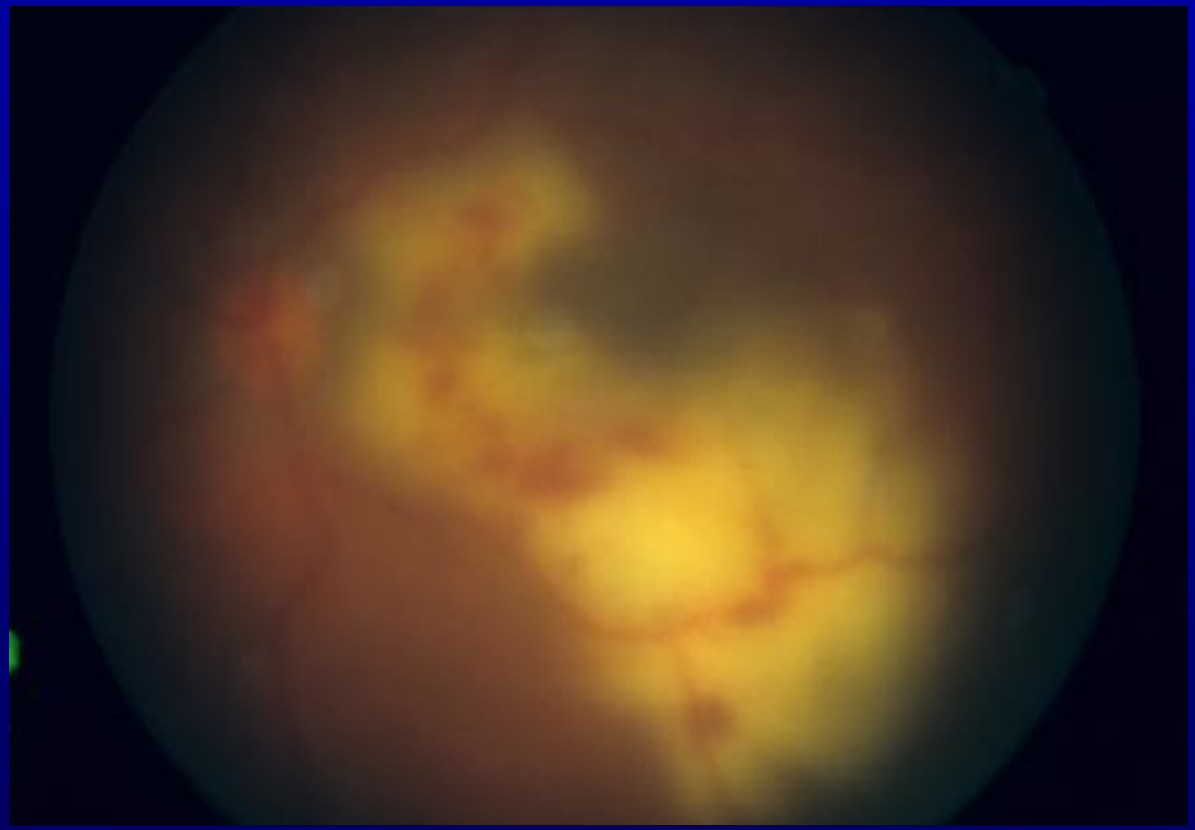
Endogenous Endophthalmitis

- Intravenous drug use
  - Fungal endophthalmitis - **Candida**

courtesy of Jennifer Chao

Endogenous Endophthalmitis

- 25 year old man
  - Intravenous drug use

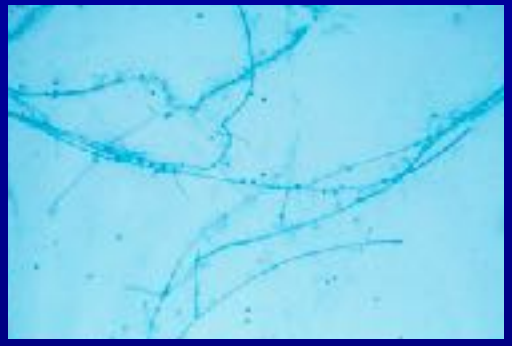


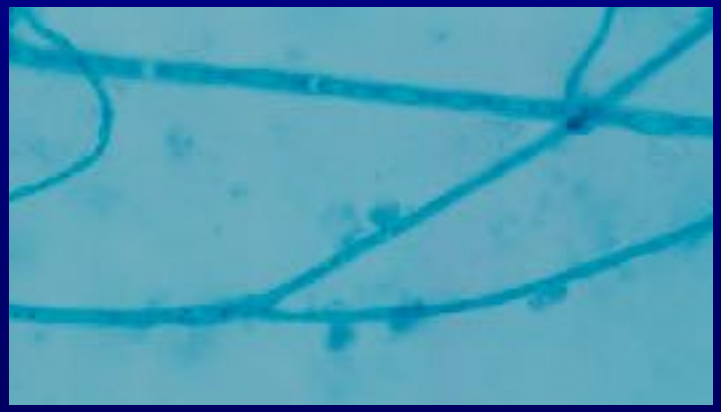
Endogenous Endophthalmitis

- 25 year old man
  - **Aspergillus**

Emerging Infectious Uveitis: *Aspergillus* and Other Fungi

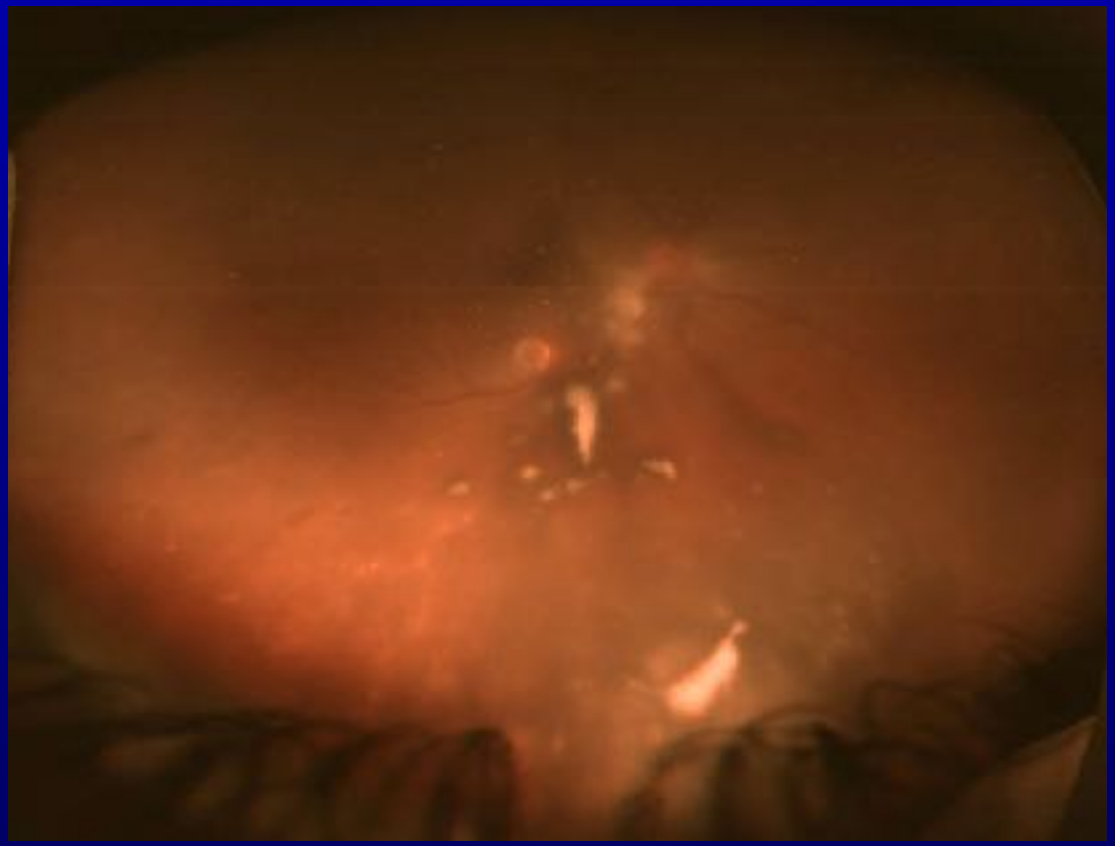
Avni V. Patel and Dean Eliott





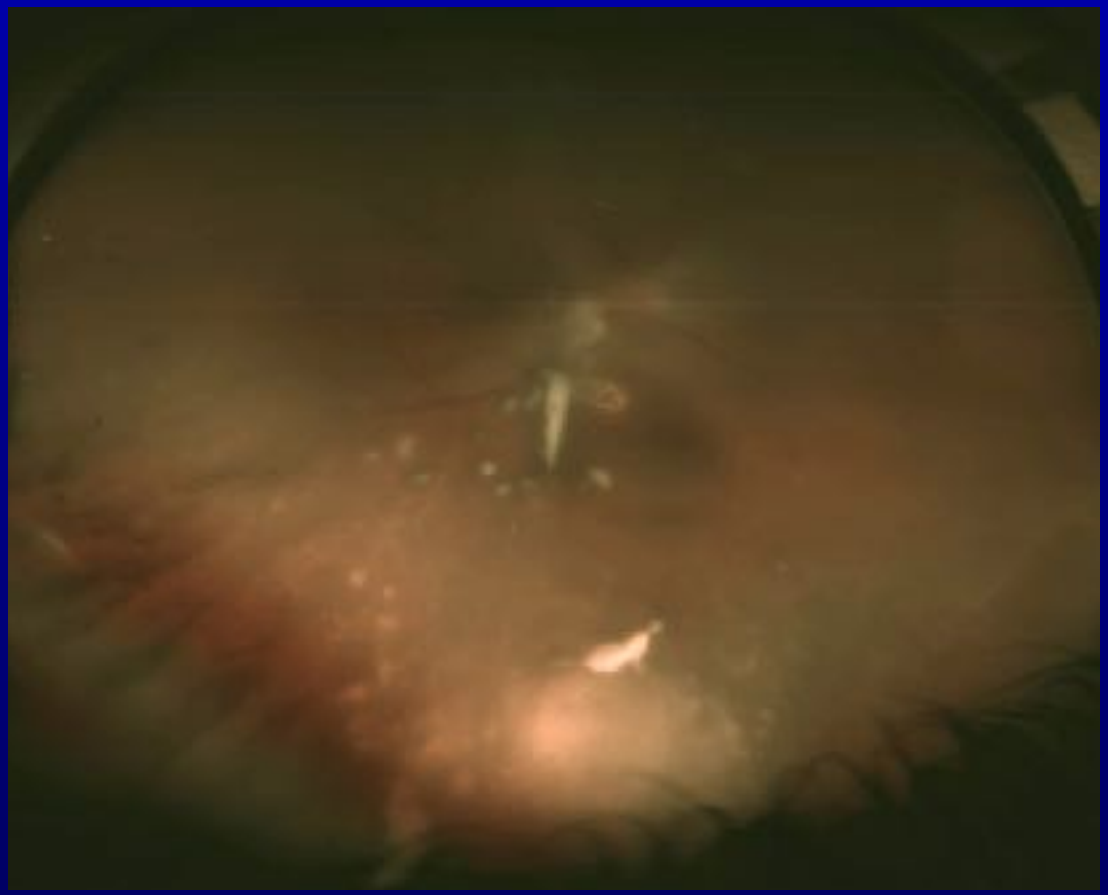
Endogenous Endophthalmitis

- Intravenous drug use



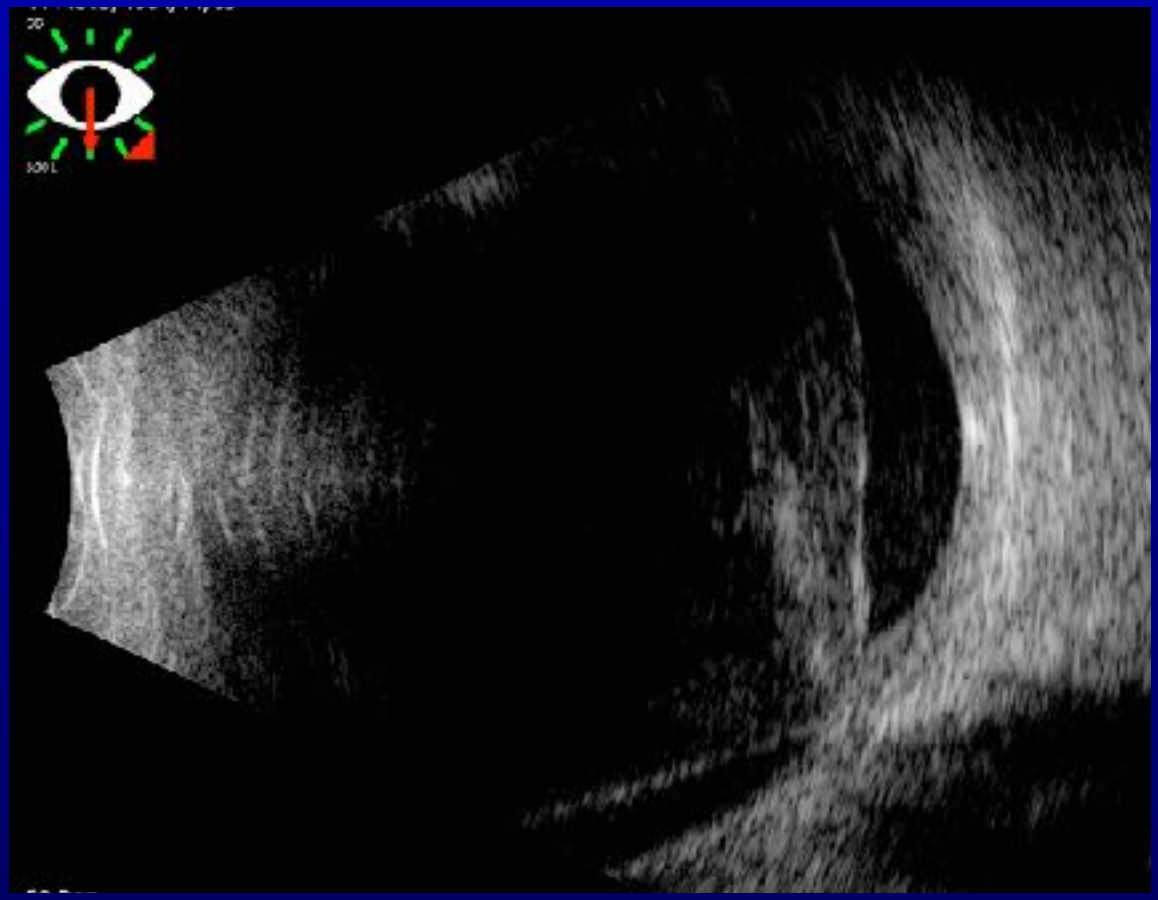
Endogenous Endophthalmitis

- Intravenous drug use



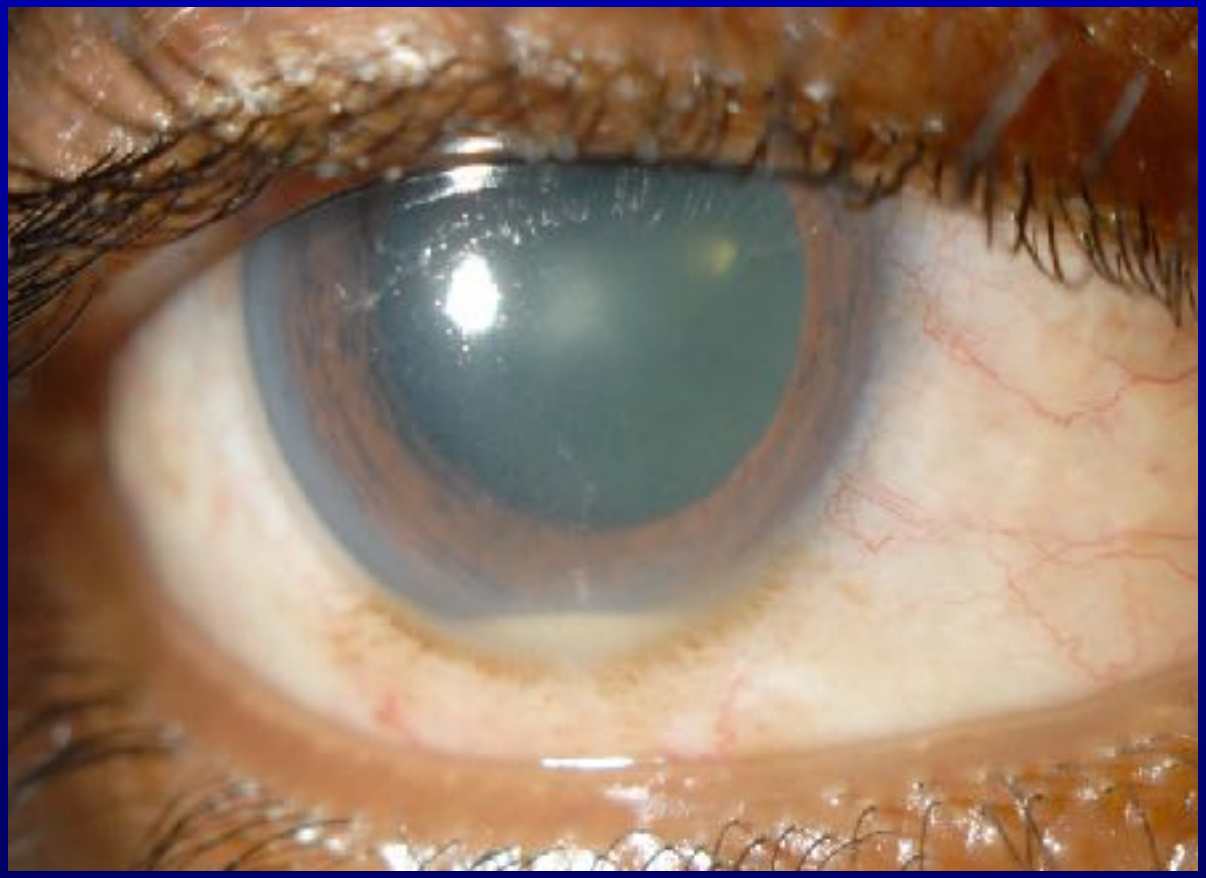
Endogenous Endophthalmitis

- Intravenous drug use



Endogenous Endophthalmitis

- Intravenous drug use

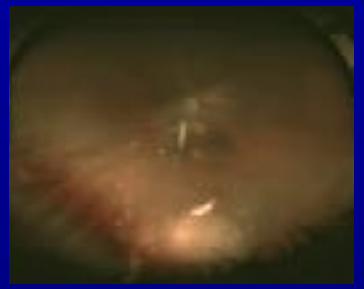


Endogenous Endophthalmitis

- Intravenous drug use

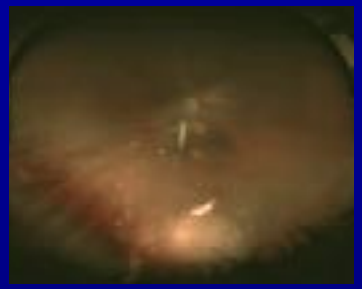
Endogenous Endophthalmitis

- management?



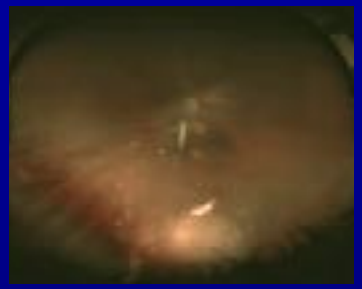
Endogenous Endophthalmitis

- tap/inject



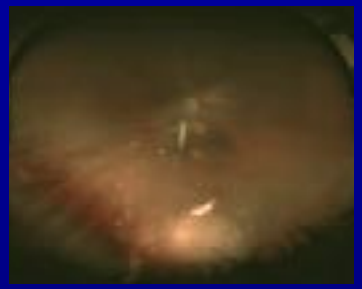
Endogenous Endophthalmitis

- tap/inject
  - vancomycin, ceftazidime, voriconazole



Endogenous Endophthalmitis

- tap/inject
  - vancomycin, ceftazidime, voriconazole
- admitted to hospital

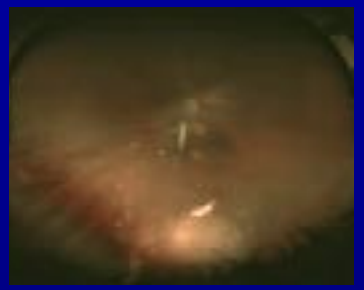


Endogenous Endophthalmitis

- tap/inject
  - vancomycin, ceftazidime, voriconazole
- admitted to hospital
- iv antibiotics/antifungals

Endogenous Endophthalmitis

- tap/inject
  - vancomycin, ceftazidime, voriconazole
- admitted to hospital
- iv antibiotics/antifungals
- underwent vitrectomy



Endogenous Endophthalmitis

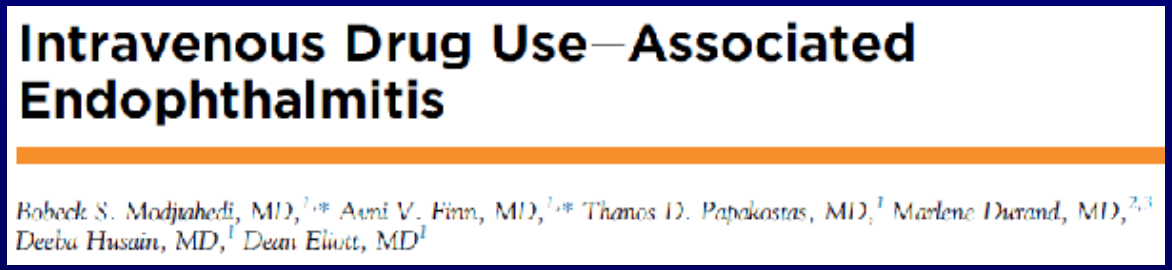
- tap/inject
  - vancomycin, ceftazidime, voriconazole
- admitted to hospital
- iv antibiotics/antifungals
- underwent vitrectomy
  - Candida albicans
  - Staph species

Treatment

- Vitrectomy
  - 18% initial PPV, no secondary procedures
  - 78% initial tap/inject, 55%secondary PPV
    - 52% culture positive


The Role of Vitrectomy in the Management of Fungal Endophthalmitis

Yewlin E. Chee & Dean Eliott


Intravenous Drug Use–Associated Endophthalmitis

Bobeck S. Modjtahedi, MD,[1,*] Avni V. Finn, MD,[1,*] Thanos D. Papakostas, MD,[1] Marlene Durand, MD,[2,3] Deeba Husain, MD,[1] Dean Eliott, MD[1]

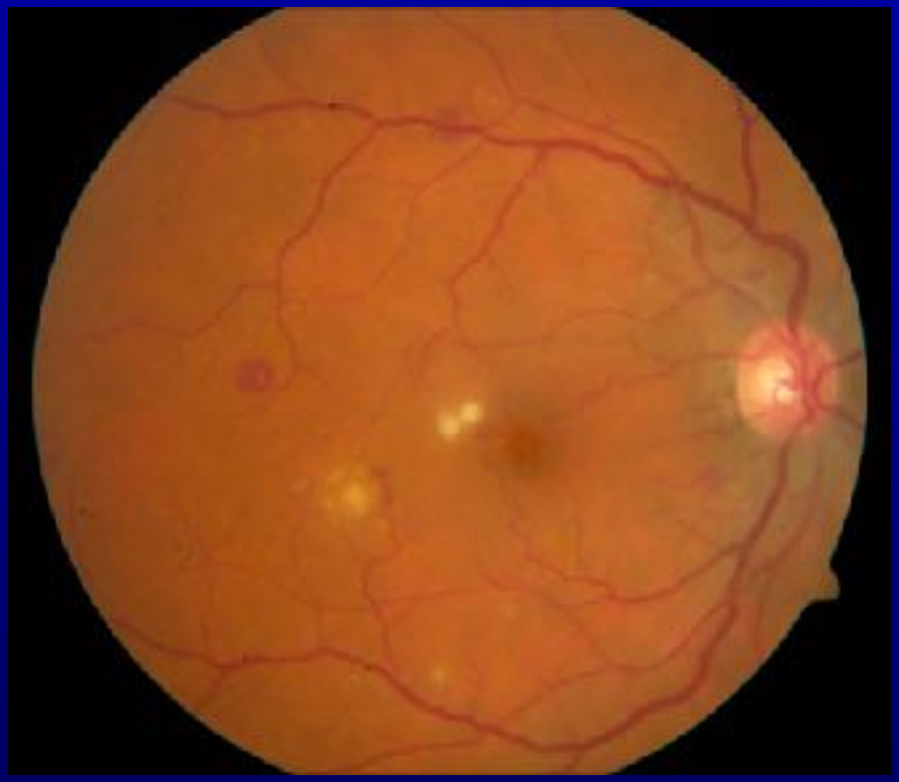
Endogenous Endophthalmitis

Risk Factors

- intravenous drug use
- **positive blood cultures**
- extraocular site of infection
- chronic antibiotic use
- indwelling catheter
- immunosuppression
  - diabetes, iatrogenic

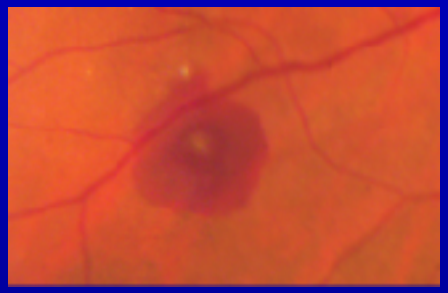
Endogenous Endophthalmitis

- 52 year old woman
  - blood cultures - **Candida**



Endogenous Endophthalmitis

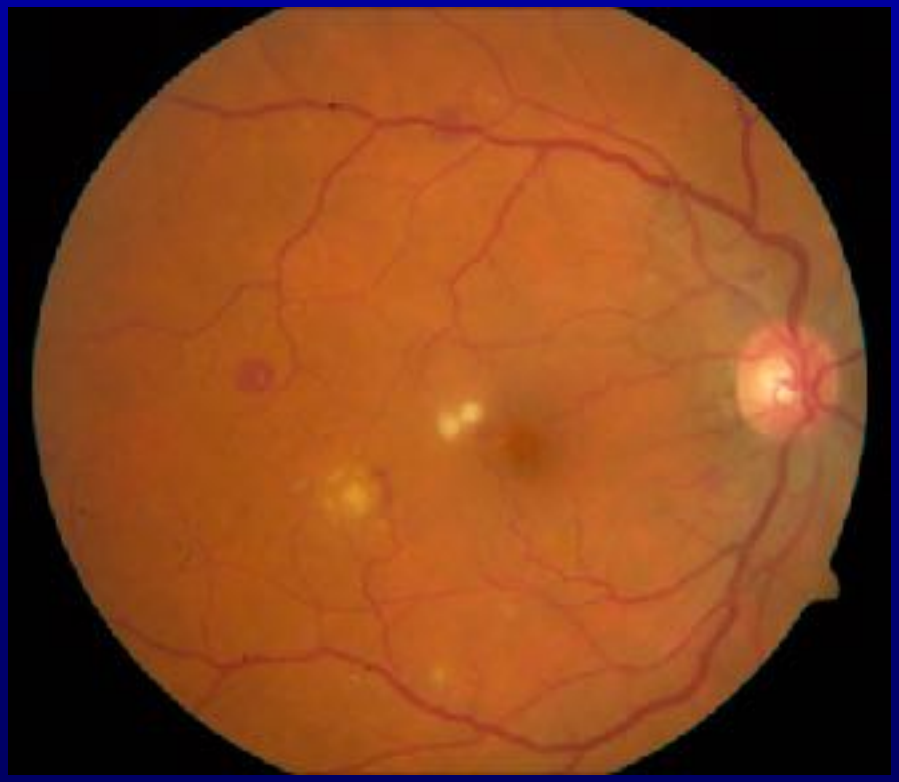
- 52 year old woman
  - blood cultures - **Candida**



White-Centered Retinal Hemorrhages

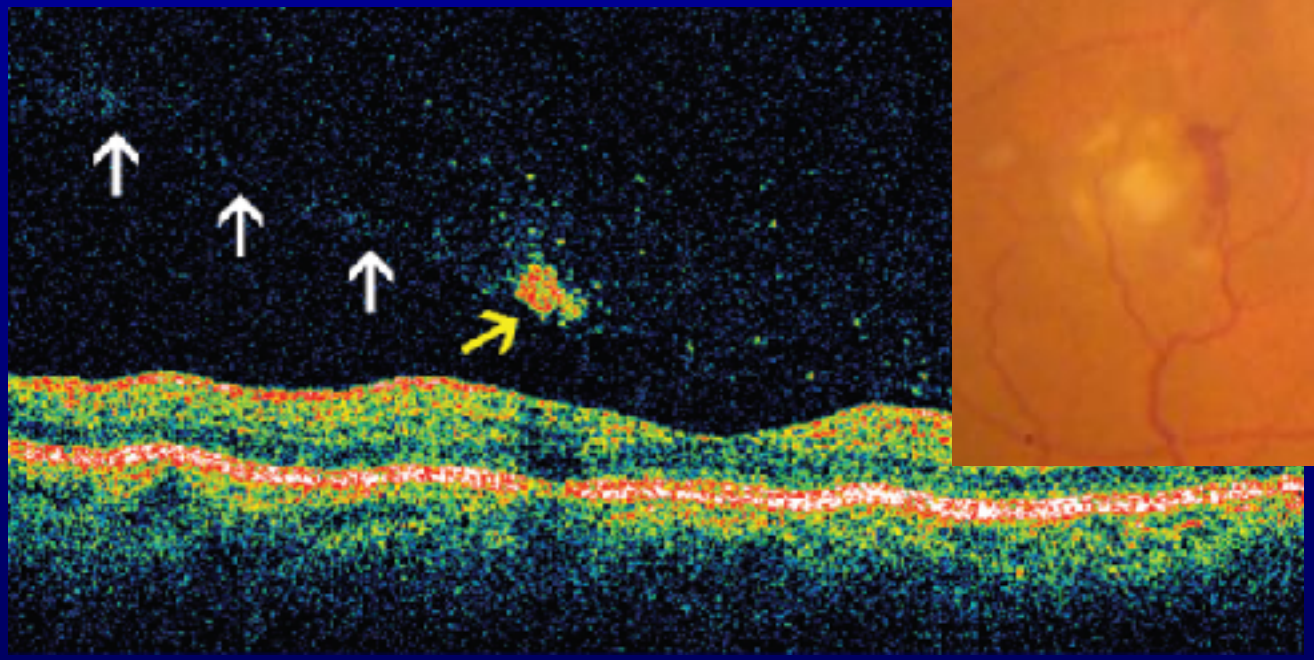
MICHAEL JAYAKER, MD
and BRUNO PERTICHI, CRA, OCTC
Doheny Retina Institute, Doheny Eye Institute and the Department of Ophthalmology, Keck School of Medicine, University of Southern California, Los Angeles, California

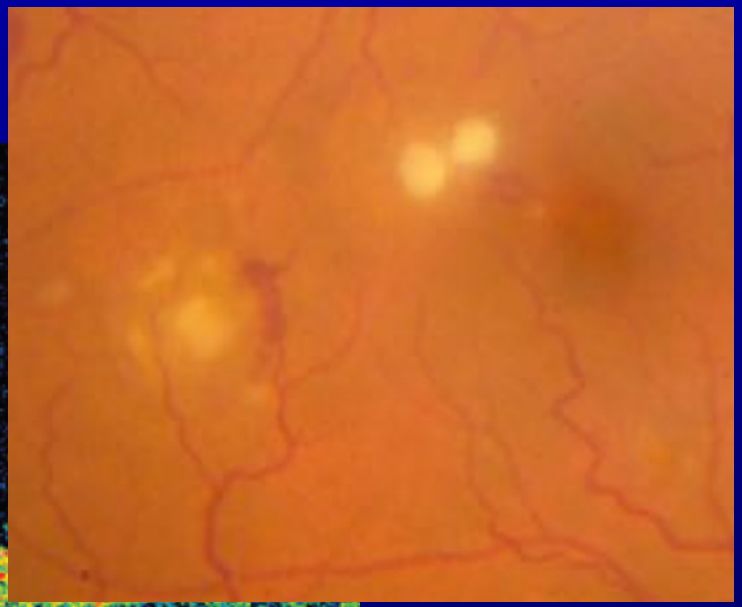
DEAN ELOTT, MD
Retina Service at Massachusetts Eye and Ear Infirmary, Harvard Medical School, Boston



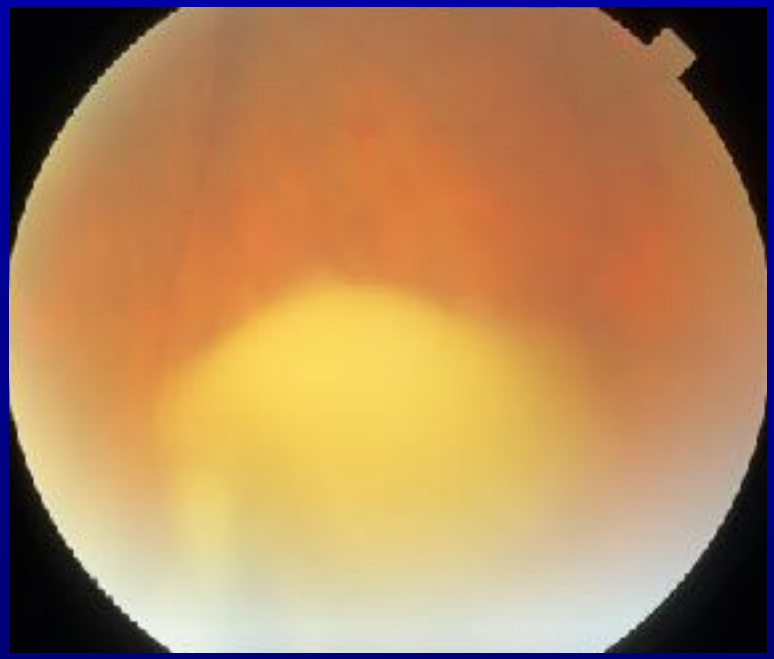
Endogenous Endophthalmitis

- 52 year old woman
  - given systemic antifungals (no intravitreal injection)
    - infection resolved





Endogenous Endophthalmitis

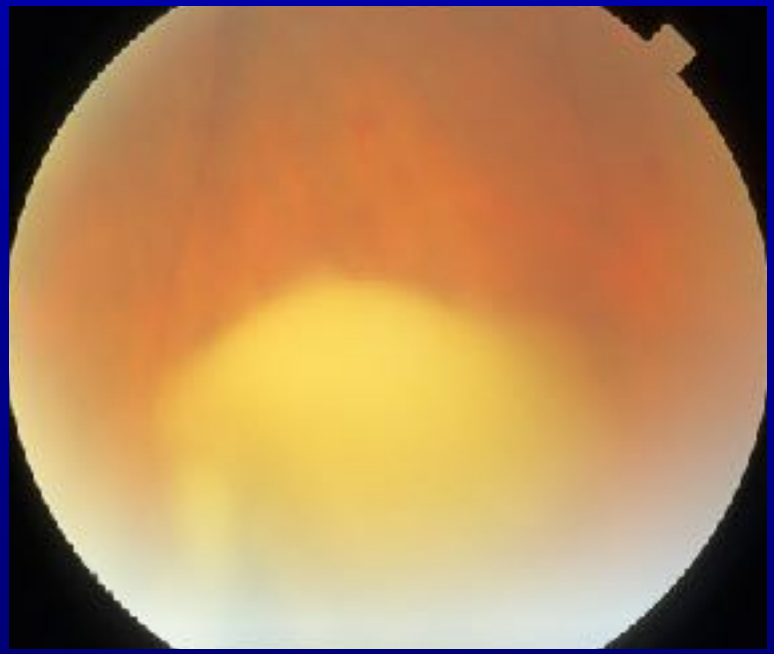


vitreous abscess

- 65 year old man
  - renal dialysis
    - presumed fistula infection
  - blood cultures
    - **Staph aureus**
  - pain & floaters OS
    - 20/20

Endogenous Endophthalmitis

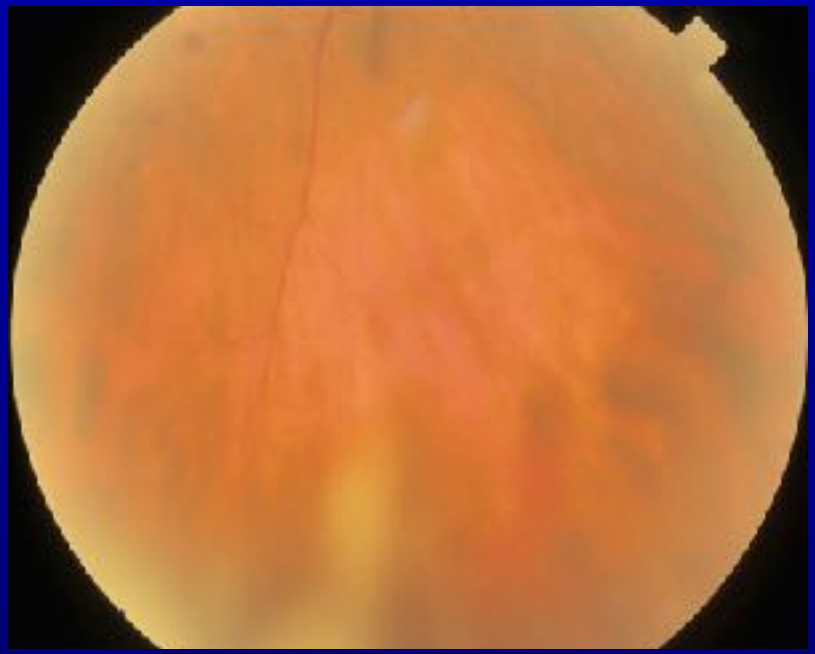
on presentation



vitreous abscess

tap / inject

after treatment



presumed Staph aureus

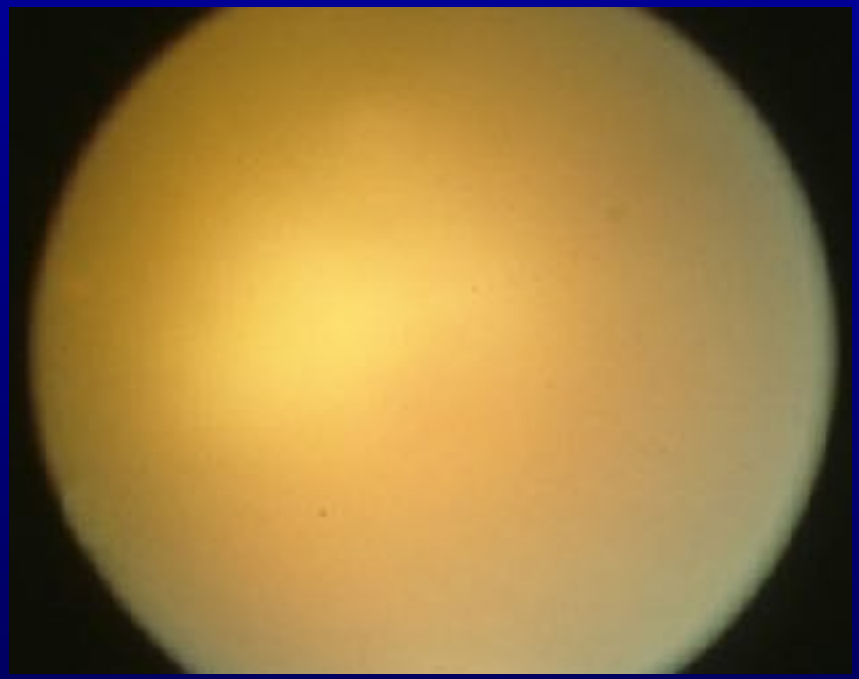
Endogenous Endophthalmitis

Risk Factors

- intravenous drug use
- positive blood cultures
- **extraocular site of infection**
- chronic antibiotic use
- indwelling catheter
- immunosuppression
  - diabetes, iatrogenic

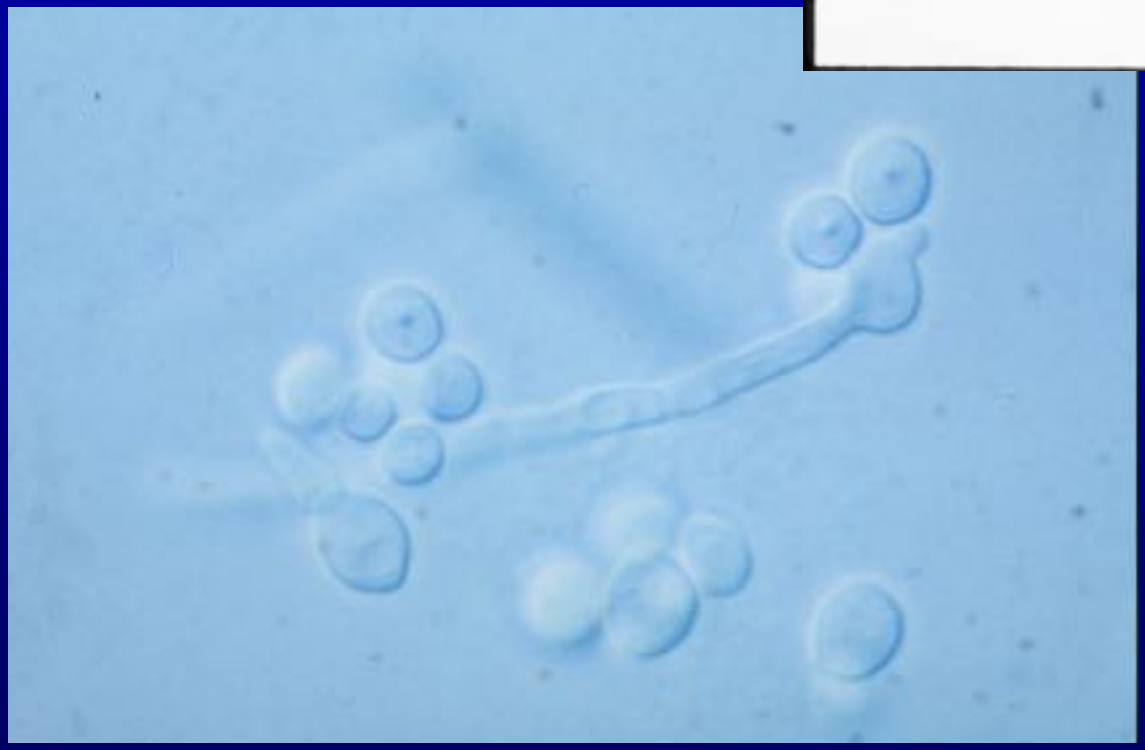
Endogenous Endophthalmitis

- 60 year old woman
  - chronic indwelling line - groin abscess
  - blood cultures - **Candida**



Endogenous Endophthalmitis

- 60 year old woman
  - vitrectomy - **Candida**

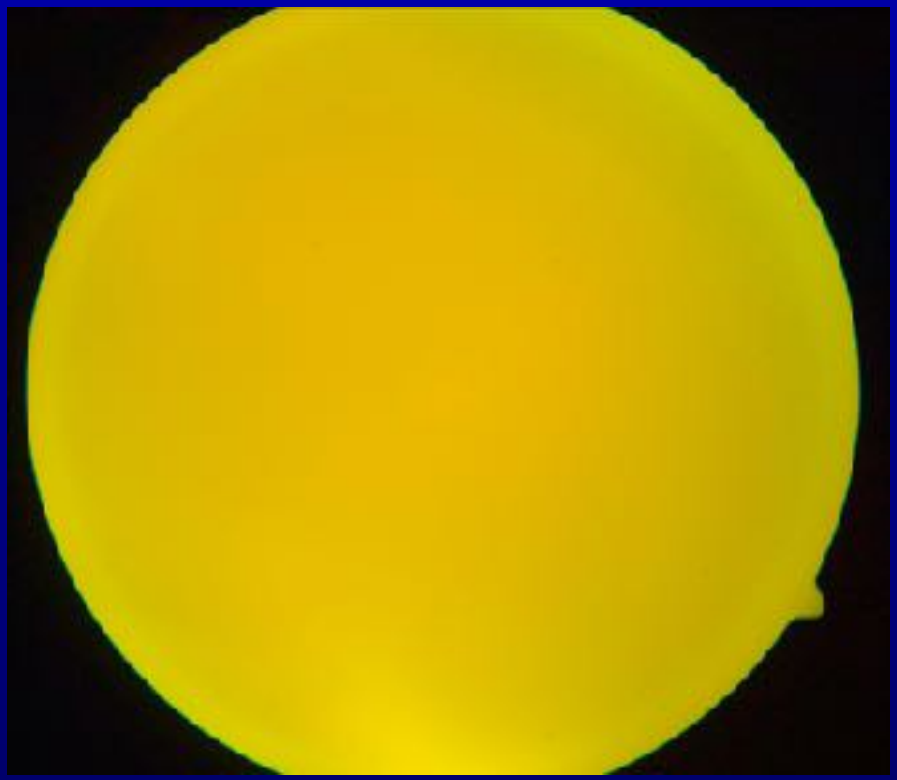


Endogenous Endophthalmitis

- 51 year old Vietnamese man
  - liver abscess, jaundice
  - blood cultures - **Klebsiella**

Endogenous Endophthalmitis

- 51 year old Vietnamese man
  - decreased vision OD
  - no hypopyon
  - dense vitritis
  - no fundus details



Endogenous Endophthalmitis

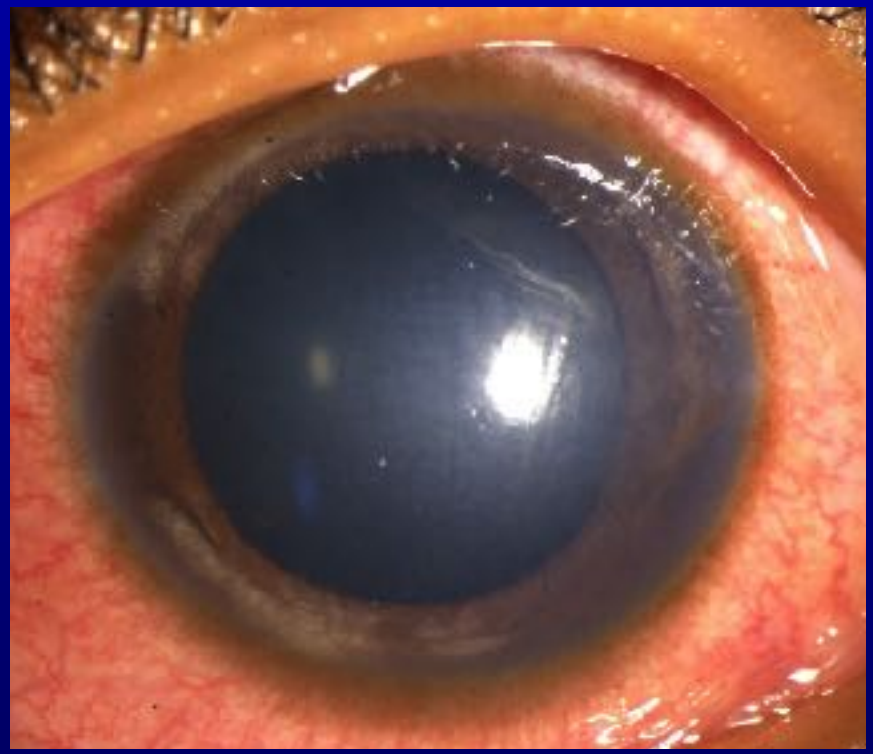
- 51 year old Vietnamese man
  - tap / inject: **Klebsiella**
  - vitrectomy: large area of retinal necrosis

Endogenous Endophthalmitis

- 10 year old boy
  - found unresponsive
  - lumbar puncture: **Neisseria meningitidis**
  - red eye OS

Endogenous Endophthalmitis

- 10 year old boy
  - tap / inject: **Neisseria meningitidis**
  - final vision 20/20
  - iris atrophy – reversible!



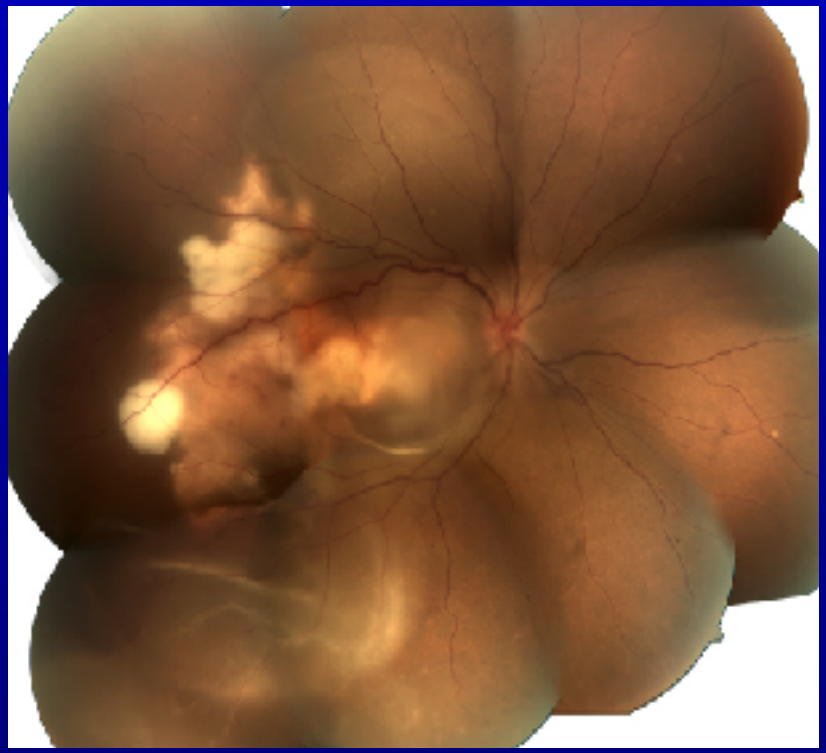
Endogenous Endophthalmitis

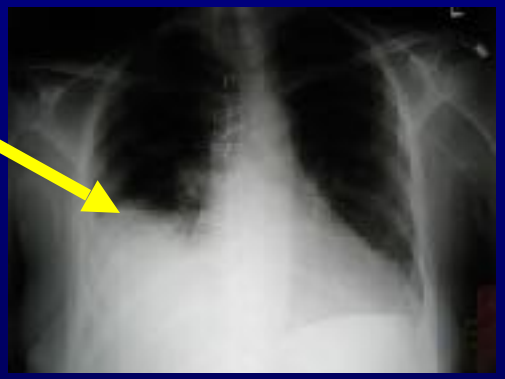
Risk Factors

- intravenous drug use
- positive blood cultures
- **extraocular site of infection**
- **chronic antibiotic use**
- **indwelling catheter**
- **immunosuppression**
  - diabetes, iatrogenic

Endogenous Endophthalmitis

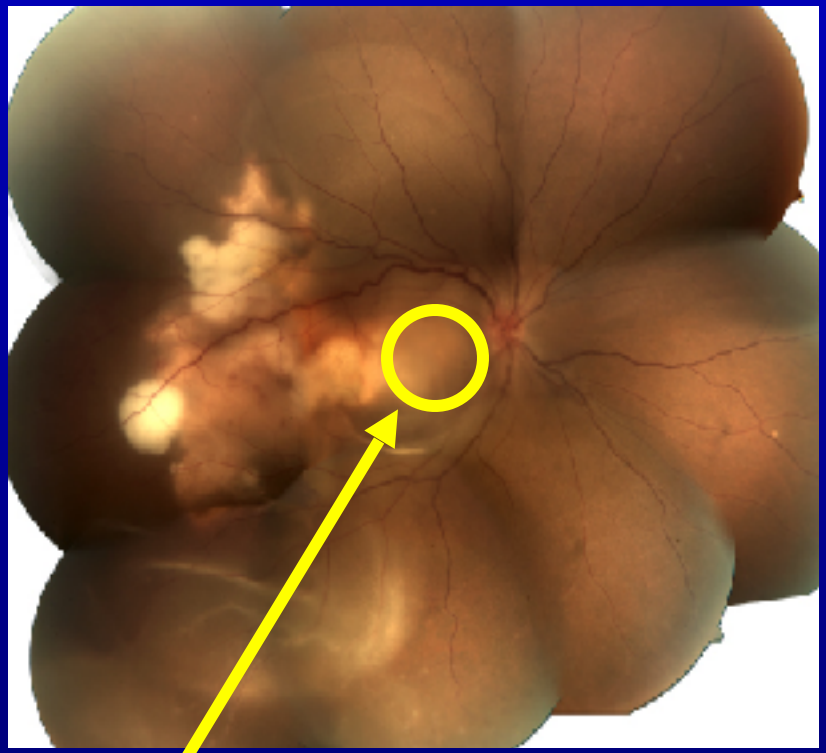
- 38 year-old woman
  - decreased vision OD few days
    - h/o cardiac transplantation
    - h/o cryptococcal meningitis
    - h/o cryptosporidial enteritis
    - h/o steroid induced diabetes
    - h/o pulmonary nodule
      - s/p multiple biopsies





Endogenous Endophthalmitis

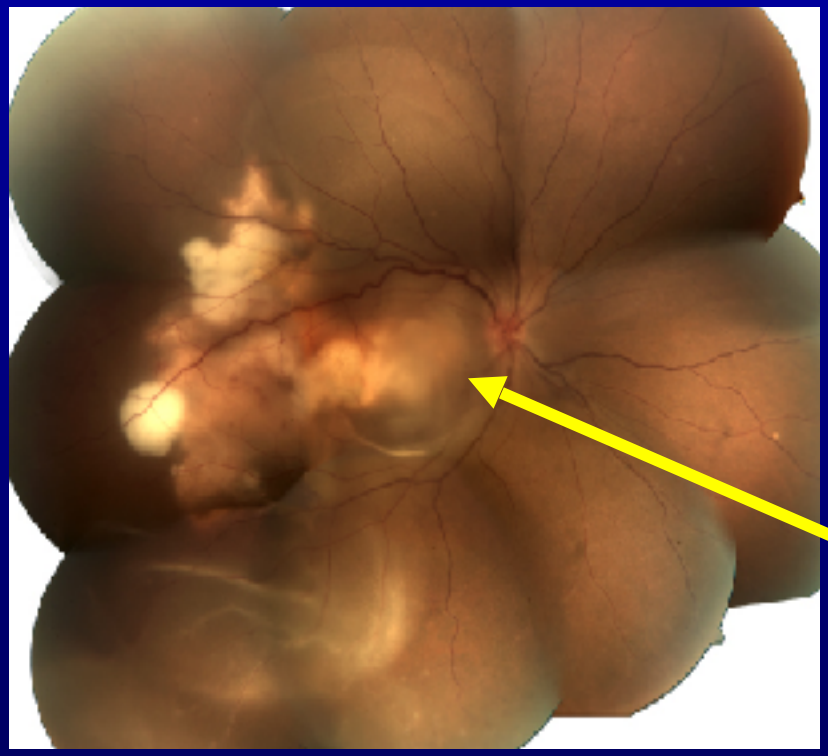
- 38 year-old woman
  - decreased vision OD few days
    - h/o cardiac transplantation
    - h/o cryptococcal meningitis
    - h/o cryptosporidial enteritis
    - h/o steroid induced diabetes
    - h/o pulmonary nodule
      - s/p multiple biopsies



focal vitreous inflammation

Endogenous Endophthalmitis

- diagnostic vitrectomy
  - undiluted vitreous & vitreous cassette - negative
  - focal vitreous aspirate - **Scedosporium prolificans**



focal vitreous aspirate

CONTROL OF DISSEMINATED *SCEDOSPORIUM PROLIFICANS* INFECTION AND ENDOPHTHALMITIS

Thomas M. O'Hearn, MD,* P. Jan Geiseler, MD,†
Rizwan Bhatti, MD,* Dean Eliott, MD*

Endogenous Endophthalmitis

Risk Factors

- intravenous drug use
- positive blood cultures
- extraocular site of infection
- chronic antibiotic use
- indwelling catheter
- **immunosuppression**
  - diabetes, iatrogenic

Endogenous Endophthalmitis

- 70 year old woman
  - severe immunosuppression (hematologic malignancy)
  - c/o bilateral decreased vision
  - skin lesions
  - vitreous aspirate – **Fusarium**

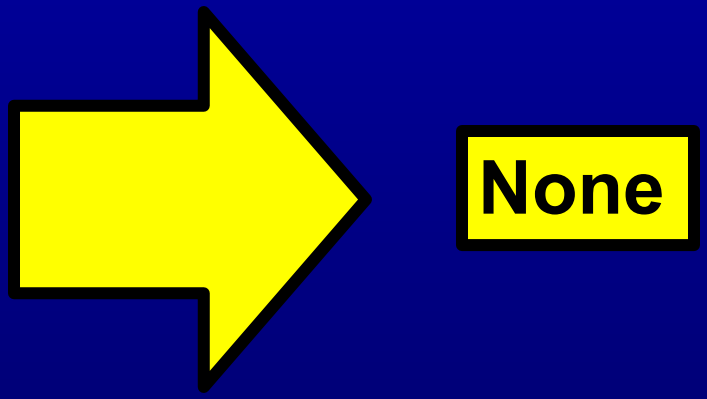
Disseminated *Fusarium* Infection Presenting as Bilateral Endogenous Endophthalmitis in a Patient With Acute Myeloid Leukemia

Kourous A. Rezai, MD
Dean Eliott, MD
Oren Pleus, MD
Jose A. Vazquez, MD
Gary W. Abrams, MD

Endogenous Endophthalmitis

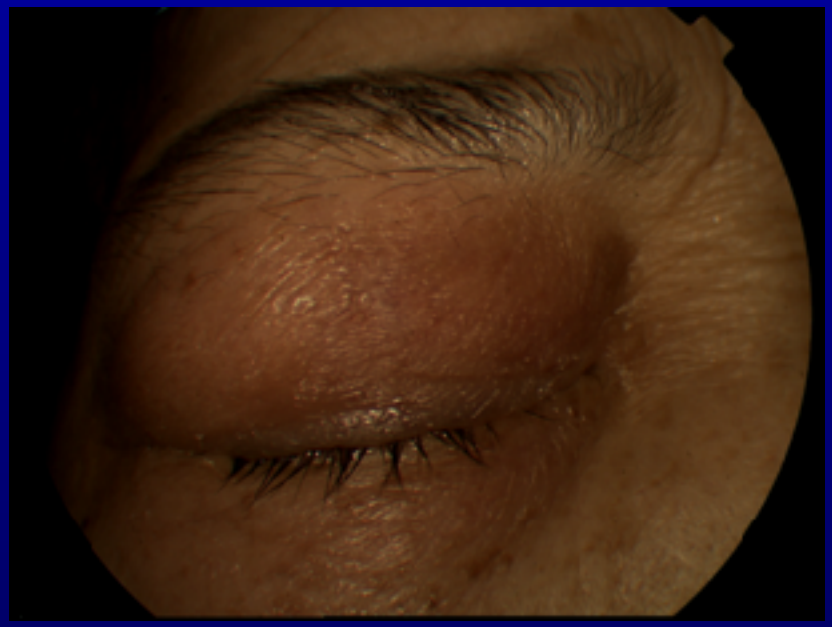
Risk Factors

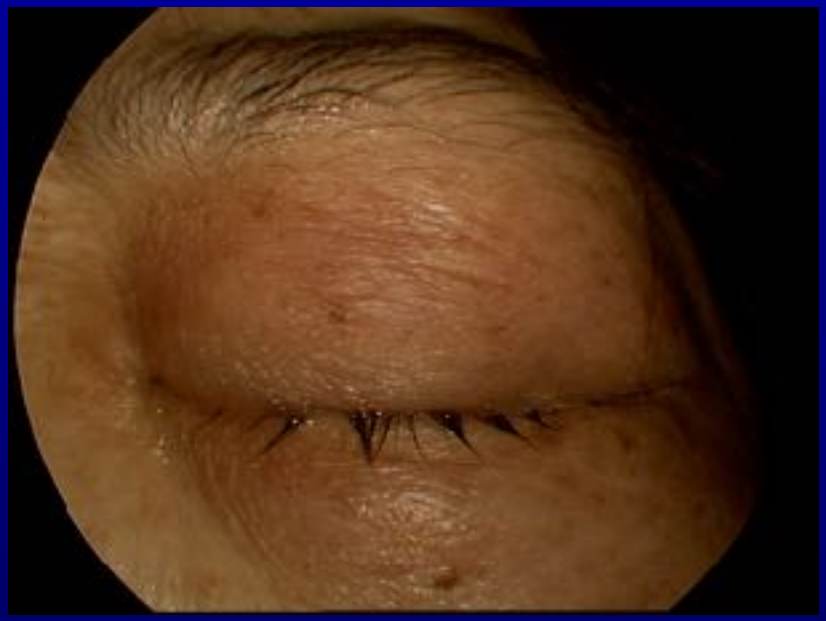
- intravenous drug use
- positive blood cultures
- extraocular site of infection
- chronic antibiotic use
- indwelling catheter
- immunosuppression
  - diabetes, iatrogenic



Endogenous Endophthalmitis

- 54 year old Chinese woman
  - bilateral lid swelling
  - light perception vision OU

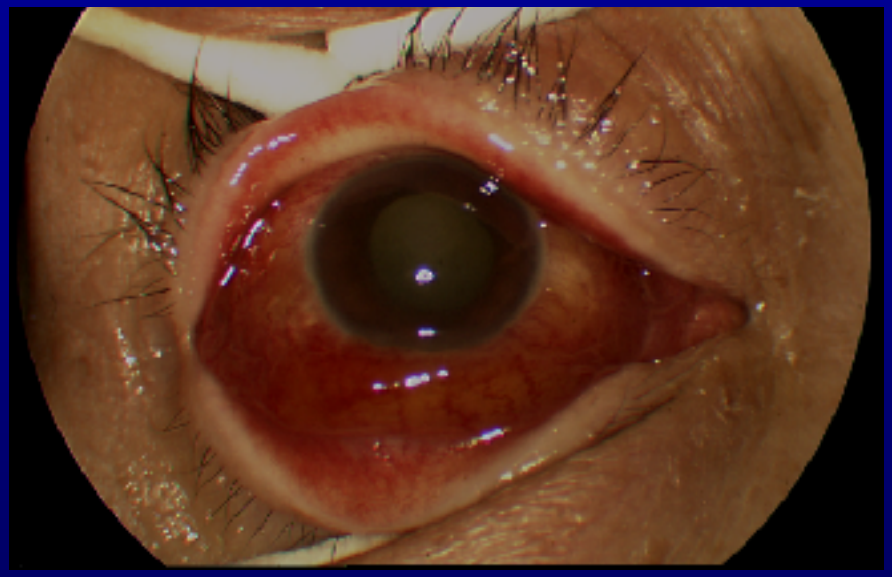


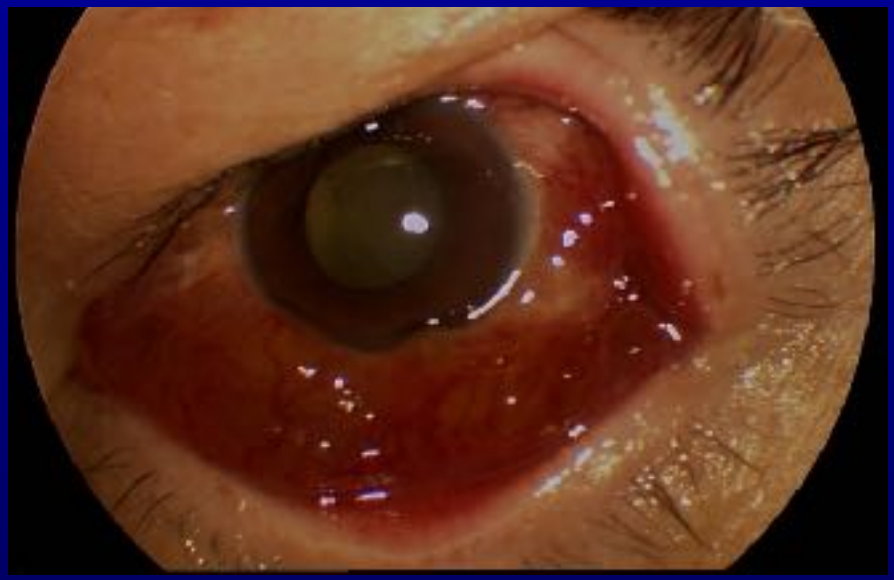


patient did not appear sick

Endogenous Endophthalmitis

- 54 year old Chinese woman
  - no hypopyon
  - vitritis
  - no fundus details

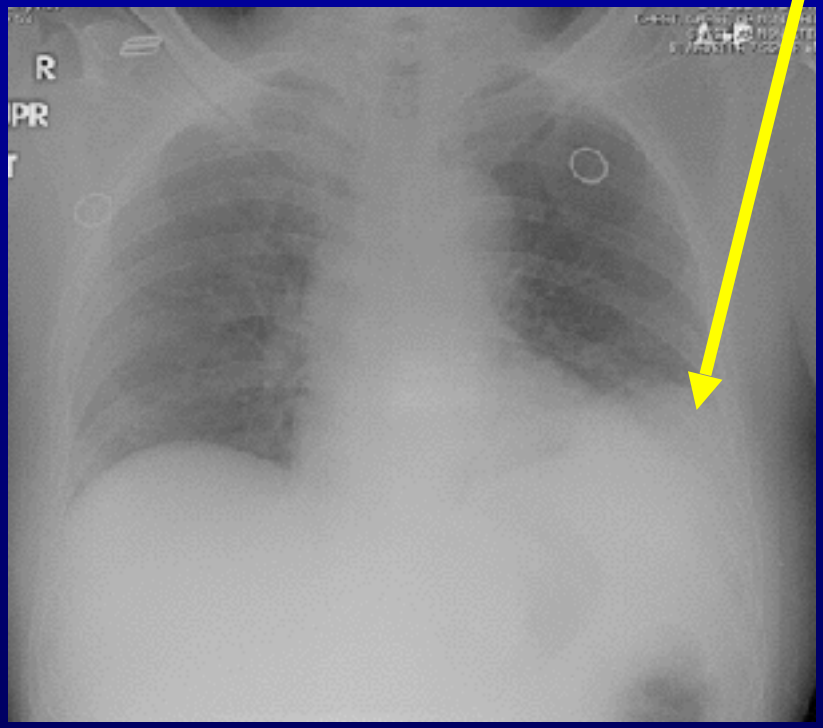


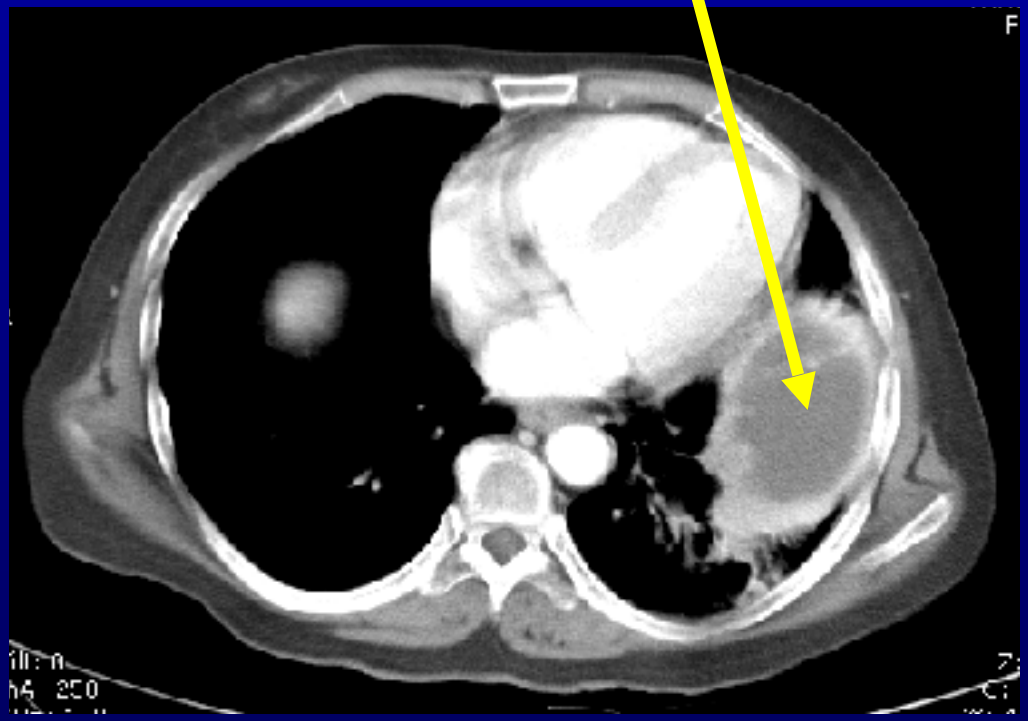


patient did not appear sick

Disseminated Infection

- CXR & chest CT
  - pneumonia

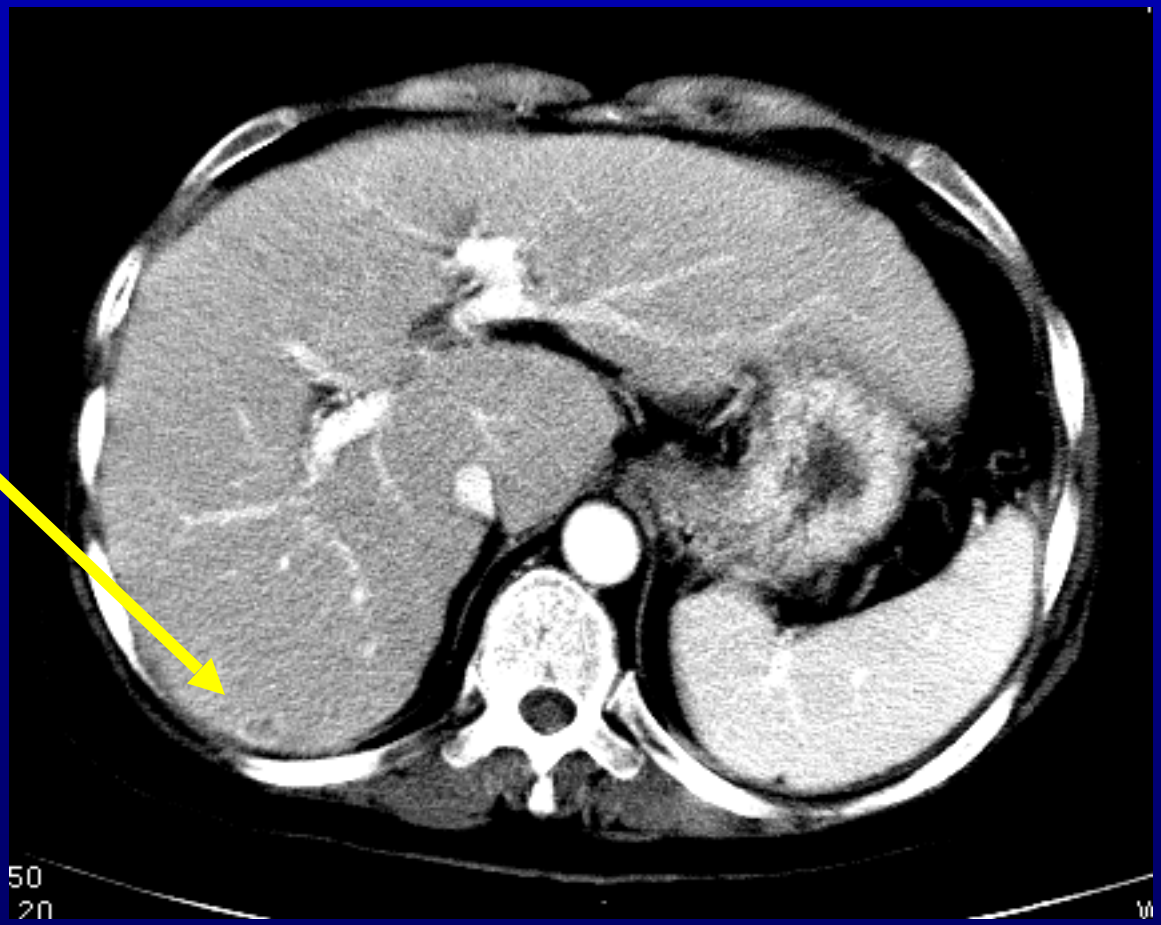




Disseminated Infection

- abdominal CT

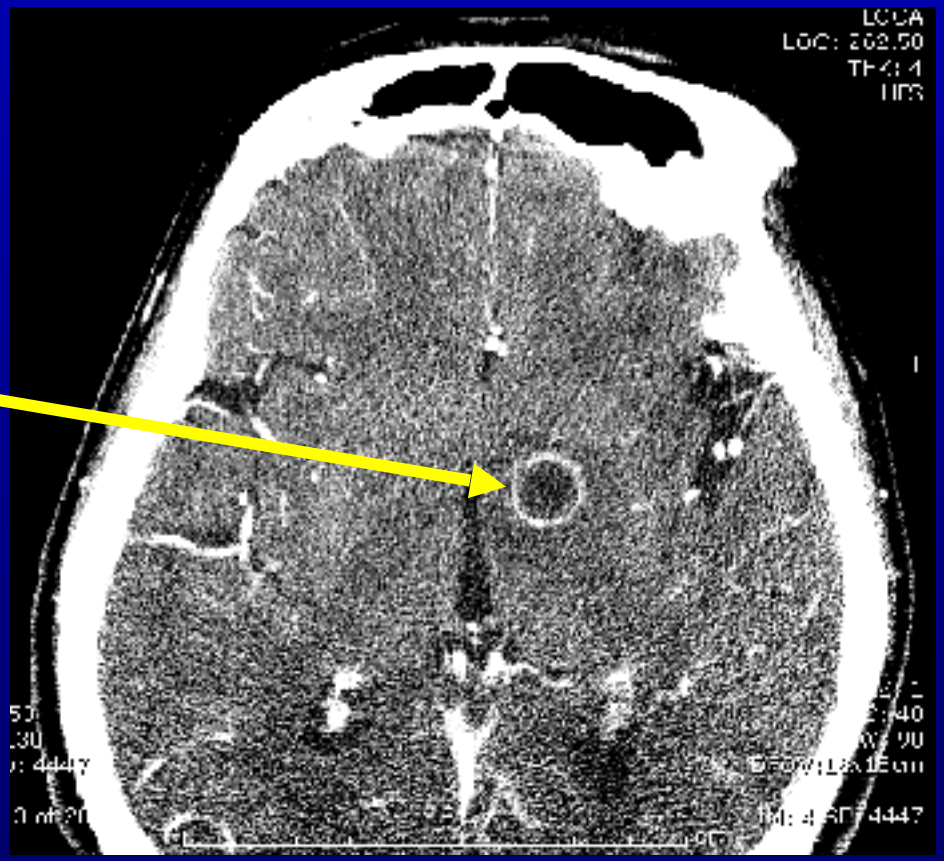
liver abscess



Disseminated Infection

- head CT

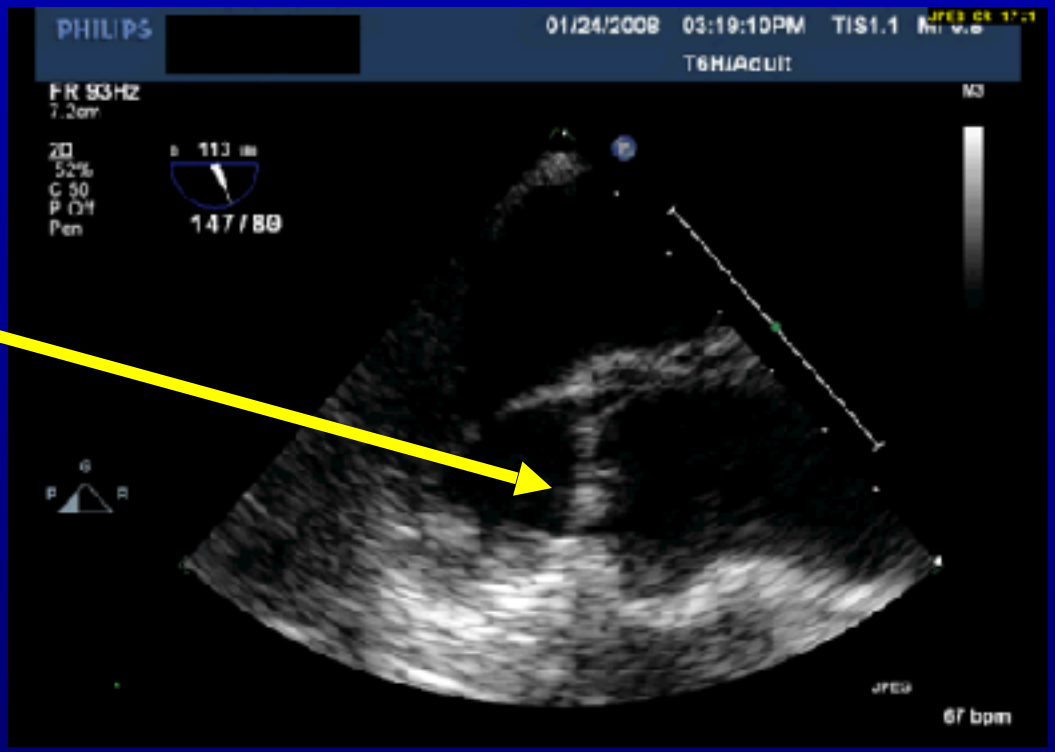
brain abscess



Disseminated Infection

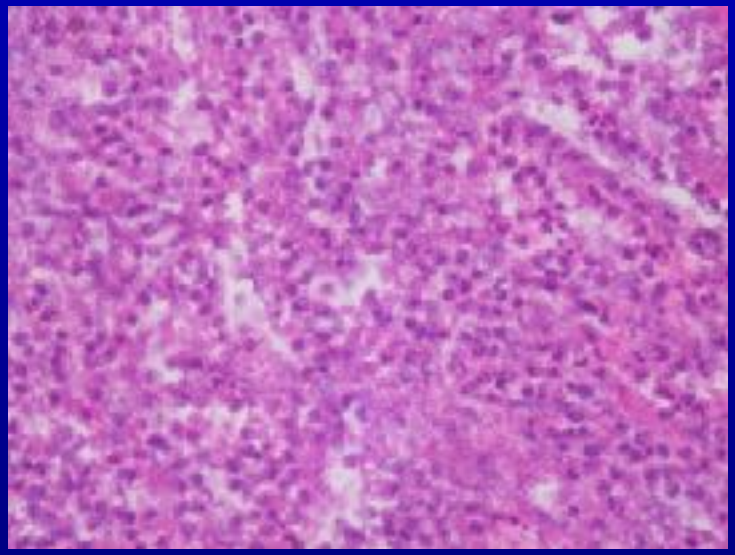
- cardiac echo

endocarditis



Disseminated Infection

- vitreous culture
  - **Klebsiella**
- blood culture
  - **Klebsiella**
- urine culture
  - **Klebsiella**

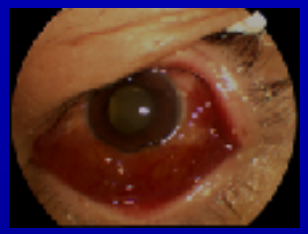
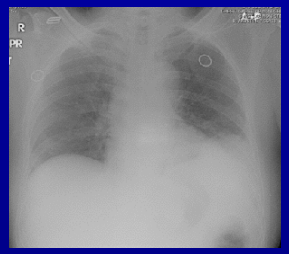
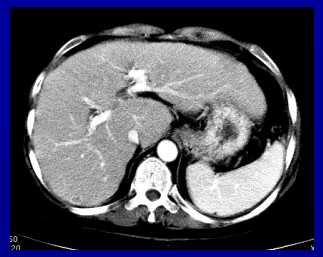
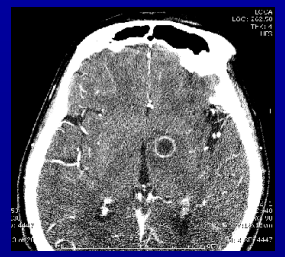


Klebsiella is an emerging pathogen in endogenous endophthalmitis in the US

Endogenous Endophthalmitis

Bilateral *Klebsiella pneumoniae* (K1 Serotype) Endogenous Endophthalmitis as the Presenting Sign of Disseminated Infection

Amir H. Kashani, MD, PhD
Dean Eliott, MD

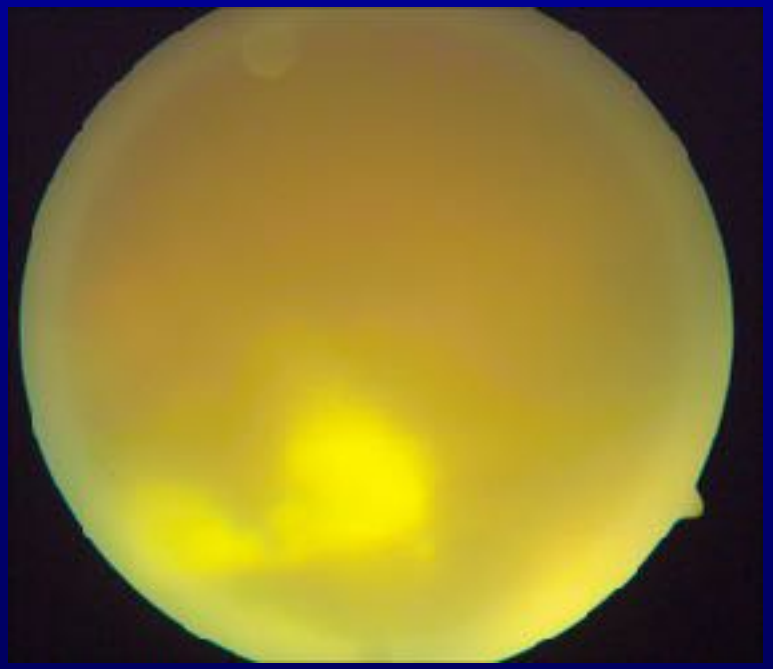






The emergence of *Klebsiella pneumoniae* endogenous endophthalmitis in the USA: basic and clinical advances

Amir H Kashani[1] and Dean Eliott[2*]

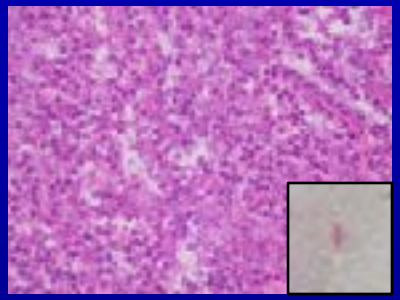
Endogenous Endophthalmitis

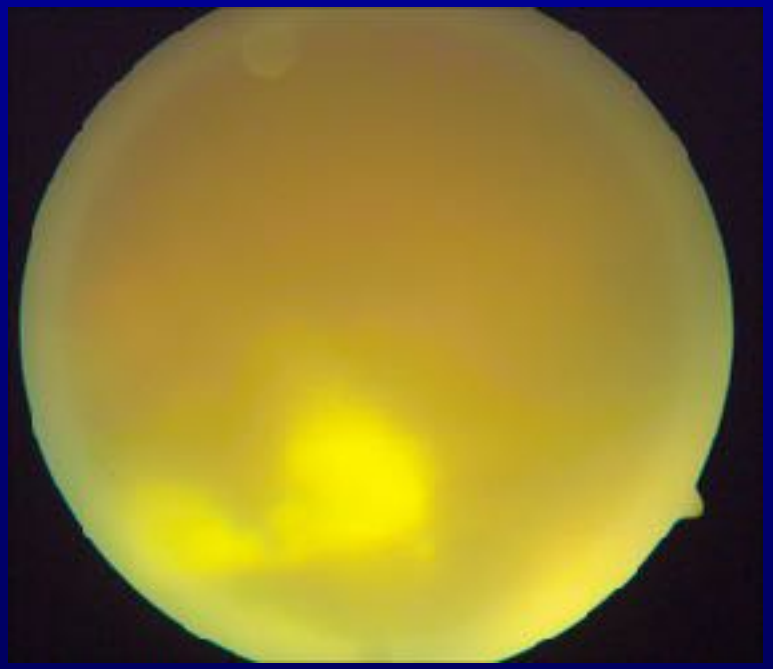
- 47 year old Hispanic man
  - decreased vision OS 3 weeks
  - given systemic steroids by ophthalmologist



Endogenous Endophthalmitis

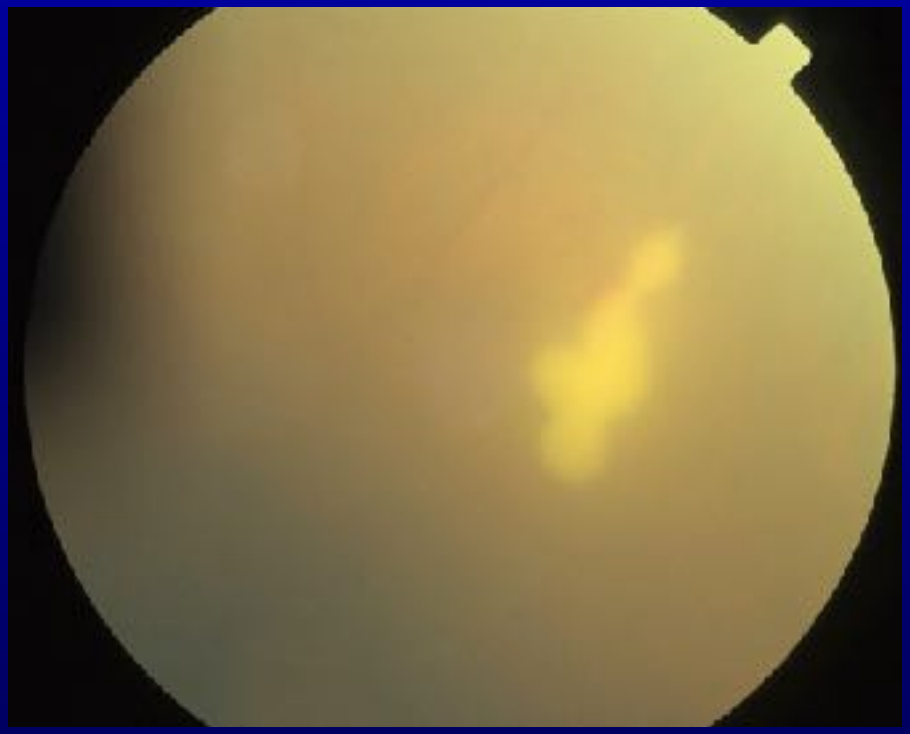
- 47 year old Hispanic man
  - vitreous culture - **Klebsiella**
  - urine culture - **Klebsiella**





Endogenous Endophthalmitis

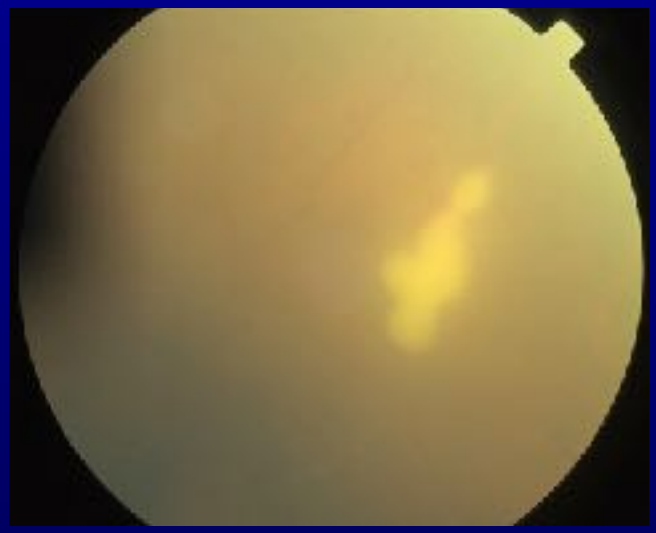
- 62 year-old man
  - immunocompetent, no obvious source of infection
  - unresponsive to systemic anti-fungals



Endogenous Endophthalmitis

- 62 year-old man
  - diagnostic vitrectomy
    - undiluted vitreous & cassette - negative
    - focal vitreous biopsy - **Candida**

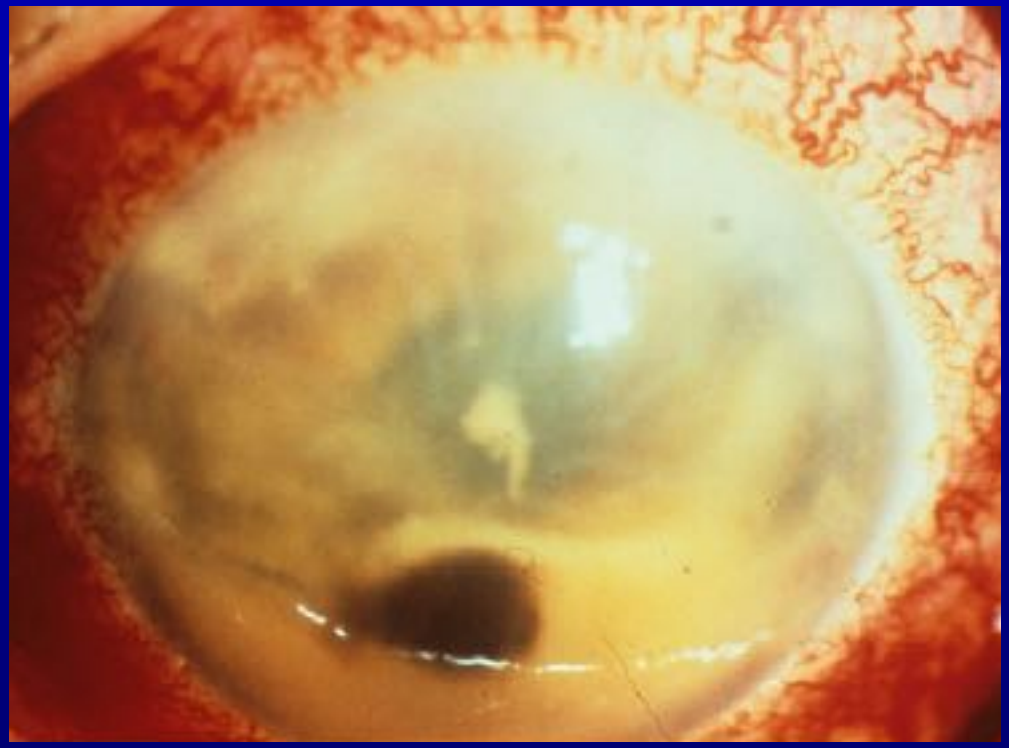
preop



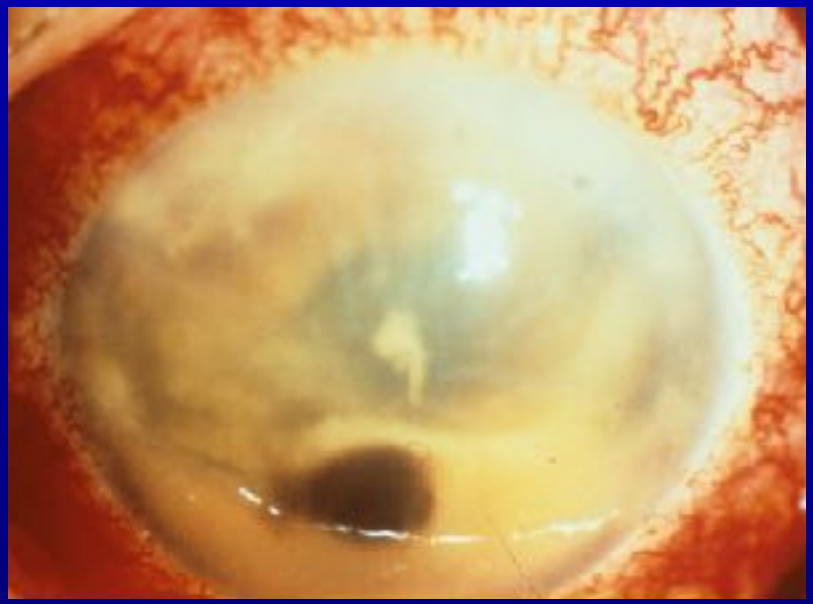
postop

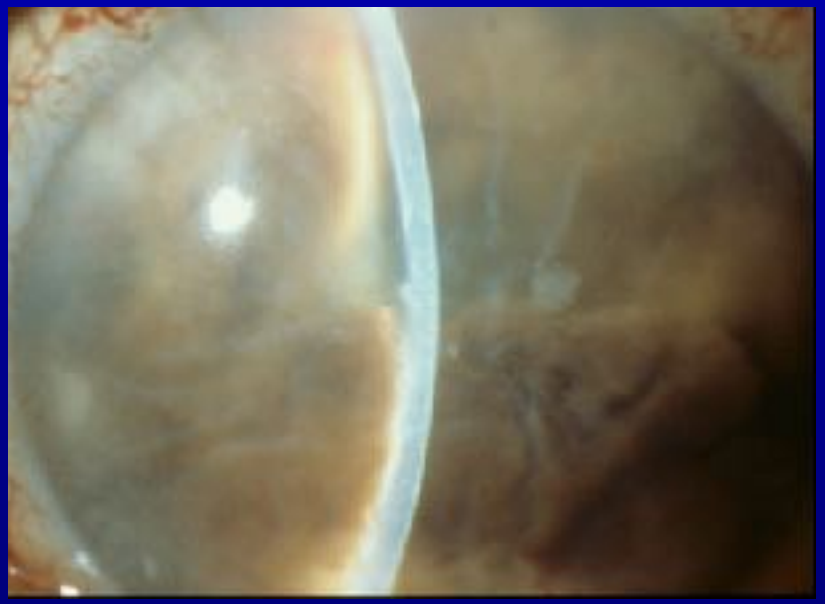
Endogenous Endophthalmitis

- 67 year old woman
  - gastroenteritis
  - visual acuity
    - hand motion
  - intraocular pressure
    - 42 mm Hg



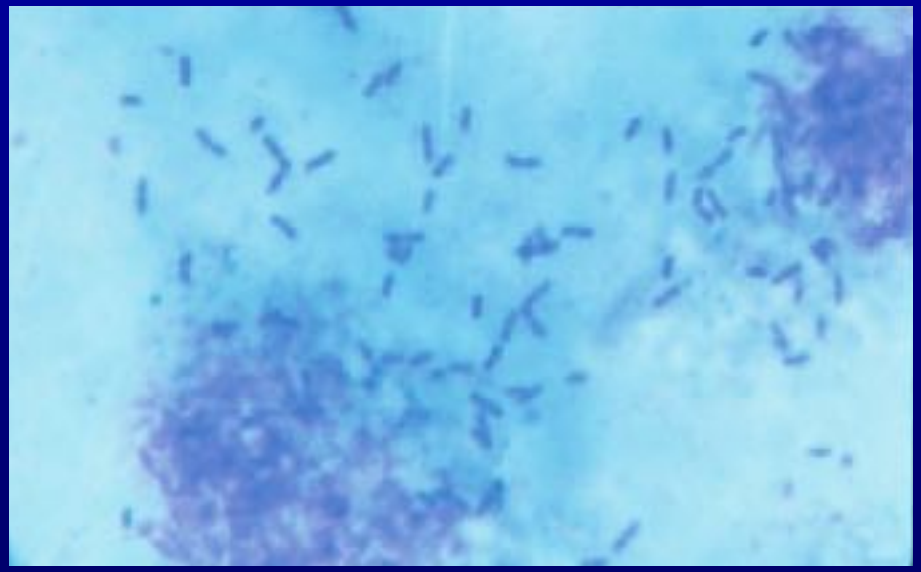
Endogenous Endophthalmitis

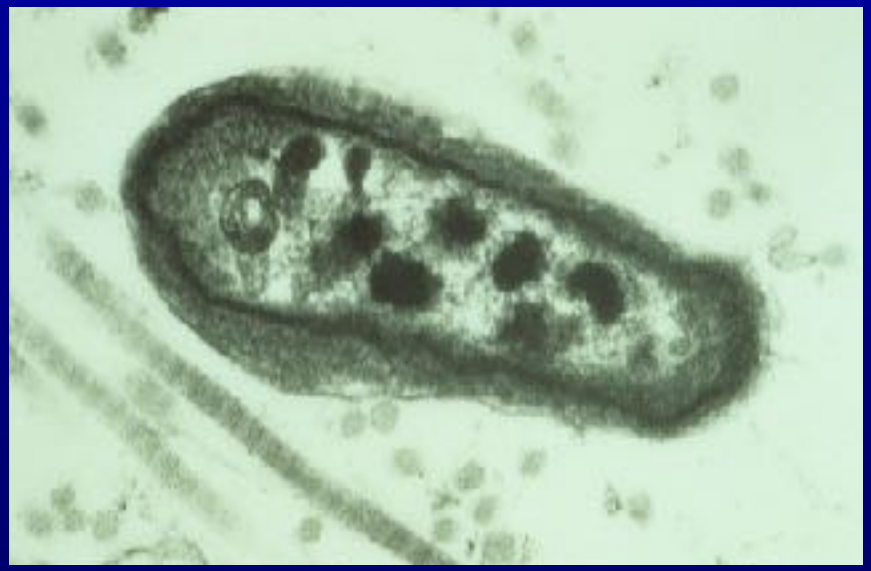




Endogenous Endophthalmitis

- **Listeria monocytogenes**
  - gram (+) bacillus

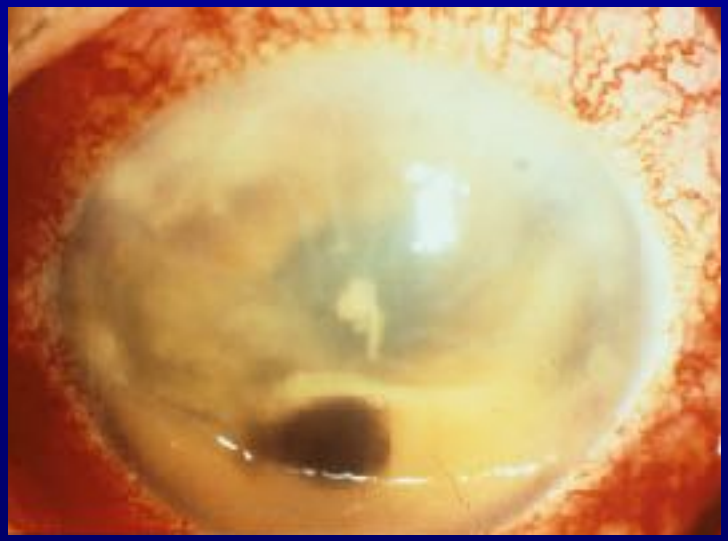


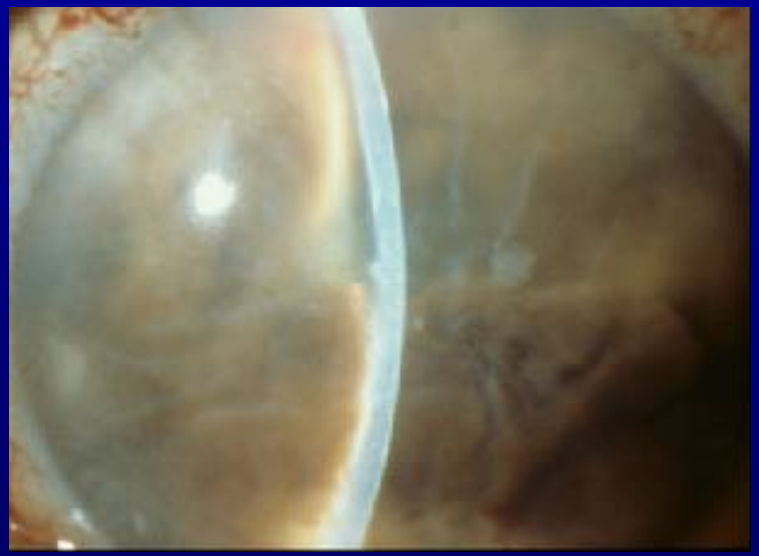


Endogenous Endophthalmitis

Elevated Intraocular Pressure, Pigment Dispersion and Dark Hypopyon in Endogenous Endophthalmitis from *Listeria monocytogenes*

DEAN ELIOTT, M.D., TERRENCE P. O'BRIEN, M.D., W. RICHARD GREEN, M.D., HENRY D. JAMPEL, M.D., AND MORTON F. GOLDBERG, M.D.

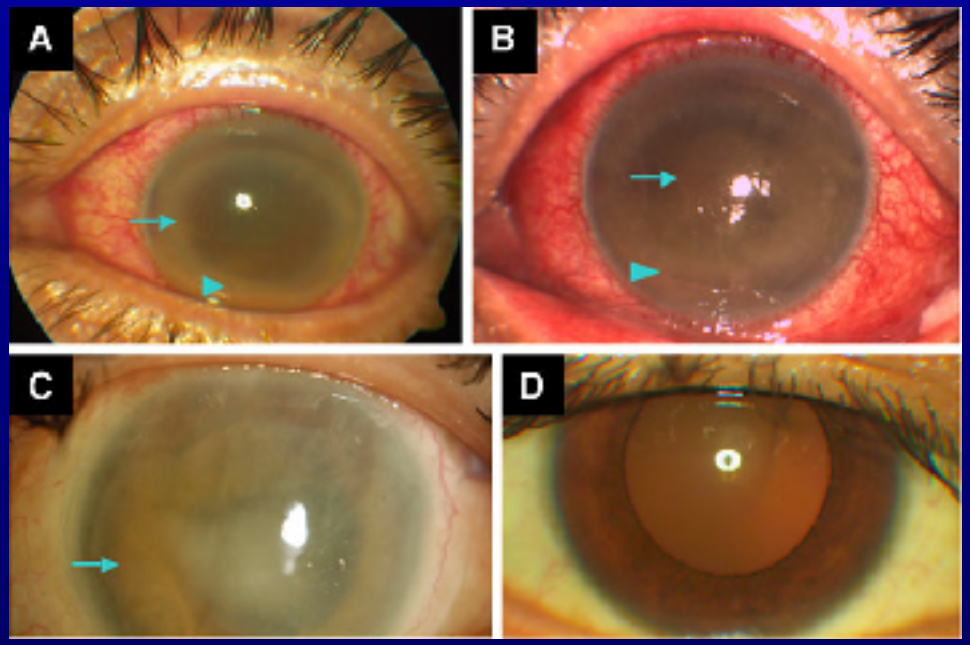


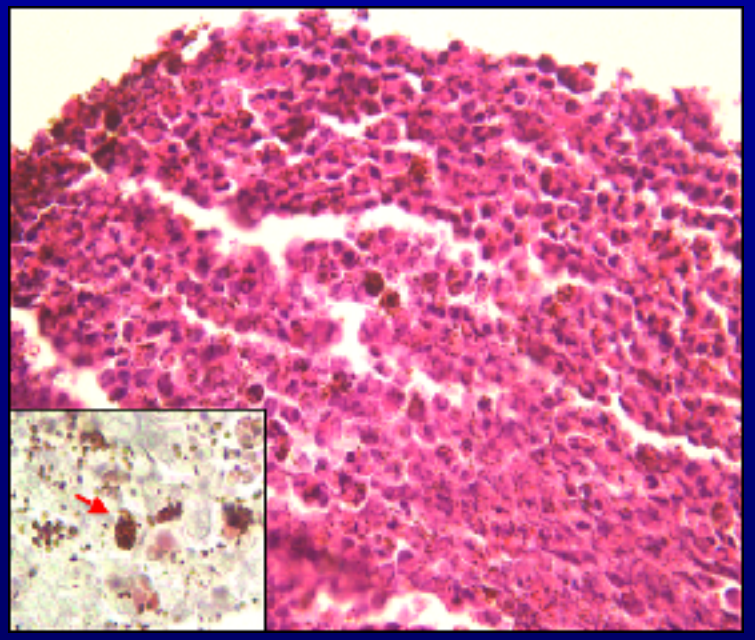


Endogenous Endophthalmitis

Dark hypopyon in *Streptococcus bovis* endogenous endophthalmitis: clinicopathologic correlations

Adam Hauch · Dean Eliott · Narsing A. Rao · Daniel V. Vasconcelos-Santos · Thomas O'Hearn · Amani A. Fawzi

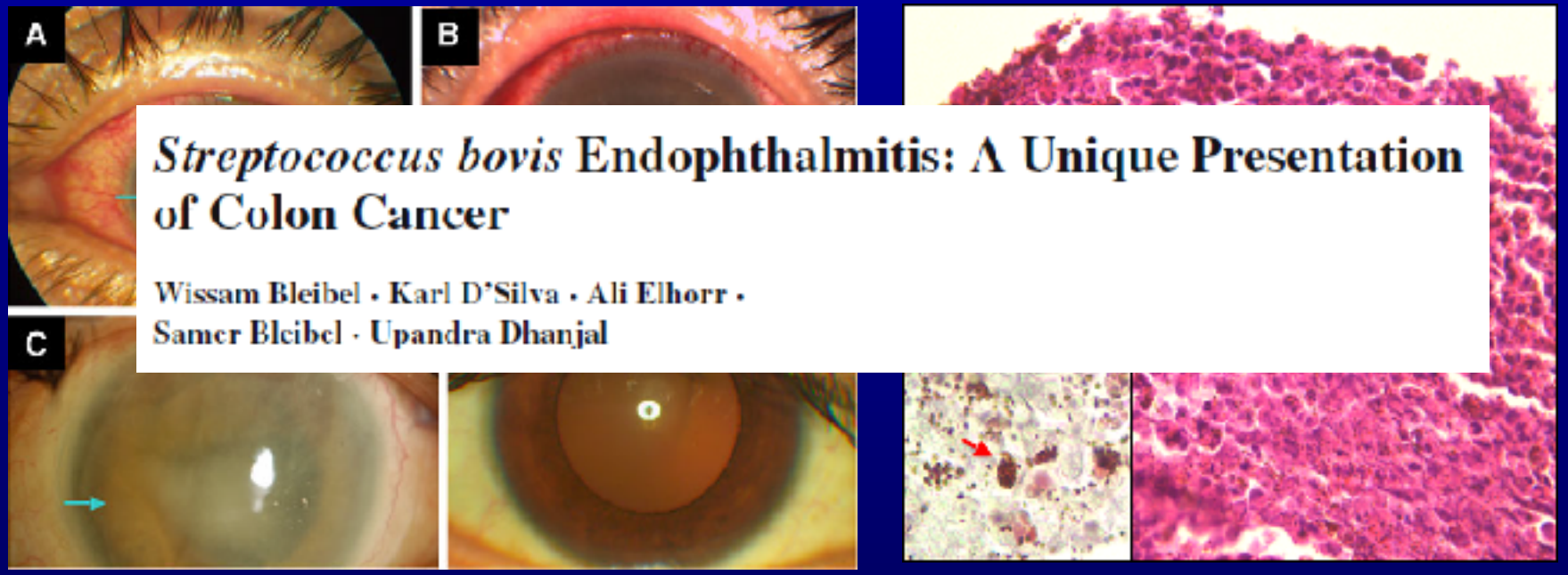




Endogenous Endophthalmitis

Dark hypopyon in *Streptococcus bovis* endogenous endophthalmitis: clinicopathologic correlations

Adam Hauch · Dean Eliott · Narsing A. Rao · Daniel V. Vasconcelos-Santos · Thomas O'Hearn · Amani A. Fawzi

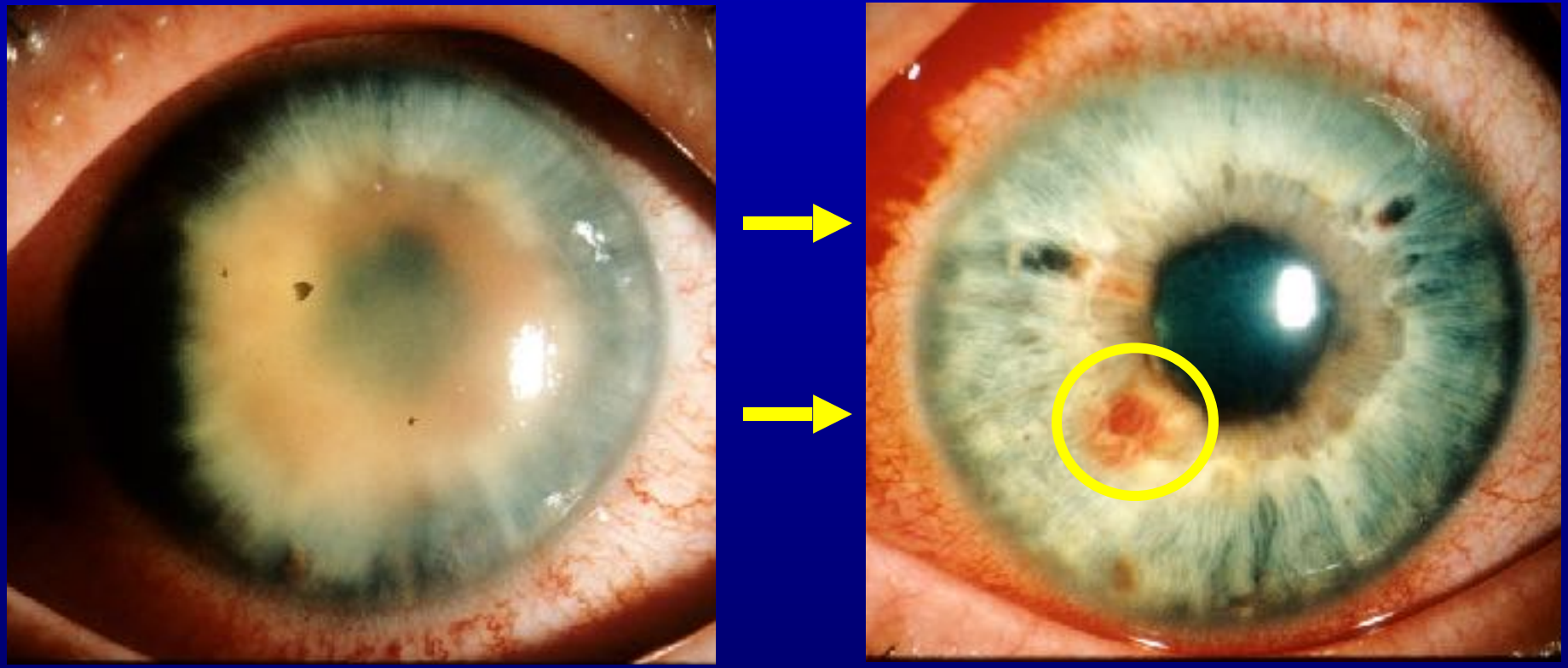


Streptococcus bovis Endophthalmitis: A Unique Presentation of Colon Cancer

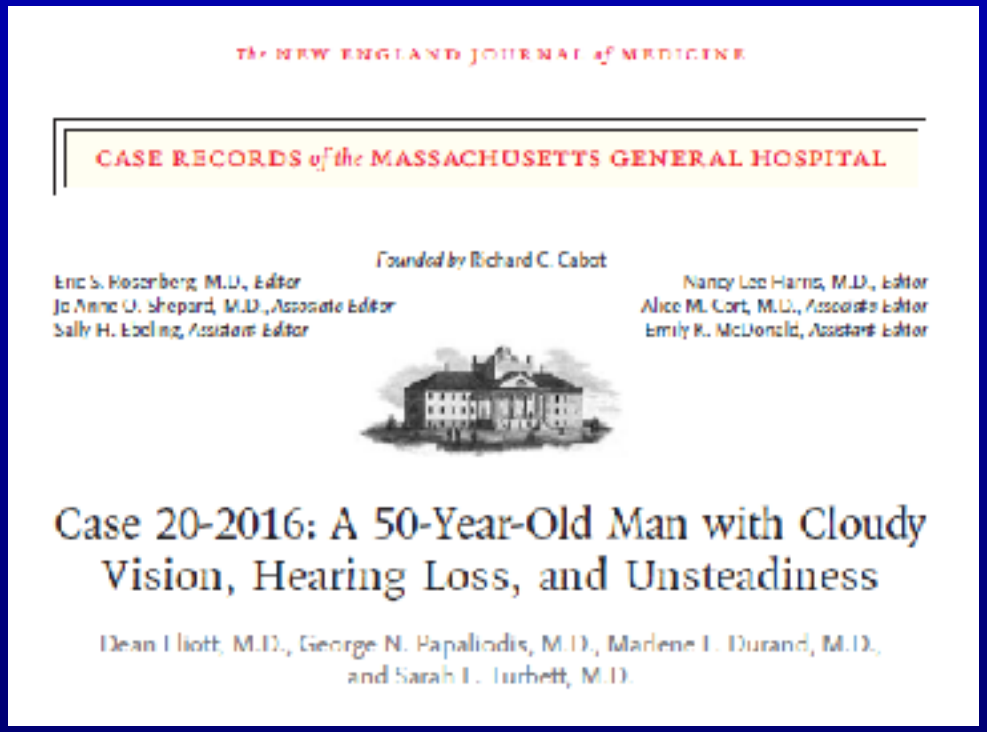
Wissam Bleibel · Karl D'Silva · Ali Elhorr · Samer Bleibel · Upandra Dhanjal

Endogenous Endophthalmitis

Endogenous Endophthalmitis



Syphilis



The NEW ENGLAND JOURNAL of MEDICINE

CASE RECORDS of the MASSACHUSETTS GENERAL HOSPITAL

Founded by Richard C. Cabot

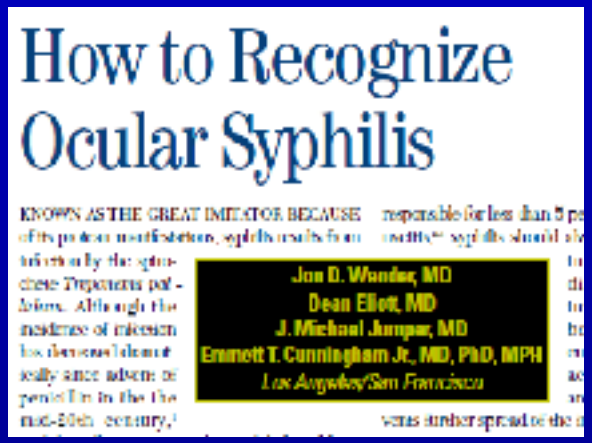
Eric S. Rosenberg, M.D., Editor
Jo Anne O. Shepard, M.D., Associate Editor
Sally H. Ebeling, Assistant Editor

Nancy Lee Harris, M.D., Editor
Alice M. Cort, M.D., Associate Editor
Emily R. McDonald, Assistant Editor

Case 20-2016: A 50-Year-Old Man with Cloudy Vision, Hearing Loss, and Unsteadiness

Dean Elliott, M.D., George N. Papaliodis, M.D., Marlene I. Durand, M.D., and Sarah L. Turbett, M.D.

Syphilis



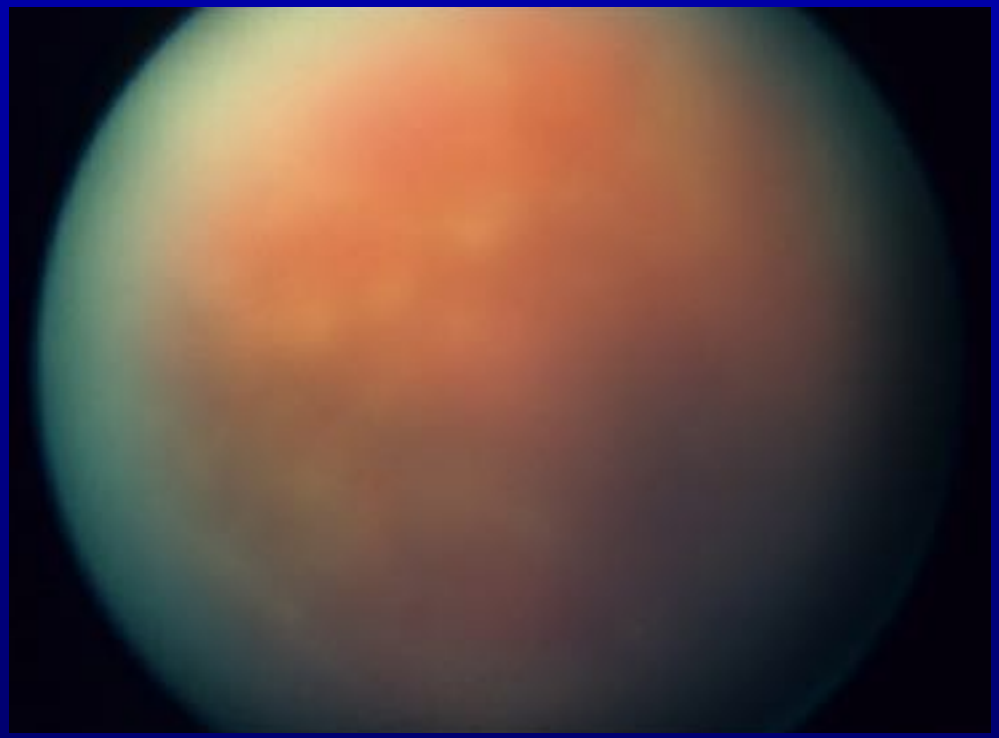
How to Recognize Ocular Syphilis

KNOWN AS THE GREAT IMITATOR BECAUSE

Jon D. Wunder, MD
Dean Eliott, MD
J. Michael Jumper, MD
Emmett T. Cunningham Jr., MD, PhD, MPH
Los Angeles/San Francisco

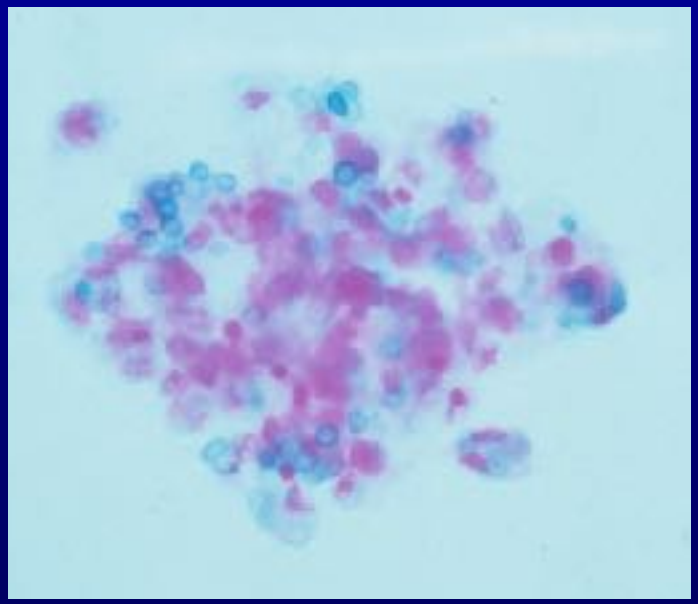
Endogenous Endophthalmitis

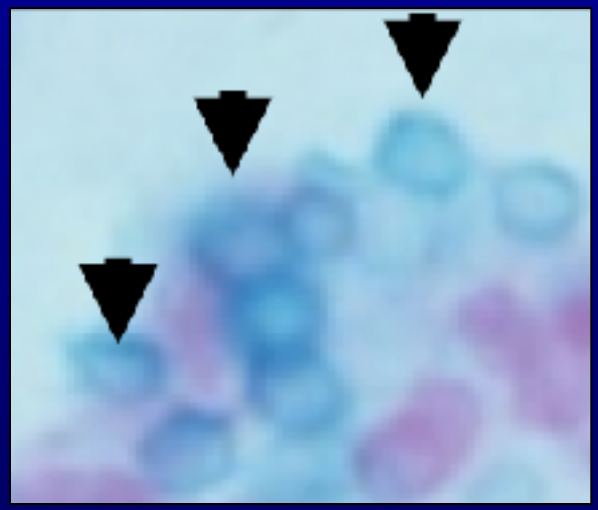
- 69 year old man
  - immunocompetent
  - decreased vision
  - gait ataxia, mental status changes, urinary incontinence

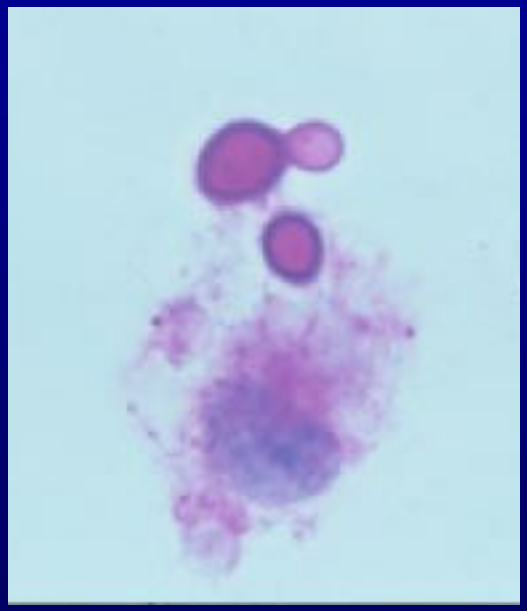


Endogenous Endophthalmitis

- 69 year old man
  - lumbar puncture - **Cryptococcus**
  - vitrectomy - **Cryptococcus**





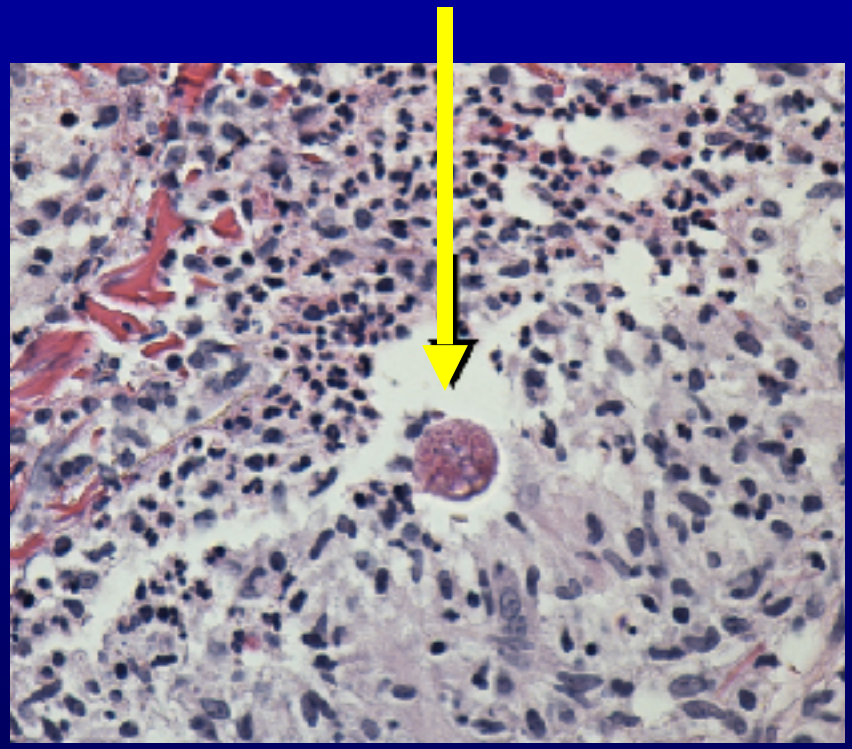


Endogenous Endophthalmitis

- 69 year old man - **Cryptococcus**
  - multiple Amphotericin B injections

Endogenous Endophthalmitis

- 36 year old man
  - **Coccidioides** choroiditis and pneumonitis



Treatment

- Intravitreal antifungals
  - Amphotericin B 5-10 mcg/0.1 ml
  - Voriconazole 100 mcg/0.1 ml
    - less toxicity concerns
- Oral antifungals
  - Fluconazole 200 mg bid

Treatment

- Intravitreal antibiotics
  - Vancomycin 1 mg/0.1 ml
  - Ceftazidime 2 mg/0.1 ml
    - avoid aminoglycosides
- Intravenous antibiotics

Treatment

- Vitrectomy
  - 18% initial PPV, no secondary procedures
  - 78% initial tap/inject, 55%secondary PPV
    - 52% culture positive

Treatment

- +/- Intravitreal steroids
  - Dexamethasone 400 mcg/0.1 ml
  - Not usually used in fungal endophthalmitis cases

Trends in Endogenous Endophthalmitis

- Okada, 1994
  - IVDU 7%
  - Staph 25%
    - MRSA 0%

Endogenous bacterial endophthalmitis. Report of a ten-year retrospective study.

Okada AA[1], Johnson RP, Liles WC, D'Amico DJ, Baker AS

Trends in Endogenous Endophthalmitis

- Okada, 1994
  - IVDU 7% versus ~20% now
  - Staph 25%
    - MRSA 0%

Trends in Endogenous Endophthalmitis

- Okada, 1994
  - IVDU 7% versus ~20% now
  - Staph 25% versus 59% now
    - MRSA 0%

Trends in Endogenous Endophthalmitis

- Okada, 1994
  - IVDU 7% versus ~20% now
  - Staph 25% versus 59% now
    - MRSA 0% versus 31% now

Trends in Endogenous Endophthalmitis

- Okada, 1994
  - IVDU 7% versus ~20% now
  - Staph 25% versus 59% now
    - MRSA 0% versus 31% now
  - Visual outcomes improved


Endogenous bacterial endophthalmitis. Report of a ten-year retrospective study.

Okada AA[1], Johnson RP, Liles WC, D'Amico DJ, Baker AS

Endogenous Endophthalmitis

Risk Factors

- intravenous drug use
- positive blood cultures
- extraocular site of infection
- chronic antibiotic use
- indwelling catheter
- immunosuppression
  - diabetes, iatrogenic

Endogenous Endophthalmitis

- 20% of all endophthalmitis cases
  - incidence increasing
  - skin infections and MRSA increasing
- 50% of endogenous cases due to IVDU
  - IVDU increasing
- fungal > bacterial
  - bacterial increasing

Endogenous Endophthalmitis

- history and exam offer clues to the systemic infection
- early vitrectomy associated with improved results

Endophthalmitis