

# Endophthalmitis: Klassifizierung, Differentialdiagnose und häufigste Organismen

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# Welche Keime lösen welche EO aus?

- Postoperative Endophthalmitis
  - (a) Nach Kataraktoperationen: Akut auftretende postoperative EO
    - Koagulase (-) Staphylokokken, Staphylococcus aureus, Streptokokken, gramnegative Bakterien
  - (b) Nach Kataraktoperationen: Später einsetzende postoperative EO
    - P. acnes, Koagulase (-) Staphylokokken, Pilze

- Flynn Jr., Harry W.. Endophthalmitis in Clinical Practice. Springer International Publishing.

# Welche Keime lösen welche EO aus?

- Postoperative Endophthalmitis
  - (c) Nach Glaukomoperationen: Filterkisseninfektion und EO
    - Streptokokkenarten, Haemophilus influenzae, Staphylokokkenarten
  - (d) Nach Glaukomoperationen: EO in Verbindung mit Drainageimplantaten
  - (e) Nach einer elektiven Hornhauttransplantation

- Flynn Jr., Harry W.. Endophthalmitis in Clinical Practice. Springer International Publishing.

# Welche Keime lösen welche EO aus?

- Posttraumatische Endophthalmitis
    - Bacillus-Arten (30-40 %), Staphylokokken-Arten
  - Endogene Endophthalmitis
    - Candida-Arten, Staphylococcus aureus, gramnegative Bakterien
- Flynn Jr., Harry W.. Endophthalmitis in Clinical Practice. Springer International Publishing.

# Welche Keime lösen welche EO aus?

- Endophthalmitis in Verbindung mit Keratitis
    - Pseudomonas, Staphylococcus-Arten
  - Endophthalmitis im Zusammenhang mit einer intravitrealen Injektion
    - Staphylococcus/Streptococcus-Arten
- 
- Flynn Jr., Harry W.. Endophthalmitis in Clinical Practice. Springer International Publishing.

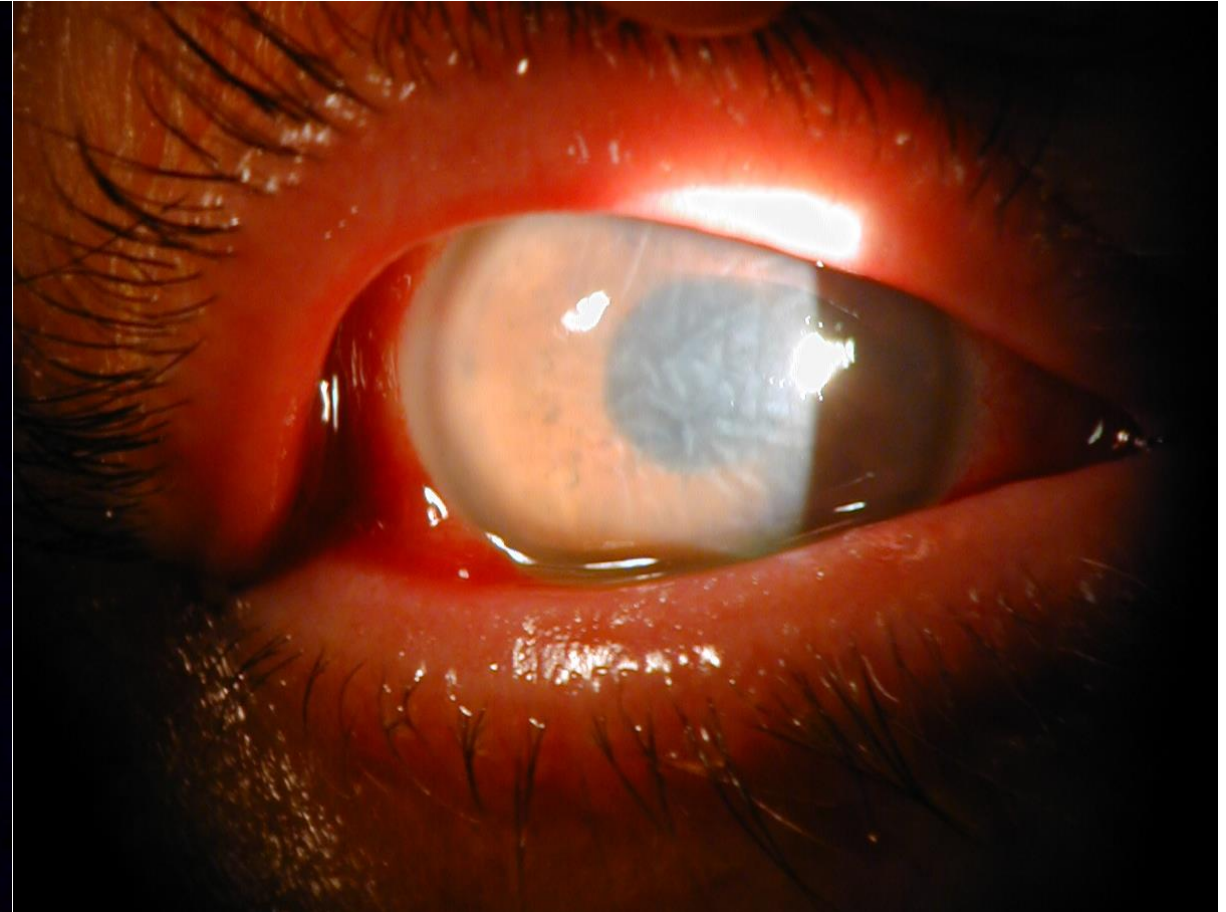
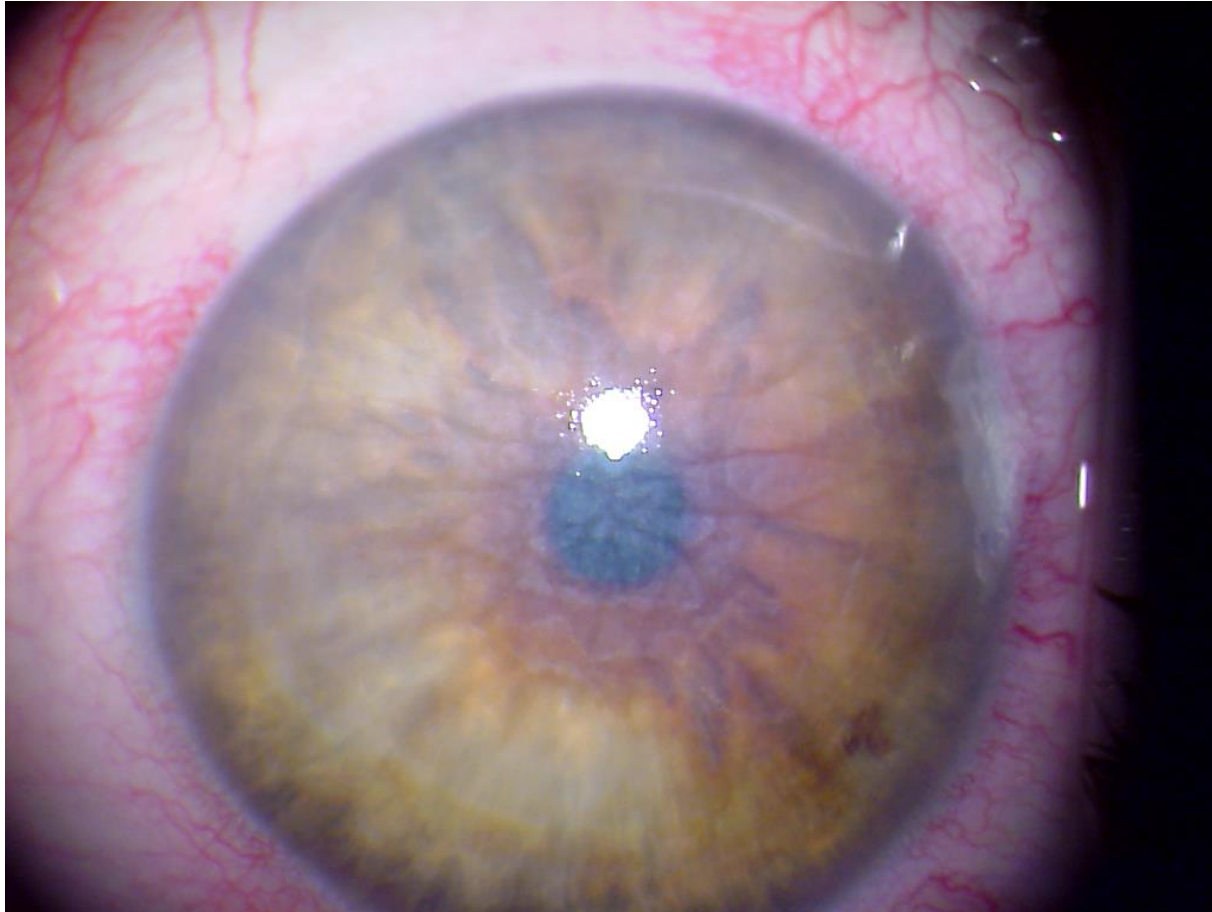


# DD der EO

- Die Endophthalmitis ist eine klinische Diagnose, die durch anschließende Laboruntersuchungen bestätigt wird.
- Eine Endophthalmitis mit negativen intraokularen Kulturen ist relativ häufig und wird in einer Größenordnung von etwa 20 % nach intraokularen Operationen und bis zu 50 % nach intravitrealen Injektionen angegeben.
- Im Folgenden sind einige Erkrankungen aufgeführt, die von einer infektiösen Endophthalmitis unterschieden werden sollten:
  - (a) Toxisches Vorderabschnittssyndrom (TASS)
  - (b) Linsenrückstände
  - (c) Aufflammen einer vorbestehenden Uveitis
  - (d) Chronische Glaskörperblutung
  - (e) Retinoblastom (bei Kindern)
  - (f) Disloziertes Triamcinolon
  - (g) Virale Retinitis
  - (h) Pseudoendophthalmitis nach intravitrealen Injektionen

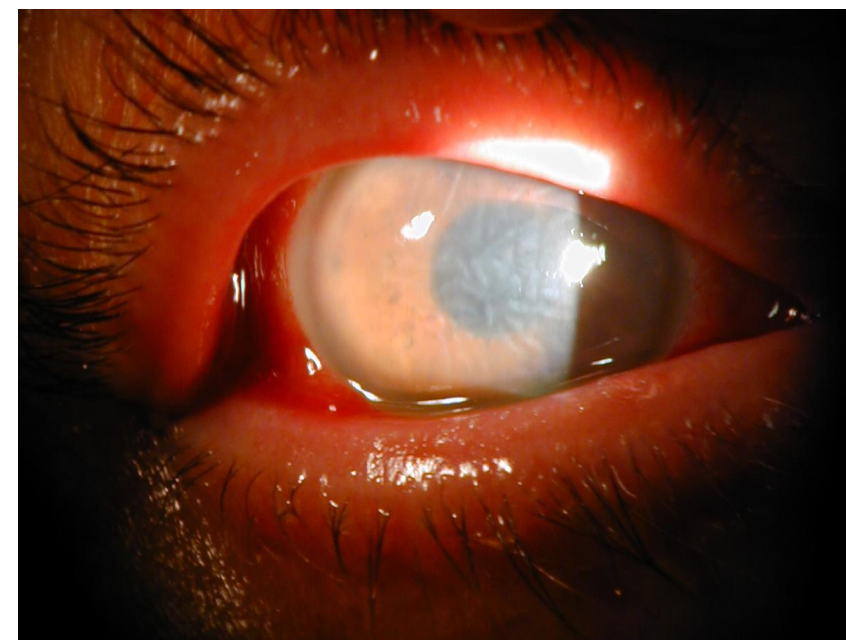


# Unkomplizierter Ausgangsbefund, unkomplizierte Phako



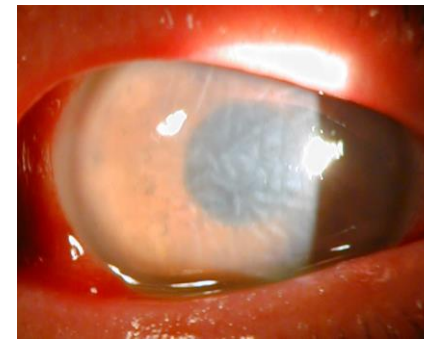
# Differentialdiagnose

- Endotheldekompensation nach Phako eines sehr harten Kerns
- Perakute Endophthalmitis
- TASS (toxic anterior segment syndrome)
- Subtotale Descemetablösung

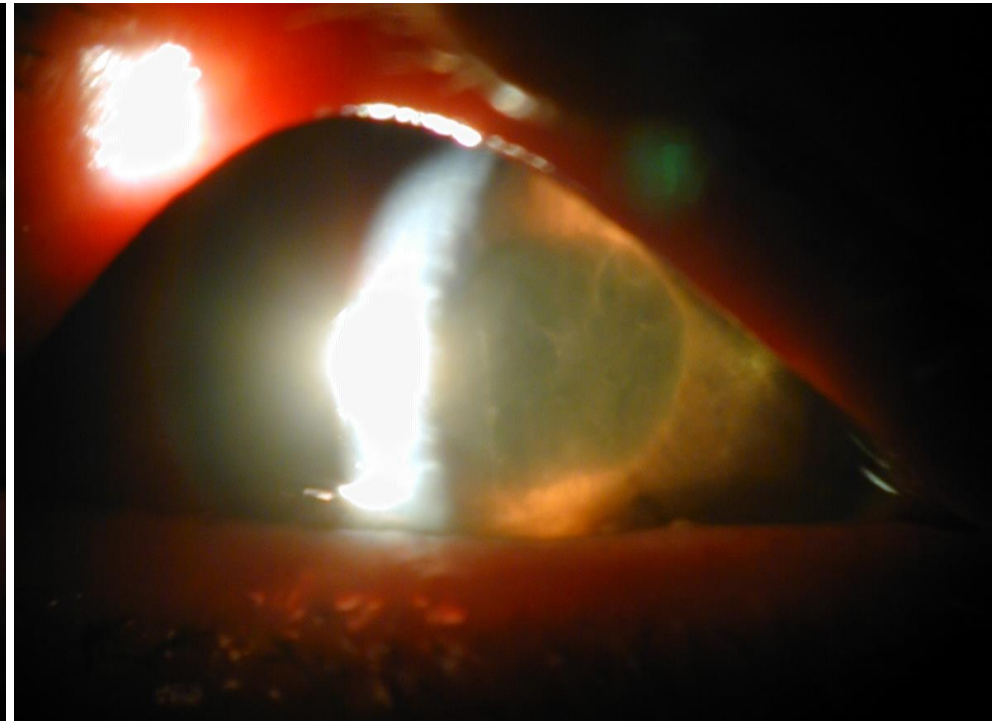




# TASS



**Augenklinik**  
Evangelisches Krankenhaus  
Essen-Werden gGmbH



# Differentialdiagnose der Endophthalmitis



- **Toxic anterior segment syndrome (TASS)**
  - Weiß zu weiß Ödem
  - Wenig Schmerzen
  - Tritt 12 – 24 Std nach der OP auf
  - Ausgeprägtes Fibrin
  - i.d.R. ohne Hypopyon
  - GK unbeteiligt

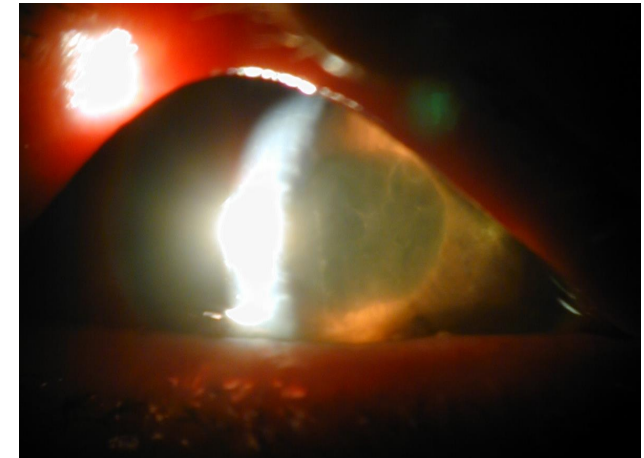
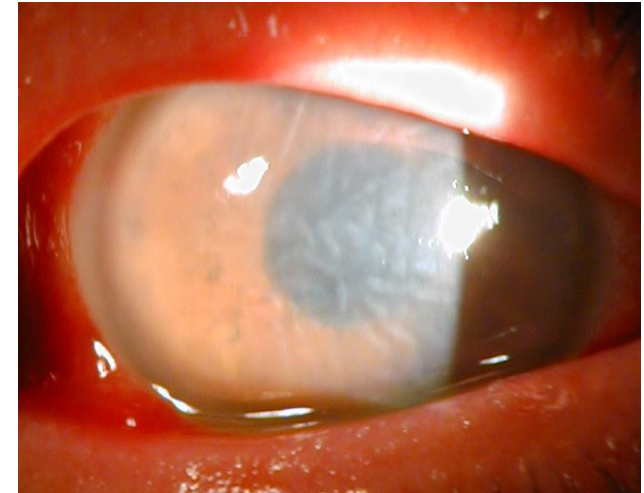


**Figure 6** Corneal edema associated with TASS. (Reprinted from Mamalis N, Edelhauser HF, Dawson DG, Chew J, LeBoyer RM, Werner L. Toxic anterior segment syndrome, *J Cataract Refract Surg*, 2006;32:324–333, Copyright © 2006, with permission from Elsevier.)

# Differentialdiagnose der sehr frühen Endophthalmitis



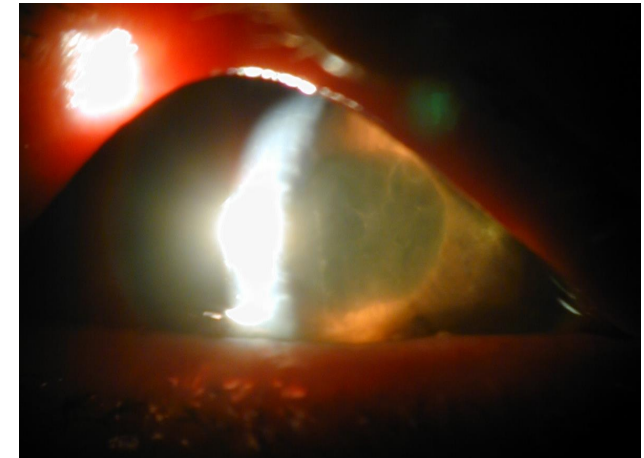
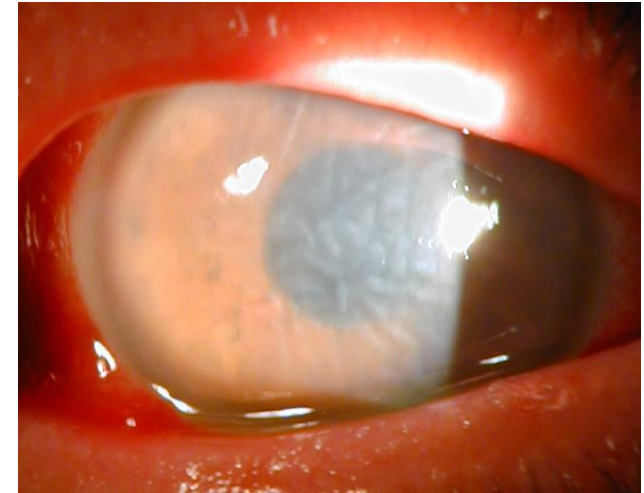
- **Toxic anterior segment syndrome (TASS)**
  - Ursachen vielfältig, z.B.
    - überdosierte Medikamente
    - Konservierungsmittel
    - Reste von Desinfektions- oder Reinigungsmitteln



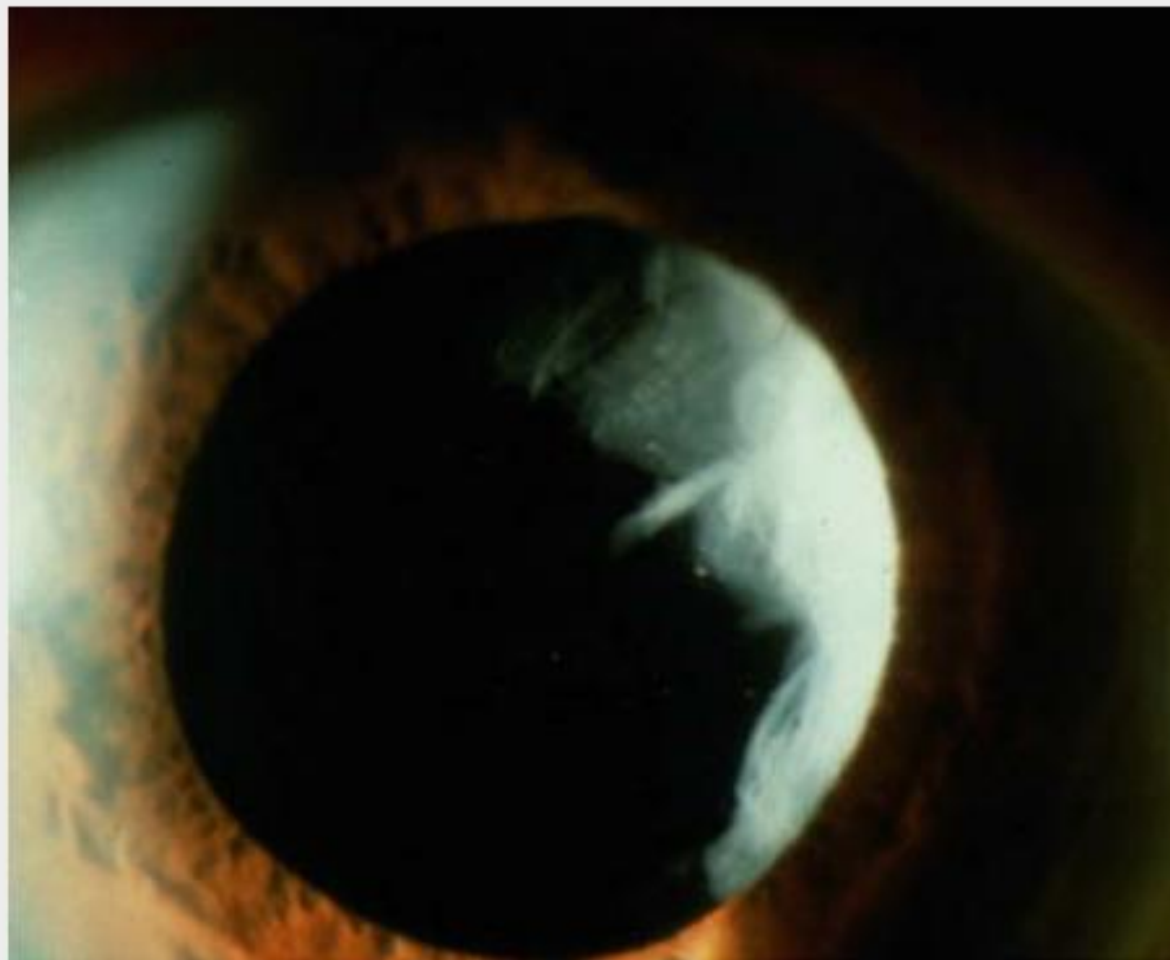
# Differentialdiagnose der sehr frühen Endophthalmitis



- **Toxic anterior segment syndrome (TASS)**
  - Therapie
    - hochdosierte Steroide
    - tgl. Kontrolle, auch Tensio
    - Bis zur Ausheilung immer die Endophthalmitis im Kopf behalten!



# Verbliebene Linsenfragmente



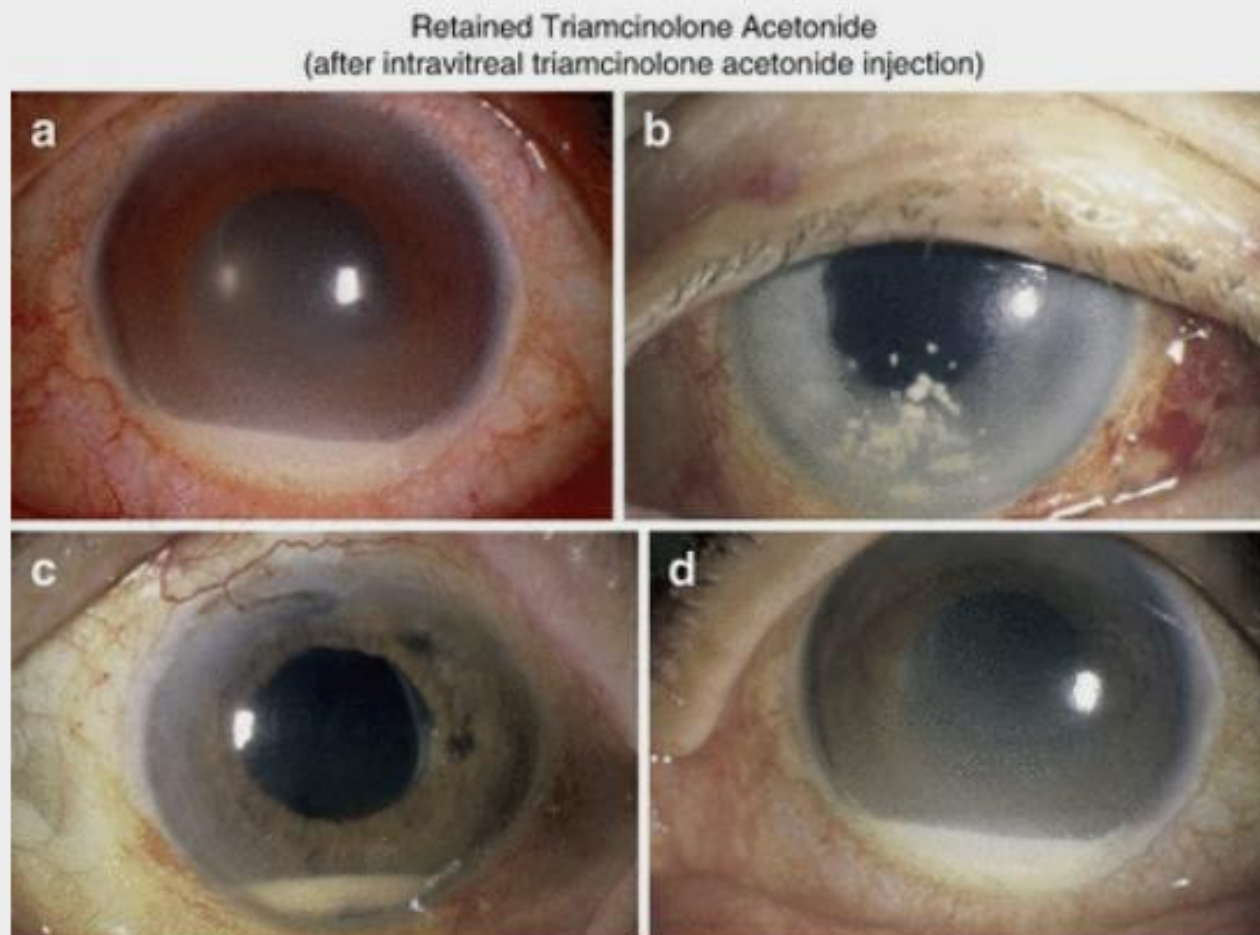
**Figure 2.3** Retained lens fragments



# Triamcinolon

- Disloziertes Triamcinolon kann zu Ablagerungen in der Vorderkammer führen, die auch als Pseudoendophthalmitis bezeichnet werden.
- In seltenen Fällen kann eine echte Endophthalmitis nach intravitrealer Triamcinolon-Injektion auftreten.

# Disloziertes Triamcinolon

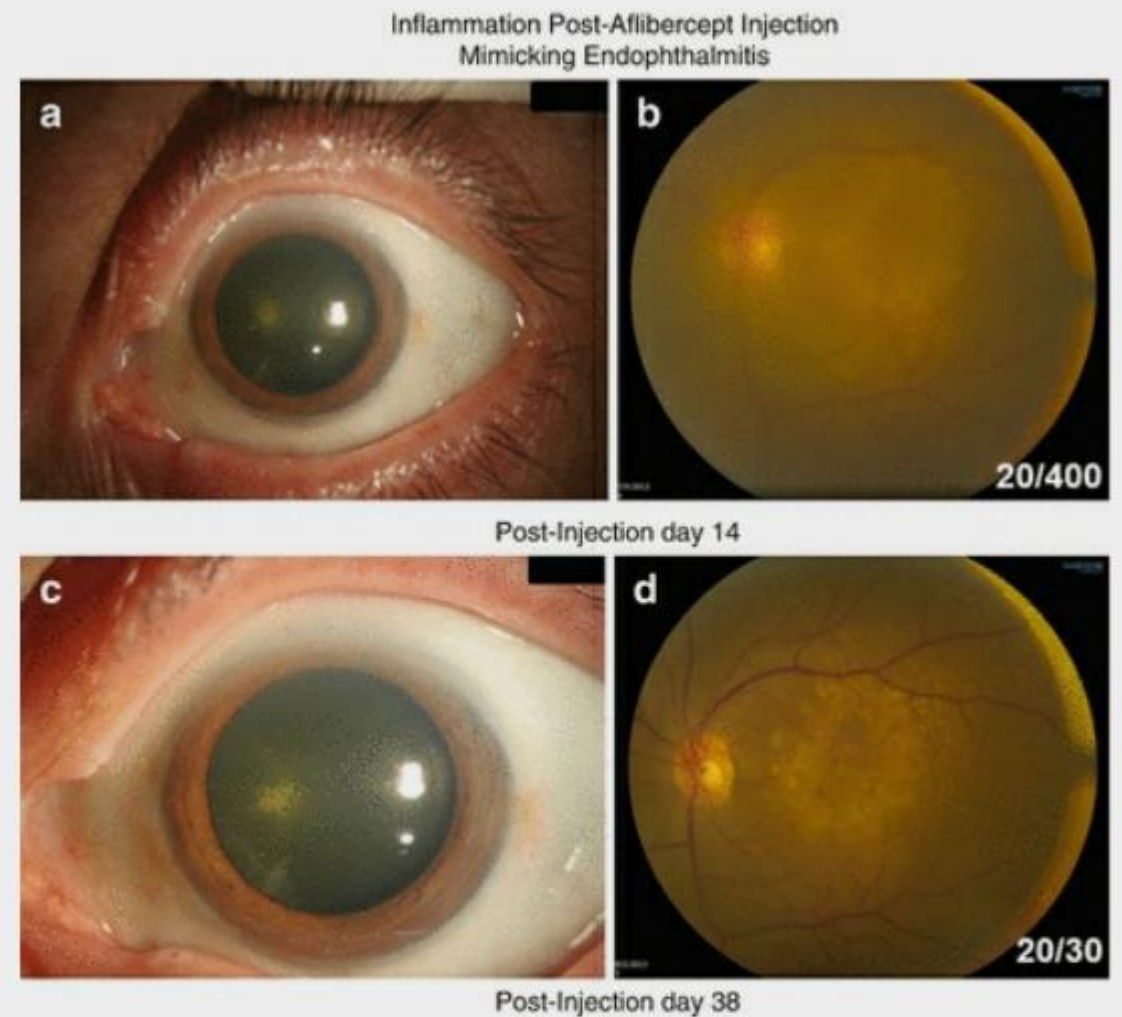


**Figure 2.10** Patients showing pseudoendophthalmitis after IVTA injection

# Pseudoendophthalmitis nach intravitrealen Injektionen

- Innerhalb der ersten drei Monate nach der Zulassung von Aflibercept (Eylea) durch die US-amerikanische Arzneimittelbehörde FDA am 18. November 2011 wurde eine Häufung von durch Injektionen verursachten sterilen intraokularen Entzündungen gemeldet.
  - Glading JA, Lake SR, Craig JE, Supramaniam D. Delayed onset panuveitis following intravitreal aflibercept injection. BMJ Case Rep. 2014;2014(

# Pseudoendophthalmitis mit Eylea nach intravitrealer Injektion

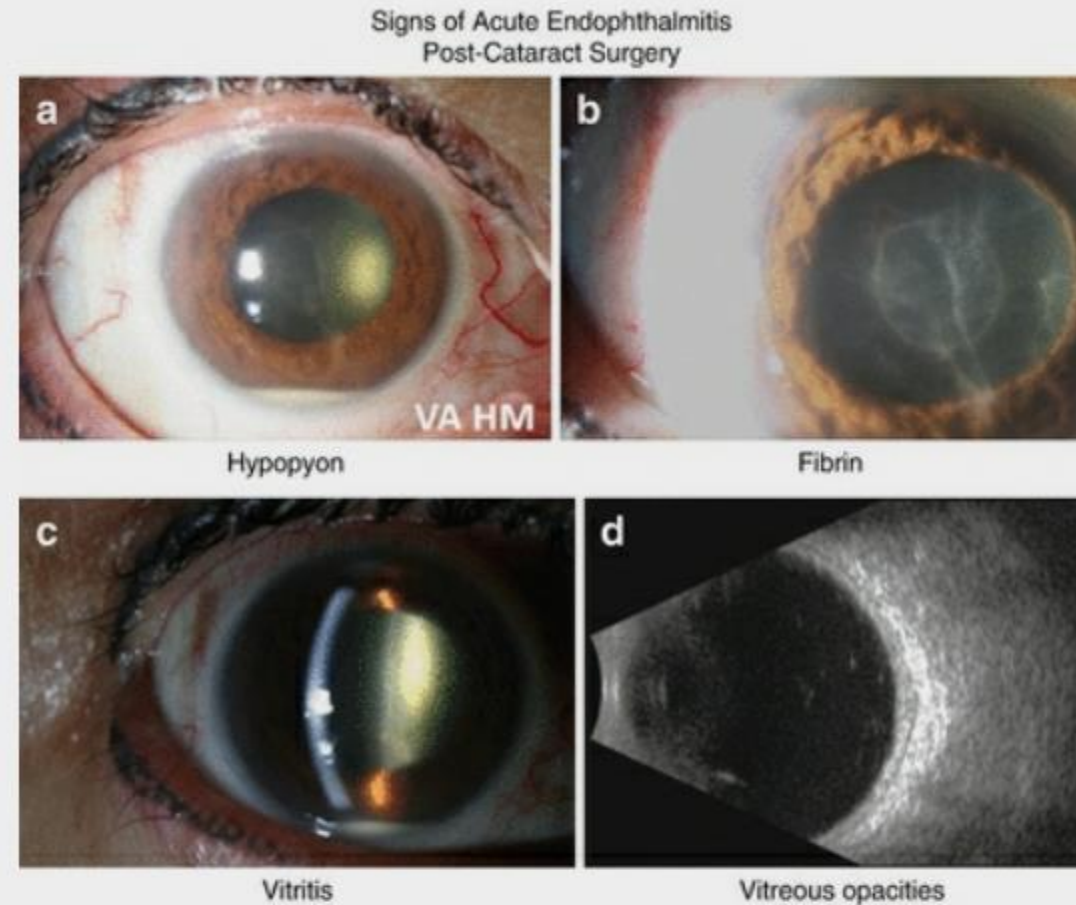


**Figure 2.13** Post-aflibercept inflammation . A 57-year-old female patient with neovascular age-related macular degeneration (wet-AMD) presented 14 days after intravitreal aflibercept injection with blurred vision (20/400). (a) and (b) Slit-lamp examination showed quiet conjunctiva, well-dilated pupil, vitritis, and hazy view of the posterior segment. (c) and (d) At day 38 follow-up, the inflammation and infection resolved with best corrected visual acuity improved to 20/30



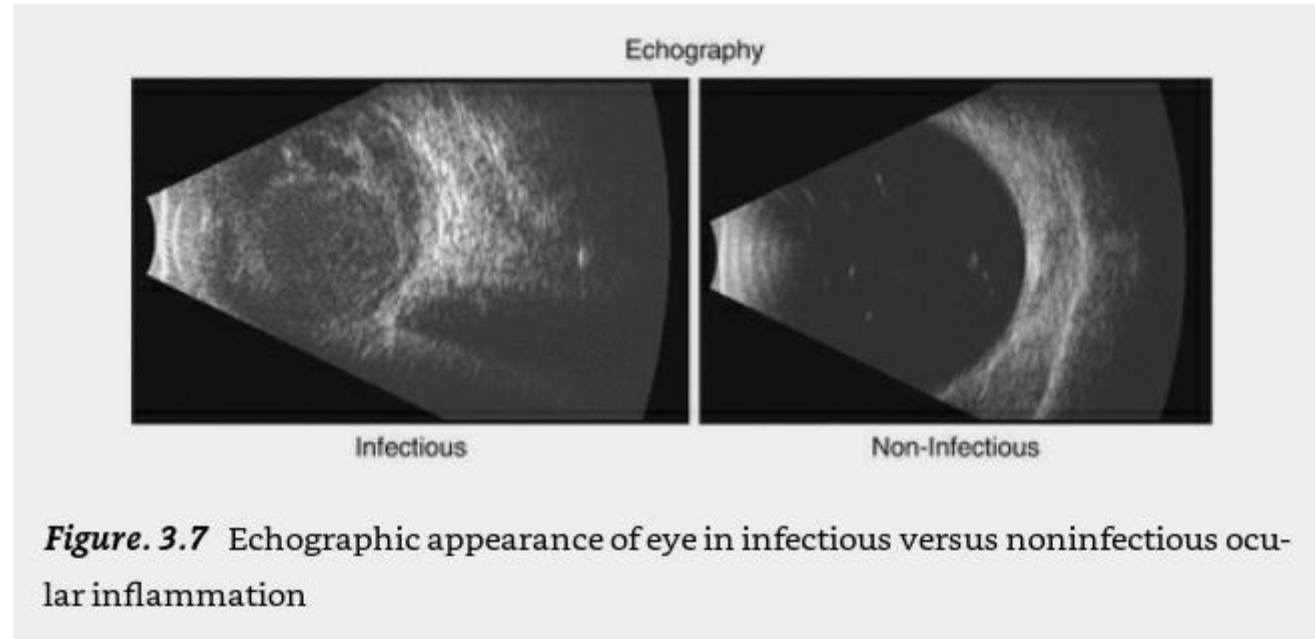
# Diagnose der Endophthalmitis: Klinische Präsentation, Mikrobiologie und Echographie





**Figure 3.1** Acute-onset endophthalmitis. Signs of acute-onset postoperative endophthalmitis following cataract surgery. **(a)** Conjunctival congestion, mild corneal edema, hypopyon, and hand motions (HM) vision on the day of presentation. **(b)** Fibrinous membrane in the anterior chamber and pupillary area. **(c)** Vitritis and hazy view of the posterior segment. **(d)** Ultrasound demonstrates presence of echogenic shadows in the vitreous cavity

# Ultraschall bei EO



# Färbungen und Kulturmedien zur mikrobiologischen Diagnostik

**Table 3.2** Stains and culture media used for microbiological diagnosis

Stains for smears	
Gram stain	Gram-positive organisms versus gram-negative organisms
Acid fast stains	For <i>Mycobacteria</i>
Calcofluor white	Fluorescent stain (fungi, microsporidia, and <i>Acanthamoeba</i> )
Culture media	
Chocolate agar	<ul style="list-style-type: none"> <li>• Used as an enriched medium for the recovery of fastidious organisms (i.e., <i>Neisseria gonorrhoeae</i> and <i>Haemophilus influenzae</i>)</li> <li>• Also, is used as a general-purpose medium for the recovery of bacteria, yeasts, and molds from aqueous and vitreous fluids</li> </ul>
5% sheep blood agar	• A general-purpose medium for recovery of the most common bacterial and fungal endophthalmitis isolates
Thioglycollate broth	• An all-purpose, enriched medium for the recovery of low numbers of aerobic or anaerobic (including <i>P. acnes</i> ) organisms from ocular fluids and tissues
Anaerobic blood agar	<ul style="list-style-type: none"> <li>• An all-purpose medium for the recovery of both anaerobic and facultative anaerobic organisms</li> <li>• Should be included for all chronic endophthalmitis or where <i>P. acnes</i> is suspected</li> </ul>
Sabouraud agar	• A selective medium used to promote the growth of fungi (yeasts and molds)
Blood culture bottles	<ul style="list-style-type: none"> <li>• Contain specially prepared for the recovery of both aerobic and anaerobic bacteria and fungi</li> <li>• Undiluted fluids, inoculated in pediatric bottles; diluted samples, inoculated in adult bottles</li> </ul>
Lowenstein-Jensen medium	• A selective medium for the recovery of acid-fast organisms ( <i>Mycobacteria</i> , <i>Nocardia</i> ) from aqueous and vitreous fluids

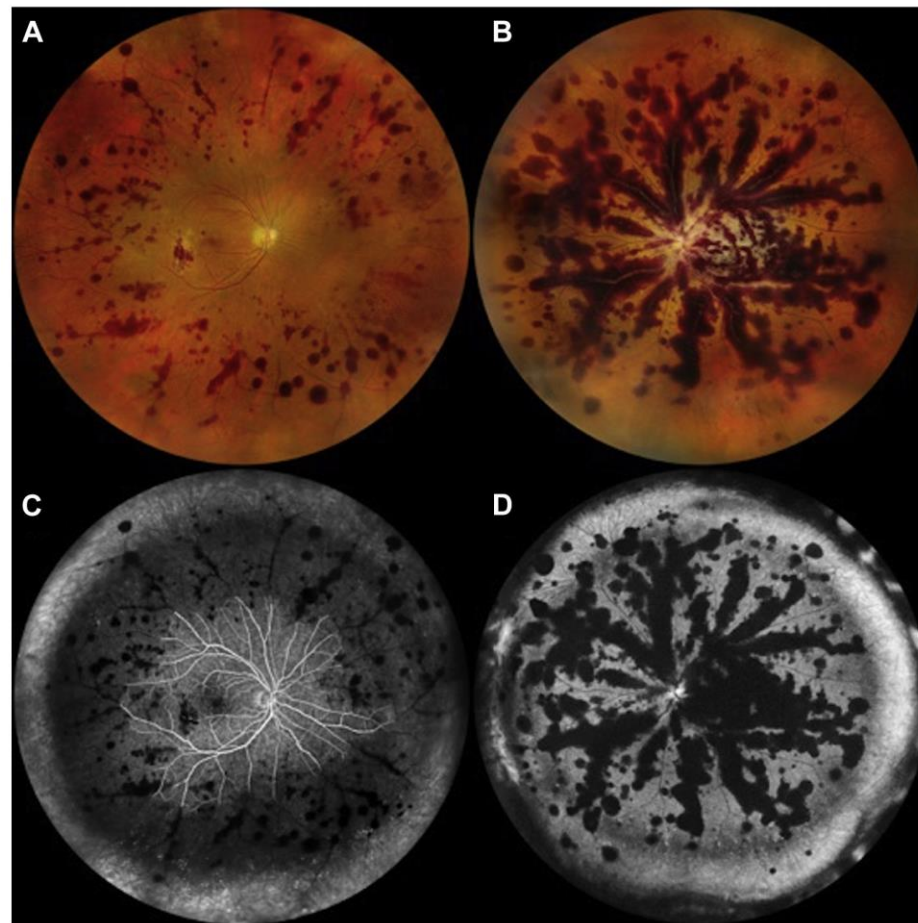


# Unerwünschte Wirkungen von Antibiotika

- Intravitreale Aminoglykoside
  - Risiko eines Makula-Infarkts
- Intravitreales Vancomycin
  - Hämorrhagische okklusive retinale Vaskulitis
- Intravitreales Amphotericin B
  - Risiko einer Netzhautschädigung
- Intravitreale Fluorchinolone
  - Risiko einer retinalen/systemischen Toxizität

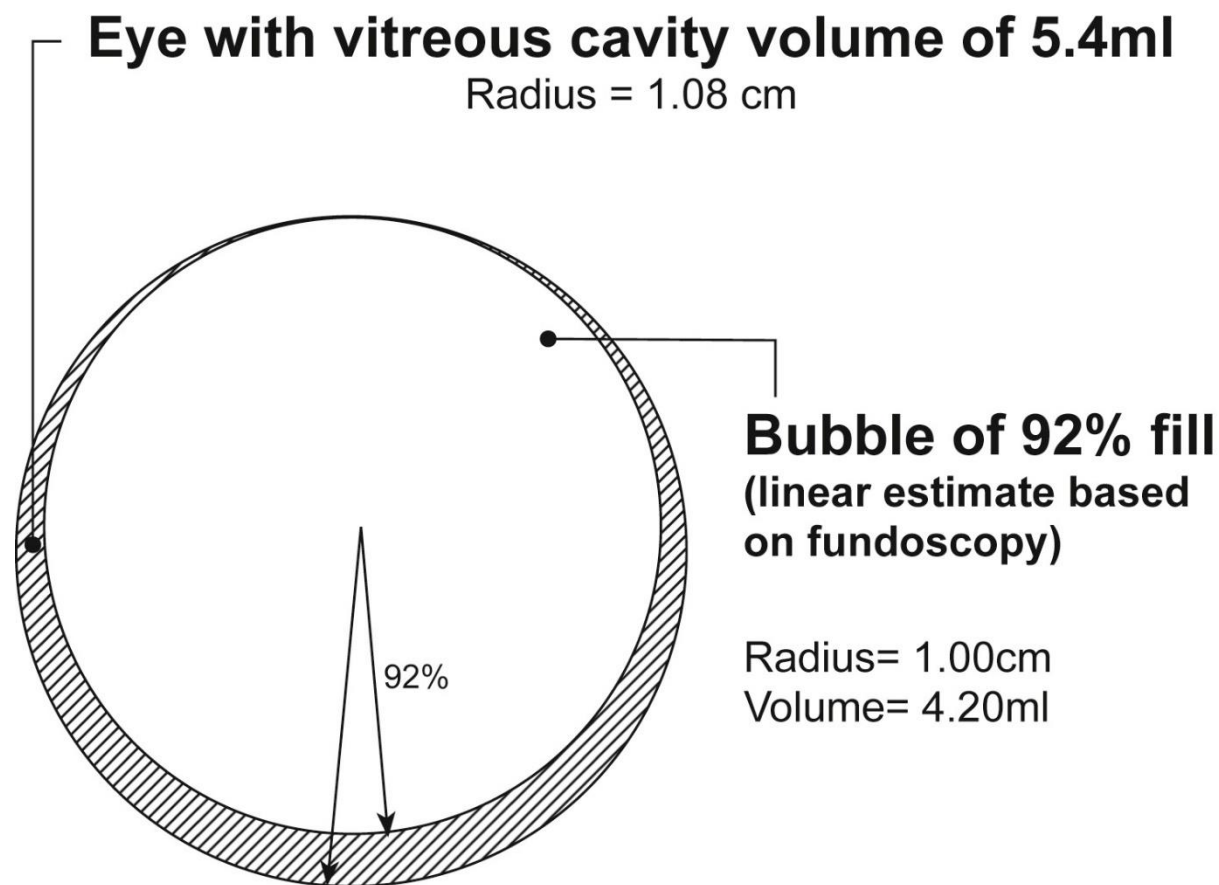
# HORV

## hämorrhagisch-okklusive retinale Vaskulitis



- Witkin, A. J., et al. (2017). "Vancomycin-Associated Hemorrhagic Occlusive Retinal Vasculitis: Clinical Characteristics of 36 Eyes." Ophthalmology **124**(5): 583-595.



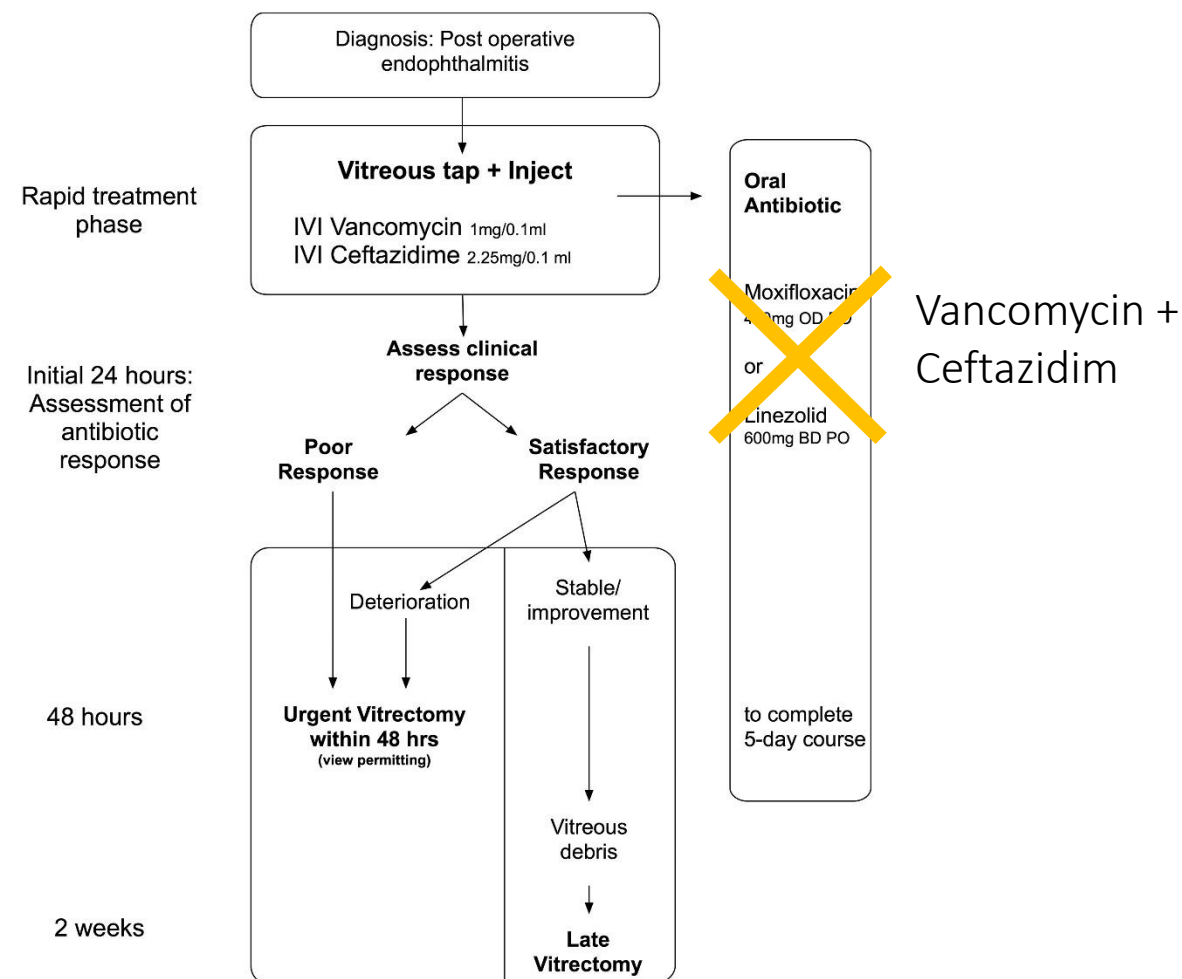


**Remaining aqueous = 1.2ml**

AB-Eingabe 5 Minuten vor partieller Luftfüllung



## Proposed Modified EVS Protocol





# Reservemedikamente für gram + Keime

**Table 5.5** Alternative intravitreal antimicrobial agents for gram-positive organisms

Name of drugs	Class of drugs	Mechanism of action	Intravitreal dose
Linezolid (Zyvox <sup>®</sup> )	Oxazolidinone (fermentation byproduct of <i>Streptomyces roseosporus</i> )	Inhibits initiation of protein synthesis by binding 23S rRNA of the 50S subunit of bacterial ribosome	300 µg/0.1 mL (rabbits and case series in humans)
Quinupristin/dalfopristin (Synercid <sup>®</sup> )	Streptogramin (isolated from <i>Streptomyces pristinaespiralis</i> )	Inhibits bacterial protein synthesis by interfering with function of 23S RNA (quinupristin/dalfopristin, 3:7)	0.4 mg/0.1 mL (rabbits and case reports in humans)
Daptomycin (Cubicin <sup>®</sup> )	Cyclic lipoglycopeptide	Terminates bacterial DNA, RNA, and protein synthesis and cell death by forming transmembrane channels in cell membrane and depolarization of membrane potential	200 µg/0.1 mL (case report in humans)
Tigecycline (Tygacil <sup>®</sup> )	Glycylcycline (a derivative of minocycline)	Inhibits bacterial protein synthesis by irreversibly binding to 30 S ribosomal unit	0.5–1 mg/0.1 mL (rabbits)



# Reservemedikamente für gram - Keime

**Table 5.6** Alternative intravitreal antimicrobial agents for gram-negative organisms

Name of drugs	Class of drugs	Mechanism of action	Intravitreal dose
Imipenem (Primaxin <sup>®</sup> )	Carbapenem	Interrupts cell-wall synthesis of various GPO and GNO and is a strong inhibitor of $\beta$ -lactamases from some GNO that are resistant to most $\beta$ -lactam antibiotics	50 $\mu$ g/0.1 m (case series in humans)
Ciprofloxacin (Cipro <sup>®</sup> )	Fluoroquinolones	Inhibition of the enzymes topoisomerase II (DNA gyrase) and topoisomerase IV, which are required for bacterial DNA replication, transcription, repair, and recombination	0.1 mg/0.1 mL
Levofloxacin (Levaquin <sup>®</sup> )	Fluoroquinolones	Same as above	0.1 mL of 0.5% ophthalmic solution (rabbits)
Moxifloxacin (Avelox <sup>®</sup> )	Fluoroquinolones	Same as above	0.2 mg/0.1 mL (case report in humans)

# Reservemedikamente für Pilze

**Table 5.7** Alternative intravitreal antimicrobial agents for fungal organisms

Name of drugs	Class of drugs	Mechanism of action	Intravitreal dose
Miconazole	Azole	Effects on respiration and cell permeability. It inhibits the growth of several species of <i>Candida</i>	25 µg/0.1 mL (case series in humans)
Caspofungin (Cancidas®)	Echinocandin	Blocks the synthesis of $\beta(1,3)$ -d-glucan of the fungal cell wall, by noncompetitive inhibition of the enzyme $\beta(1,3)$ -d-glucan synthase. $\beta(1,3)$ -d-Glucan is an essential component of the cell wall of numerous fungal species	50 µg/0.1 mL (rabbits and mice)
Micafungin (Mycamine®)	Echinocandin	It inhibits an enzyme essential for fungal cell-wall synthesis	0.025 mg/0.1 mL (rabbits)





# Danke