NOTES
EYE INFECTIONS

GENERALLY, WHAT ARE THEY?

PATHOLOGY & CAUSES

- Ocular disorders with infectious, noninfectious etiologies → inflammation, damage to eye structures

RISK FACTORS

- Immunocompromised state, contact with infectious agent, ocular trauma, certain systemic diseases

COMPLICATIONS

- Range from benign, self-limiting to vision-threatening infections

SIGNS & SYMPTOMS

- Structural damage, functional impairment

DIAGNOSIS

DIAGNOSTIC IMAGING

- Fundoscopy

CT scan/MRI

- Orbits, sinuses

LAB RESULTS

- Giemsa/Gram stains; cultures

OTHER DIAGNOSTICS

- Snellen chart

TREATMENT

MEDICATIONS

- Antimicrobials

OTHER INTERVENTIONS

- Address comorbidities

CHALAZION

osms.it/chalazion

PATHOLOGY & CAUSES

- Firm, painless lipogranulomatous inflammatory lump in eyelid; caused by blockage of ocular sebaceous glands
  - *Deep chalazion:* inflammation of meibomian sebaceous glands
  - *Superficial chalazion:* inflammation of Zeis sebaceous glands
- Gland obstruction → impissation (decreased flow of secretions) → granulomatous inflammatory response → lipogranuloma inflammation → lesion forms on upper (most common)/lower eyelid
- Slow growing; may persist for weeks/months; deeper within eyelid than hordeolum (stye)

RISK FACTORS

- Rosacea, seborrhea, blepharitis, inflamed hordeolum

COMPLICATIONS

- If large chalazion presses on cornea → visual changes
- *Recurring chalazion:* may signal carcinoma (rare)

SIGNS & SYMPTOMS

- Eyelid erythema; swelling; firm, nodular, rubbery consistency

DIAGNOSIS

OTHER DIAGNOSTICS

- Clinical history, physical examination
- *Histological examination:* chalazia may indicate eyelid carcinoma

Slit-lamp

- Determine status of meibomian glands; may demonstrate diffuse inspissation of yellowish contents from eyelid margin orifices

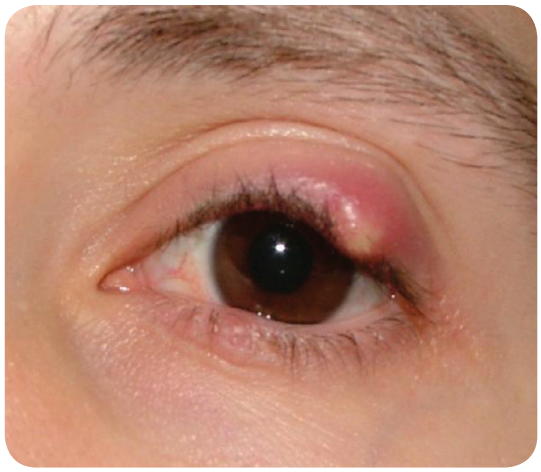

Figure 76.1 A chalazion of the left upper eyelid.

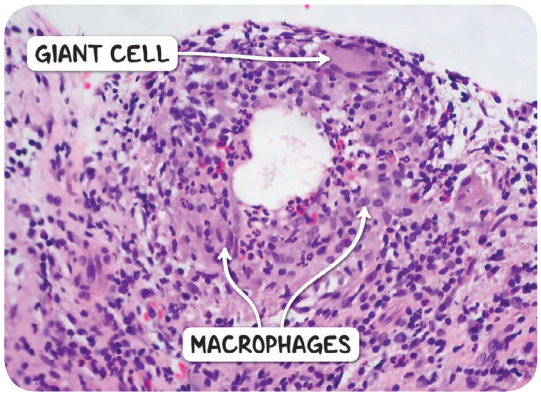

Figure 76.2 The histological appearance of a chalazion. There is granulomatous inflammation with giant cells, numerous macrophages as well as neutrophils and eosinophils surrounding a nidus of lipid.

TREATMENT

MEDICATIONS

- *Recalcitrant chalazia:* intralesional steroid injection

SURGERY

- *Recalcitrant chalazia:* incision, curettage

OTHER INTERVENTIONS

- Warm, wet compresses encourage drainage
- Ocular cleansing pads applied to eyelid margin
- Treat comorbidities (e.g. blepharitis, rosacea)
- Small chalazion may resolve on own

CHORIORETINITIS

osms.it/chorioretinitis

PATHOLOGY & CAUSES

- Inflammation of choroid, retina; AKA posterior uveitis

CAUSES

Infectious

- *Bacterial:* tuberculosis, syphilis
- *Viral:* cytomegalovirus, West Nile virus, herpes simplex virus (HSV) 1
- *Parasitic:* toxoplasmosis, onchocerciasis
- *Fungal:* *Candida albicans*

Noninfectious

- Sarcoidosis, Behçet's disease, traumatic chorioretinitis

RISK FACTORS

- Immunodeficiency, contact with infectious agent, traumatic eye injury, systemic disease associated with chorioretinitis

COMPLICATIONS

- Retinal hemorrhage/detachment, visual impairment with macular involvement

SIGNS & SYMPTOMS

- Floaters (vitritis), blurred vision, impaired color/night vision, ocular pain, photophobia, excessive lacrimation

DIAGNOSIS

DIAGNOSTIC IMAGING

Fluorescein angiography

- Irregularities

Fundoscopy

- Creamy white/yellow/gray lesions; keratic precipitates; retinal edema, necrosis; chorioretinal atrophy, neovascularization; cotton-wool infiltrates (Candida-associated chorioretinitis); polymorphic retinochoroidal scars (toxoplasmosis-associated chorioretinitis)

OTHER DIAGNOSTICS

- Clinical history, physical examination

TREATMENT

MEDICATIONS

- Corticosteroids/antimicrobials

Figure 76.3 A retinal photograph displaying the features of chorioretinitis. There are numerous, patchy, cream-colored lesions and retinal edema.

CONJUNCTIVITIS

osms.it/conjunctivitis

PATHOLOGY & CAUSES

- Inflammation of conjunctiva, transparent mucous membrane covering inside of eyelids (tarsal conjunctiva), globe (bulbar conjunctiva)
  - Non-keratinized epithelium containing goblet cells, highly vascularized substantia propria
  - *Turns pink/red when inflamed:* diffuse conjunctival injection
- Infection, inflammation → dilatation of conjunctival vessels → conjunctival hyperemia, edema → inflammatory discharge

TYPES

Infectious (bacterial)

- Highly contagious; spread by direct contact
- *Common causes:* *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Haemophilus influenzae*
- Hyperacute bacterial conjunctivitis
  - *Causes:* *Neisseria gonorrhoeae* (most common)/*Neisseria meningitidis*
  - *Oculogenital disease:* usually transmitted from genitals to eyes via hands
  - Vision-threatening
- Chlamydial
  - Caused by *Chlamydia trachomatis*
  - *Adult inclusion conjunctivitis:* chronic, indolent
  - *Trachoma:* infectious blindness cause worldwide; active trachoma caused by serotypes A, B, Ba, C (low-income country-endemic, mostly in children); initial follicular inflammation progresses in severity → cicatricial disease, vision loss

Infectious (viral)

- Highly contagious; spread by direct contact
- *Causes:* adenovirus (most common), HSV (in children), varicella zoster virus (VZV)
  - Ocular manifestation of systemic infection
  - *Epidemic keratoconjunctivitis (EKC):* caused by adenovirus 8, 19, 37; fulminant conjunctivitis, keratitis (epithelium of conjunctiva, cornea); corneal inclusions degrade visual acuity

Noninfectious (allergic)

- Caused by airborne allergens (seasonal, perennial)
- Immunoglobulin E (IgE)-mediated → local mast cell degranulation

Noninfectious (nonallergic)

- Caused by mechanical/chemical insult

RISK FACTORS

- Exposure to causative agent, immunocompromised state, atopy (allergic conjunctivitis)
- *Contact lens wear:* common source of mechanical injury, nonallergic, infectious conjunctivitis

COMPLICATIONS

- *Cornea:* keratitis (inflammation), ulcer, perforation, scarring
- Dacryocystitis (bacterial infection of lacrimal sac)
- Vision loss

SIGNS & SYMPTOMS

- *Appearance:* unilateral/bilateral inflammation; pinkish-red eye; eyelid edema; chemosis (conjunctival edema); excessive lacrimation
- Discharge
  - *Bacterial:* purulent/mucopurulent; white/yellow/green
  - *Gonococcal:* hyper-purulent, profuse
  - *Viral:* watery; stringy
  - *Allergic:* watery, mucoid
  - *Nonallergic:* mucoid
- Infected eye "stuck" shut from morning crusting; gritty, burning sensation (viral); itching (allergic); photophobia (corneal involvement); transient visual impairment
- Preauricular lymphadenopathy

Figure 76.4 The clinical appearance of conjunctivitis.

DIAGNOSIS

LAB RESULTS

- *Adenoviral conjunctivitis:* rapid point-of-care adenovirus antigen test
- *Recalcitrant conjunctivitis:* conjunctival biopsy (rule out neoplasm)

Giemsa/gram stains

- Confirm identity of organism in suspected infectious cause

OTHER DIAGNOSTICS

- Clinical history, physical examination

TREATMENT

MEDICATIONS

- Ocular lubricant drops/ophthalmic ointment
- *Allergic conjunctivitis:* antihistamine drops
- *Adult inclusion conjunctivitis:* systemic therapy to eradicate *Chlamydia* infection (antibiotics)
- *Bacterial conjunctivitis:* Topical antibiotic drops/ointment
- *Epidemic keratoconjunctivitis (EKC):* topical glucocorticoids

OTHER INTERVENTIONS

- Warm, wet compresses encourages drainage
- *Hyperacute conjunctivitis, EKC:* immediate specialized ophthalmologist referral
- *Viral conjunctivitis:* self-limiting; usually resolves in 2–3 weeks

KERATITIS

osms.it/keratitis

PATHOLOGY & CAUSES

- Cornea inflammation → corneal tissue destruction
- Inflammatory response → stromal damage from infection, host response → edema, infiltrates, necrotic ulceration, focal thinning, perforation

CAUSES

Infectious

- *Bacteria:* *Staphylococcus aureus*, *Pseudomonas aeruginosa*, coagulase-negative *Staphylococcus*, diphtheroids, *Streptococcus pneumoniae*
- *Viruses:* HSV, herpes zoster
- *Fungi:* *Candida* supp., *Aspergillus* supp., *Fusarium* supp.
- *Parasites:* *Acanthamoeba*

Noninfectious

- Corneal inflammation with no known infectious etiology

RISK FACTORS

- Corneal epithelium disruption
  - Contact lenses (contact lens-related keratitis); esp. improper use (e.g. overnight wear, poor hygiene)
  - Recent keratoplasty, trauma, corneal exposure (e.g. Graves' ophthalmopathy, Bell's palsy)
- Immunocompromised state
- Topical (ocular) corticosteroid use
- *Contributing disorders:* rosacea; keratoconjunctivitis sicca (dry eye syndrome); neurotrophic keratitis (lesion on cranial nerve V); autoimmune diseases (e.g. rheumatoid arthritis, cicatricial pemphigoid)

COMPLICATIONS

- Endophthalmitis (interior eye inflammation), intraocular damage, vision loss, keratolysis (corneal melting)

SIGNS & SYMPTOMS

- Erythema
- Preauricular lymphadenopathy
- *Discharge:* mucopurulent (bacterial), watery (viral)
- Corneal opacity, stromal infiltrate (immune complex deposits), ulcer
  - *Bacterial keratitis:* yellow infiltrates
  - *Fungal keratitis:* white infiltrates, feathery borders
  - *Acanthamoeba:* Wessely ring infiltrate
- *Hypopyon (layer of white cells in anterior chamber):* fulminant bacteria
- Foreign body sensation; difficulty keeping eye open; photophobia; pain; decreased visual acuity, blurred vision; blepharospasm

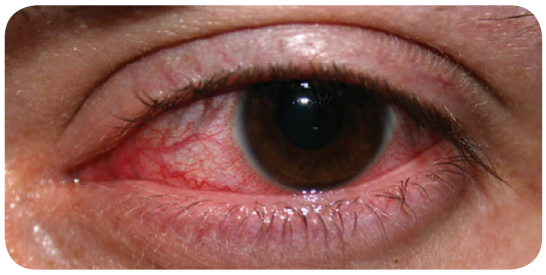

Figure 76.5 An individual with sterile keratitis of the left eye.

DIAGNOSIS

DIAGNOSTIC IMAGING

Fundoscopy

- Slit beam; examine contour abnormalities of cornea, lens, retina; small corneal infiltrates; faint branching grey opacity (viral keratitis)

LAB RESULTS

- *Corneal scrapings, cultures:* suspected infectious etiology

OTHER DIAGNOSTICS

- Clinical history, physical examination

Penlight

- Visualizes infiltrate/ulcer (> 0.5mm); round, white spot (bacterial keratitis)

Fluorescein dye

- Corneal uptake of dye
  - Visualize loss of epithelial cells, ulceration
  - Green glow under cobalt blue light
  - Diffuse white opacity/dull corneal light reflex
  - *Seidel sign (leaking aqueous humor → fluorescein streaming):* penetrating trauma

Snellen chart

- ↓ visual acuity

TREATMENT

MEDICATIONS

- Topical antimicrobials for infectious etiology

OTHER INTERVENTIONS

- Control of associated comorbidities
- Temporary discontinuation of wearing contact lenses

ORBITAL CELLULITIS

osms.it/orbital-cellulitis

PATHOLOGY & CAUSES

- Serious infection involving contents of orbit (ocular muscles, surrounding fat; not globe)

CAUSES

- Entry of microorganisms into orbital space
  - Via anatomical perforations of nerves, blood vessels in paranasal sinuses (e.g. ethmoid)
  - Migration from surrounding tissues (e.g. face, eyelids) after local trauma/surgery
  - Inflammatory response → tissue destruction

RISK FACTORS

- More common in children
- Migration from other infections
  - *Bacterial rhinosinusitis: Staphylococcus aureus*, streptococci (common); fungal rhinosinusitis (rare)
  - *Dacryocystitis:* lacrimal sac infection
  - *Infected mucocele:* mucus-containing cystic lesion of salivary gland
  - Infections involving teeth, middle ear, face
- *Direct inoculation:* ophthalmic surgical procedures; orbital trauma with fracture/ foreign body

COMPLICATIONS

- *Extraorbital extension:* epidural/subdural empyema; brain abscess; meningitis; cavernous sinus thrombosis; dural sinus thrombosis; involvement of cranial nerves III, IV, V, VI; optic neuritis
- *Endophthalmitis:* interior eye inflammation
- Vision loss
- Potentially fatal if sepsis develops

SIGNS & SYMPTOMS

Systemic

- Fever; severe headache, vomiting, mental status changes (intracranial complications)

Ocular

- Red, swollen eyelids; chemosis (conjunctival edema); pain (esp. with eye movement); ophthalmoplegia (paralysis of eye muscles); proptosis (abnormal displacement of eye); impaired visual acuity, color vision; abnormal pupillary light reflex

DIAGNOSIS

DIAGNOSTIC IMAGING

CT scan/MRI

- Orbits, sinuses; detects abscess, intracranial changes

Dilated fundoscopy

- Determines optic neuropathy/retinal vascular occlusion

LAB RESULTS

Complete blood count (CBC)

- Leukocytosis; ↑ absolute neutrophil count (ANC)

Blood/orbital/subperiosteal aspirates cultures

- Identify causative organism

OTHER DIAGNOSTICS

- Clinical history, physical examination
- *Ocular motility:* pain with movement
- *Pupillary light reflex:* sluggish/absent reflex → optic nerve involvement
- *Exophthalmometry:* measures degree of proptosis
- *Asses color vision acuity:* determines optic nerve involvement
- Intraocular pressure measurement (↑)

TREATMENT

MEDICATIONS

- Antimicrobials

SURGERY

- External (through orbit)/endoscopic transcaruncular approach

CHARACTERISTICS OF PERIORBITAL & ORBITAL CELLULITIS

	PERIORBITAL CELLULITIS	ORBITAL CELLULITIS
EYE SWELLING WITH/WITHOUT ERYTHEMA	+	+
FOCAL PAIN	+/-	+
PAIN WITH MOVEMENT	-	+
PROPTOSIS	-	+
OPHTHALMOPLEGIA	-	+
DECREASED VISUAL ACUITY	-	+
CHEMOSIS	-	+/-
IMPAIRED PUPILLARY FUNCTION	-	+
FEVER	+/-	+
LEUKOCYTOSIS	+/-	+/-
POTENTIAL FOR VISION LOSS	-	+

PERIORBITAL (PRESEPTAL) CELLULITIS

osms.it/periorbital-cellulitis

PATHOLOGY & CAUSES

- Mild infection of superficial tissues of anterior eyelid (tissues anterior to orbital septum); more common than orbital cellulitis

CAUSES

- *Introduction/migration of microorganisms into preseptal space:* *Staphylococcus aureus*, *Streptococcus pneumoniae*, other streptococci, anaerobes

RISK FACTORS

- More common in children
- *Migration from other infections:* sinusitis; upper respiratory tract infection; dacryocystitis; bacteremia (rare)
- *Direct inoculation:* trauma (e.g. insect bites, animal bites, introduction of foreign bodies); ophthalmic surgical procedures

COMPLICATIONS

- Orbital cellulitis

Figure 76.6 An individual with left-sided periorbital cellulitis.

SIGNS & SYMPTOMS

- Ocular pain, eyelid swelling, erythema, fever, lymphadenopathy

DIAGNOSIS

DIAGNOSTIC IMAGING

Contrast-enhanced CT scan (orbits, sinuses)

- Distinguishes between preseptal, orbital cellulitis; associated sinusitis

LAB RESULTS

CBC

- Leukocytosis

Cultures (abscess contents, paranasal sinus secretions)

- Identify causative agent

OTHER DIAGNOSTICS

- Clinical history, physical examination

TREATMENT

MEDICATIONS

- Oral antibiotics

STYE (HORDEOLUM)

osms.it/stye

PATHOLOGY & CAUSES

- Blockage, purulent inflammation of upper/lower eyelid

CAUSES

- Sterile/bacterial (e.g. *Staphylococcus aureus*, *Staphylococcus epidermidis*)

Internal

- Meibomian sebaceous gland; points toward conjunctival side of lid → conjunctival inflammation

External

- Zeiss/Moll sebaceous glands; points toward skin surface of eyelid

RISK FACTORS

- Touching eyes with contaminated hands, chronic blepharitis, seborrhea, improper contact lens hygiene, sleeping with eye makeup, immunocompromised state

COMPLICATIONS

- Hardens → chalazion

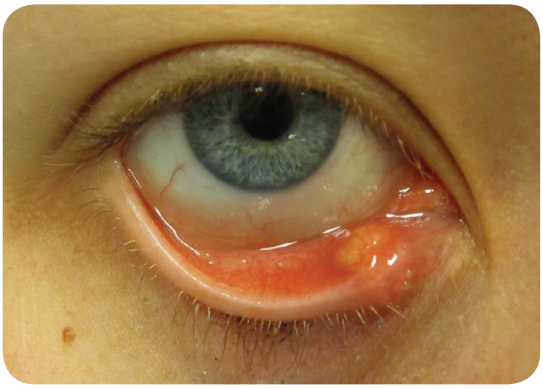

Figure 76.7 A stye on the right lower eye lid.

SIGNS & SYMPTOMS

- Tenderness; fluctuant pustule; localized swelling, erythema; excessive lacrimation; photophobia

DIAGNOSIS

DIAGNOSTIC IMAGING

Slit lamp, fundoscopy

- Determine infection extension to other tissues

OTHER DIAGNOSTICS

- Clinical history, physical examination
- Visual acuity assessment

TREATMENT

MEDICATIONS

- Topical antibiotic ointment

SURGERY

- *Incision, curettage:* if progresses to chalazion

OTHER INTERVENTIONS

- Warm compresses encourage drainage
- Usually self-limiting with spontaneous resolution

EYELID LESIONS OVERVIEW

	STYE (HORDEOLUM)	CHALAZION
ONSET	Acute	Chronic
CAUSE	Usually infectious	Noninfectious
GLAND INVOLVEMENT	Internal stye - Involves meibomian gland - Lesion points toward conjunctival side of lid External stye - Involves Zeiss/Moll glands - Lesion points toward skin surface of eyelid	Deep chalazion - Involves meibomian gland Superficial chalazion - Involves Zeis glands Lesions are deeper than hordeolum
PAIN	Yes	No; possible mild tenderness
INFLAMMATORY CHARACTERISTICS	Purulent	Lipogranulomatous
LESION CHARACTERISTICS	Small, fluctuant	Large, firm, rubbery, nodular
DURATION OF SYMPTOMS	Self-limiting with spontaneous drainage	May wax, wane; often lasts for months
SEVERE COMPLICATION	May evolve into chalazion if healing compromised	May be sign of eyelid carcinoma

UVEITIS

osms.it/uveitis

PATHOLOGY & CAUSES

- Inflammation of uveal tract (choroid, ciliary body, iris); unilateral/bilateral
- *Onset:* rapid/insidious
- *Course:* acute/recurrent/chronic
- *Duration:* persistent (> three months)/ limited (≤ three months)

TYPES

Anterior (most common)

- Anterior uveal tract; iritis, iridocyclitis (inflammation of ciliary body)

Panuveitis

- Anterior chamber, vitreous body, retina/ choroid

Posterior uveitis

- Retina/choroid

Intermediate uveitis
- Vitreous body; chorioretinal inflammation

CAUSES
- *Bacterial:* tuberculosis, syphilis
- *Viral:* cytomegalovirus, HSV
- *Fungal:* candidiasis, *Pneumocystis jirovecii*
- *Parasitic:* *Acanthamoeba*, toxoplasmosis
- *Noninfectious systemic:* Crohn's disease, ankylosing spondylitis
- *Conditions confined to eye:* trauma, acute retinal necrosis

RISK FACTORS
- Systemic infectious, inflammatory conditions

COMPLICATIONS
- Intraocular hypertension, glaucoma; increased intraocular pressure; posterior synechiae (iris adheres to lens); band keratopathy (corneal calcium deposits); cataract; vision loss

SIGNS & SYMPTOMS
- Ocular erythema
- Impaired vision
- Pain, photophobia, vision distortion, floaters (vitritis), photopsia (flashing lights)

DIAGNOSIS

DIAGNOSTIC IMAGING

Fluorescein/indocyanine green angiography (posterior uveitis)
- Evaluate status of retinal vascular circulation; identify choroidal disease

Fundoscopy
- *Ciliary flush:* perilimbal redness
- *Keratic precipitates:* inflammatory deposits on cornea
- Hypopyon: white blood cells settle on bottom of anterior chamber
- *Haziness of aqueous humor:* protein accumulation

LAB RESULTS

Microscopy, cytology, culture, polymerase chain reaction (PCR)
- Fluid sampling/biopsy; identify presence of infectious agent

OTHER DIAGNOSTICS
- Clinical history, physical examination

Snellen chart
- ↓ visual acuity

Pupillary light reflex
- Sluggish pupillary reaction to light → synechiae

Intraocular pressure
- No change if uncomplicated uveitis; ↑ in acute uveitis-induced glaucoma

TREATMENT

MEDICATIONS
- *Corticosteroids:* topical, local injection, implantable, systemic
- *Recalcitrant uveitis:* immunomodulatory agents (if corticosteroid response inadequate)
- *Recalcitrant uveitis:* tumor necrosis factor (TNF) inhibitor (if resistant to treatment)
- *Posterior synechiae prevention:* mydriatic/cycloplegic medications
- *Viral-associated uveitis:* antivirals

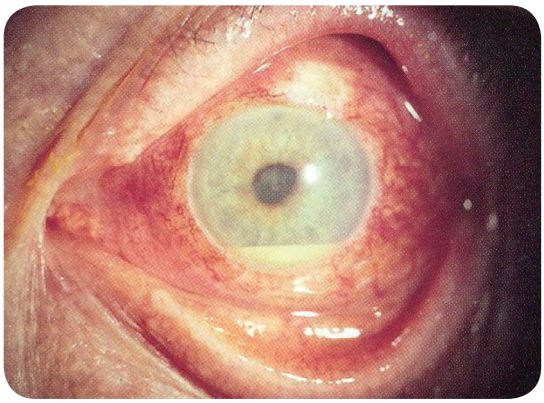

Figure 76.8 An individual with a hypopyon of the left eye as a result of severe anterior uveitis.