OCULAR EMERGENCIES:
THE RED EYE

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Eye Anatomy

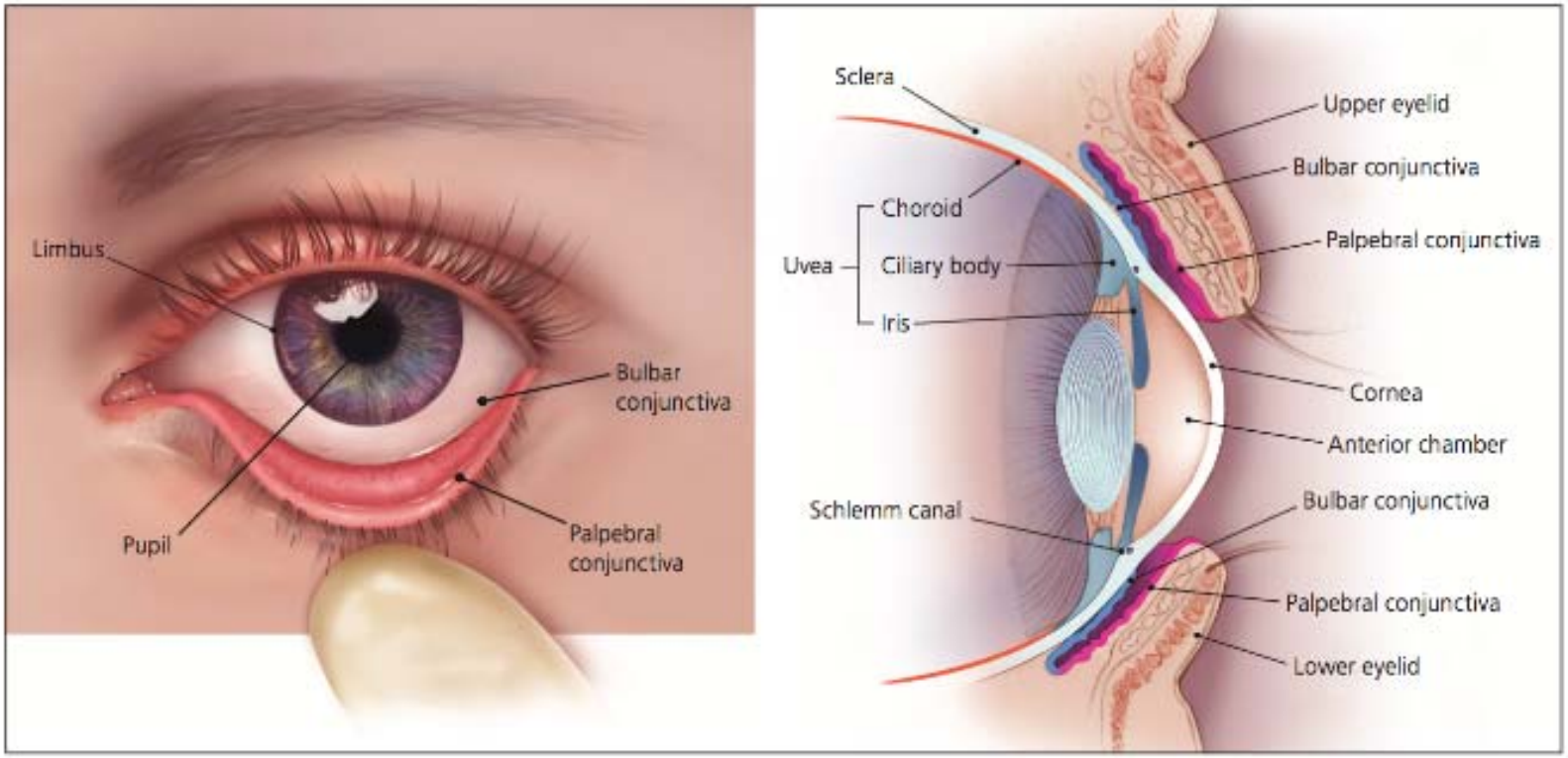


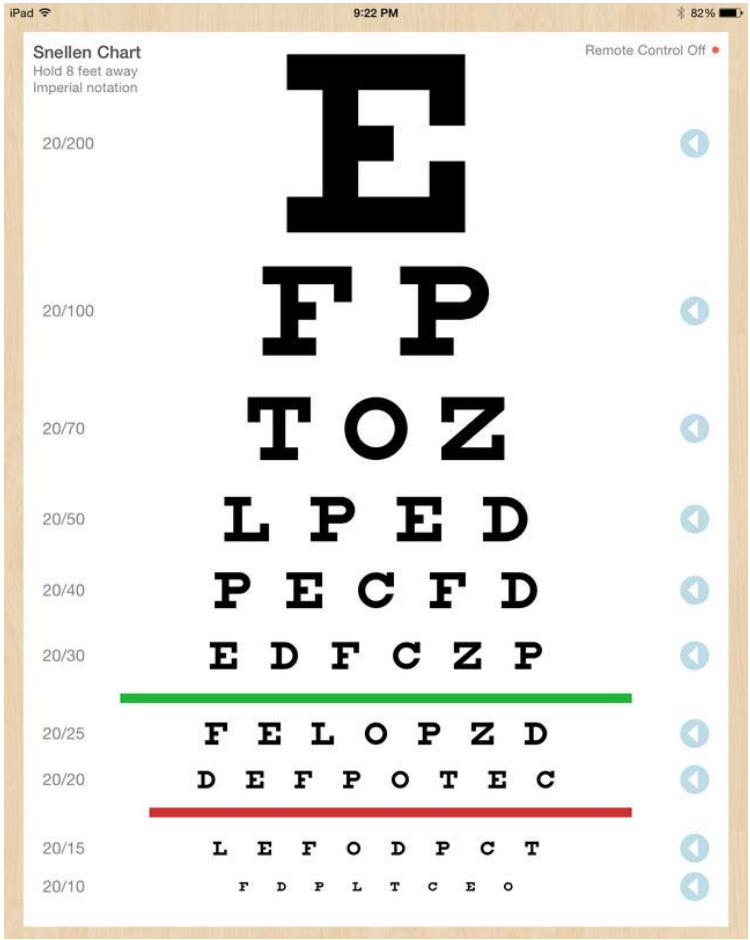
Figure 1. Anatomy of the eye.

The History

- One or both eyes
- The duration of symptoms
- Previous eye and medical problems
- The type of discharge, if present
- Visual changes, pain, or photosensitivity

The Exam

- Visual acuity (use glasses)
- Pupil size and reaction to light
- The pattern and location of the redness
- The cornea and anterior segment
- Preauricular lymph nodes
- Fundoscopic Exam



Visual Acuity

- App for Iphone or Android
- Patient should use their glasses
- Pinhole corrects for refractive error
- What if patient cannot see the chart?
  - Move the chart closer
  - Count fingers
  - Hand motion
  - Light perception

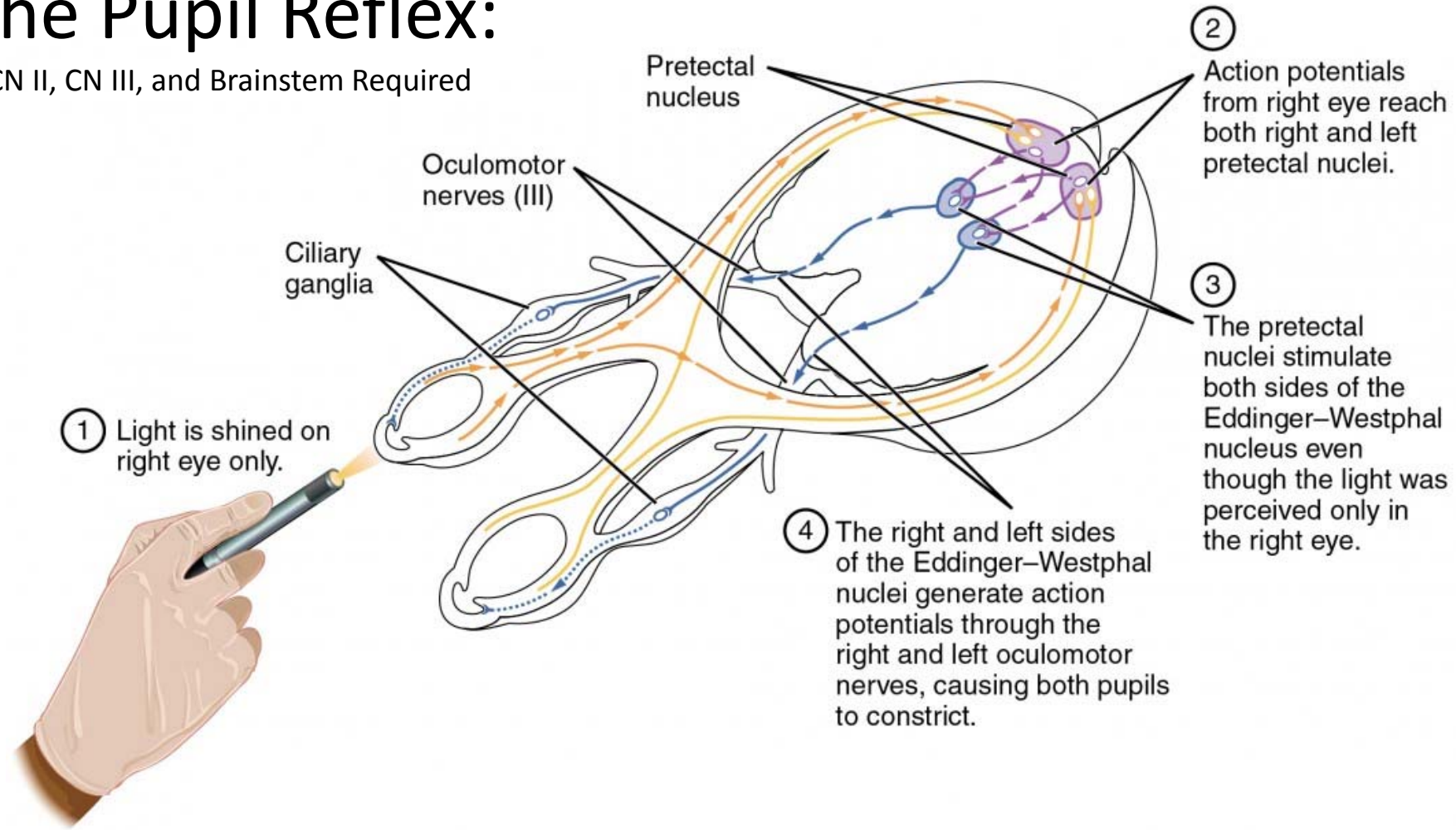
Eye Chart HD - Screen Vision 4+
Dok LLC

What should you do if the patient does not have their glasses?

Using a pinhole will correct for refractive error

The Pupil Reflex:

CN II, CN III, and Brainstem Required



Pupillary Light Reflex

The pupillary light reflex requires CN II, CN III, and central brain stem connections. Light shined in one eye stimulates retinal photoreceptors, and subsequently retinal ganglion cells, whose axons travel through the optic nerve, chiasm, and tract to terminate in the pretectum (pretectal nucleus). The pretectal neurons project to a portion of the nucleus of Edinger-Westphal on both sides. This preganglionic parasympathetic nucleus projects to ciliary ganglion neurons, which in turn send postganglionic axons to innervate the pupillary constrictor muscle. Thus, light shined in one eye normally results in the constriction of both pupils (ipsilateral pupillary constriction—direct response; contralateral pupillary constriction—consensual response).

Lesions of CN II produce an unresponsive pupillary light reflexon both sides (afferent pupillary defect) from light shined in the eye on the side of the CN II lesion. With light shined in the unaffected eye, both pupils constrict.

Lesions of CN III result in unresponsive ipsilateral pupillary constriction on the affected side (the pupil is “fixed and dilated”) when light is shined in either eye (efferent pupillary defect).

Normal and Abnormal Pupil Response to Light

Normal

- LIGHT in Right Eye
- Retinal photoreceptors (CN II)
- Retinal ganglion cells (CNII)
- Optic nerve, optic chiasm, optic tract → pretectum (CN II)
- Projects to BILAT nucleus of Edinger-Westphal (PS)
- BILAT Ciliary ganglions (CN III)
- BILAT Pupil Constriction

Abnormal

- Lesion of CN II:
  - Relative Afferent Pupil Defect (Marcus Gunn Pupil)
  - Swinging light test
  - Complete Afferent Defect: Unresponsive pupils to light shined in the eye with CN II lesion. Bilateral constriction in unaffected eye.
- Lesion of CN III:
  - Efferent Pupil Defect
  - Unresponsive ipsilateral pupil constriction defect
  - Pupil Fixed and Dilated when light is shined in either eye

Red Eye Triage

Emergency

- Acute Angle Closure Glaucoma
- Central Retinal Artery Occlusion
- Orbital Cellulitis
- Central Corneal Ulcer
- Globe Rupture

Less Emergent

- Central Retinal Vein Occlusion
- Corneal Abrasion
- Corneal Foreign Body
- Preseptal Cellulitis
- Iritis (Uveitis)
- Conjunctivitis

Case 1

A 32 year old woman is evaluated for a 4 week history of eye symptoms. She notes redness of both eyes with itchiness and irritation. There is watery discharge and crusting, mostly in the morning. Vision is normal, and she notes no other symptoms except for intermittent sneezing. She has not had contact with anyone who has similar symptoms or is ill. She does not wear contact lenses. Medical history is remarkable for hypothyroidism. Her medications are levothyroxine and an oral contraceptive.

On physical examination, she is afebrile, blood pressure is 124/60 mm Hg and pulse rate is 62/min. Skin examination is normal. There is redness with edematous swelling of the conjunctiva in both eyes. A watery discharge is present, and there is mild swelling of the upper eyelids bilaterally. Visual acuity is normal. The remainder of the physical examination is normal.

Which of the following is the most likely diagnosis?

A. Allergic conjunctivitis

B. Bacterial conjunctivitis

C. Blepharitis

D. Viral conjunctivitis

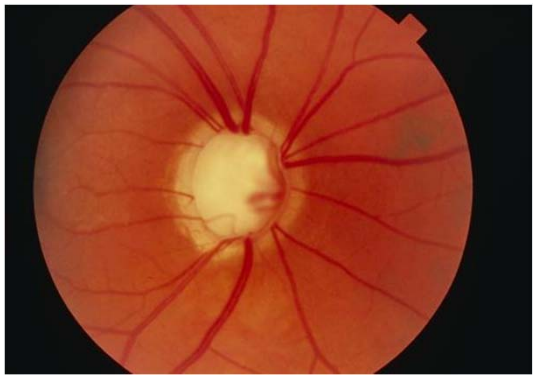
Conjunctivitis

- Allergic
- Viral
- Bacterial
  - Thicker discharge
  - Pre-auricular node
  - Antibiotic/steroid combo

Case 2

A 50 year-old man is evaluated for a 1 year history of reduced vision in both eyes. Over the course of this time he has noticed a decrease in peripheral vision, most apparent when driving his car. He has no eye pain, redness, or other symptoms. He only wears reading glasses and does not wear contact lenses. Medical history is significant for hypertension and hyperlipidemia. He has a 35 pack year history of smoking and is a current smoker. Medications are losartan and simvastatin.

On physical exam, temperature is normal, blood pressure is 138/88 mm Hg, and pulse rate is 84/min. BMI is 32. The eyes appear normal on inspection. There is mild loss of peripheral vision on clinical visual field testing. Fundoscopic examination findings are shown. Intraocular pressure is 35 mm Hg bilaterally. The remainder of the examination is unremarkable.



Which of the following is the most likely diagnosis?

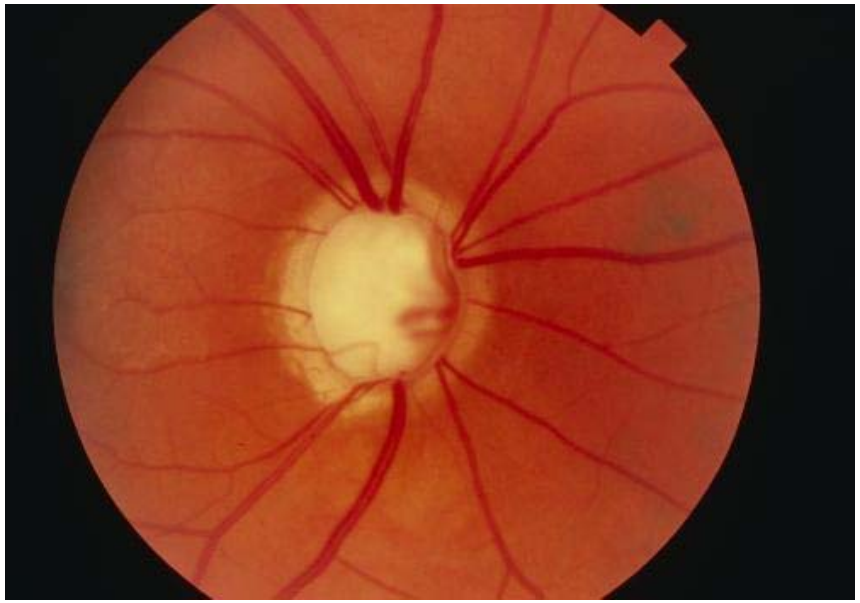
A. Ophthalmic artery occlusion

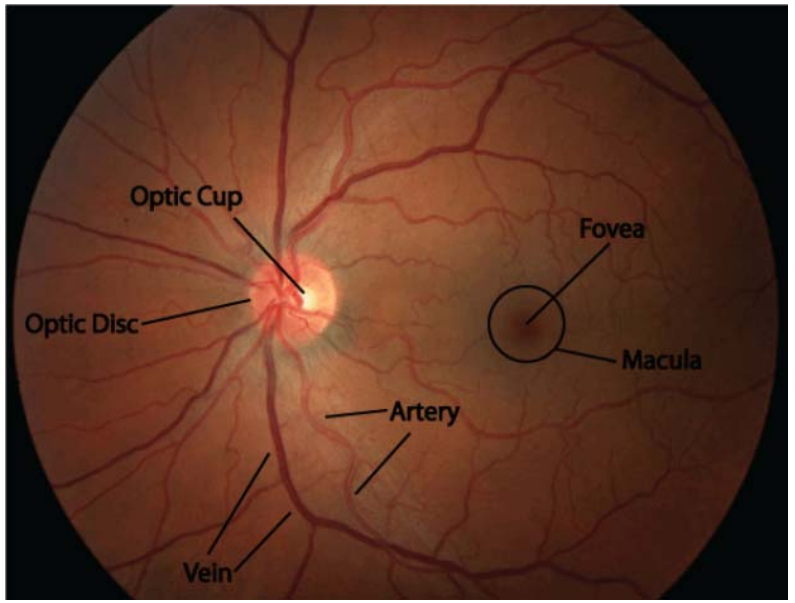
B. Optic neuritis

C. Papilledema

D. Primary open angle glaucoma

Primary open angle glaucoma vs. Normal





Case 3

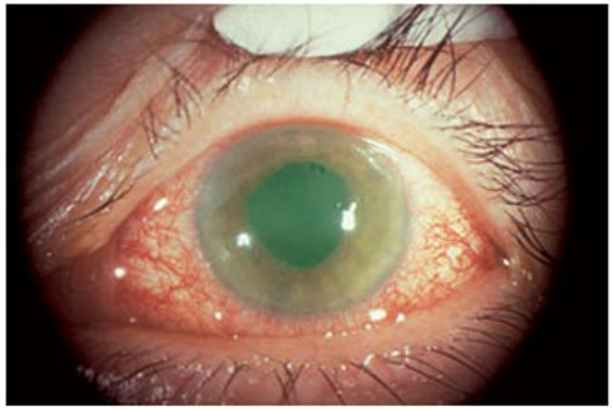
A 26 year old woman is evaluated for a 3-day history of pain and redness of the left eye. She also notes increased pain when looking at bright objects with that eye. Her symptoms have been progressively worsening since onset. Medical history is unremarkable, although she reports generalized fatigue, chronic low back pain, and stiffness over the past several months. The back pain awakens her at night and improves throughout the day with activity. Her only medication is as-needed ibuprofen for her back pain which provides some relief.

On physical examination, temperature is normal, blood pressure is 126/64 mm Hg, and pulse is 54/min. BMI is 27. On ophthalmological examination, extraocular muscle movements and visual acuity are normal. There is pronounced redness of the sclera surrounding the border where it meets the cornea in the left eye. The left pupil is constricted, and there is photophobia with illumination of the left eye. The right eye is normal. The physical examination is normal except for tenderness to palpation over the buttocks in the region of the sacroiliac joints.

Which of the following is the most likely diagnosis?

A. Corneal ulcer
B. Episcleritis
C. Scleritis
D. Uveitis

Acute angle closure glaucoma



- Circumferential redness around limbus
- Photophobia
- Blurred vision
- Etiology
  - Trauma
  - Autoimmune
  - Sarcoid
- Prednisolone 1% Q 4 H
- Atropine 1% QID if synechiae present

Case 4

A 28 year-old man is evaluated for bilateral eye pain and redness of 3 months' duration, which has recently worsened. He describes the pain as deep and constant and notes that it worsens at night. He also reports photophobia. He does not wear contact lenses. He has tried several types of over-the-counter eye drops without improvement in her symptoms. He is otherwise healthy and takes no medications.

On physical examination, the patient is afebrile, blood pressure is 100/62 mm Hg, and pulse rate is 94/min. BMI is 24. Ophthamologic examination shows diffuse redness bilaterally, sparing the lids and iris. Visual acuity is normal. A nondilated fundoscopic examination is unremarkable. The remainder of the examination is normal.

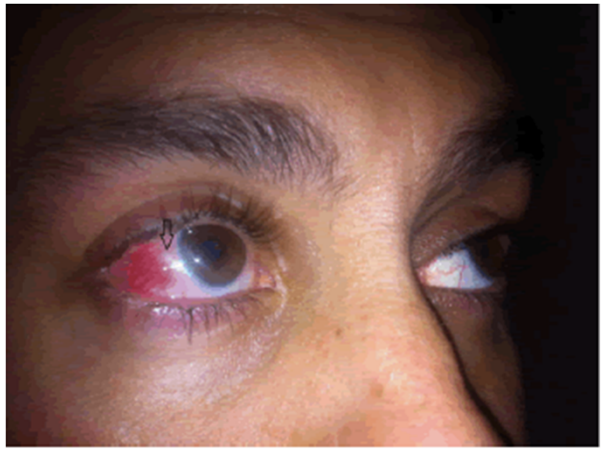
Which of the following is the most likely diagnosis?

A. Episcleritis

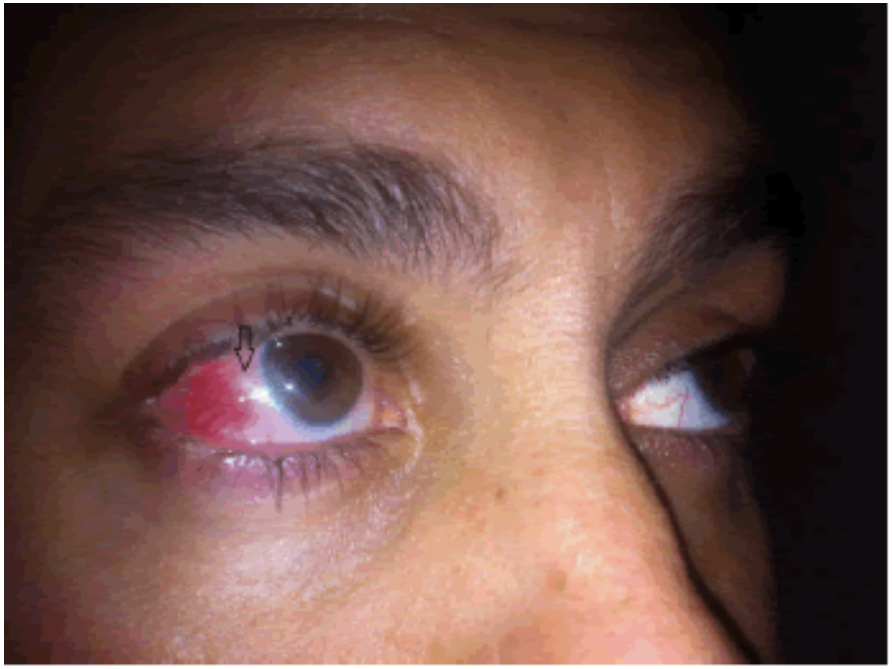
B. Keratoconjunctivitis sicca

C. Scleritis

D. Subconjunctival hemorrhage



Scleritis



Case 5

A 43 year-old radiologist is preparing to do a thoracentesis on a patient who is in contact and respiratory droplet precautions. As he puts on his mask with the respiratory shield, he accidentally hits himself in the eye with the edge of the plastic eye shield. He experiences instant pain and tearing of the eye, and returns to his cubicle, unable to perform the procedure. He notices an acute visual acuity problem in the affected eye when he tries to look at his digital monitor, and calls you in a panic.

His past medical history is significant for glaucoma that was diagnosed in medical school related to an episode of iritis. He has had a trabeculectomy in the uninjured eye 20 years ago and and has been on medication for his glaucoma treatment since then. He is extremely concerned about his vision, and wants to know what you recommend.

Which of the following is the most appropriate treatment for this patient?

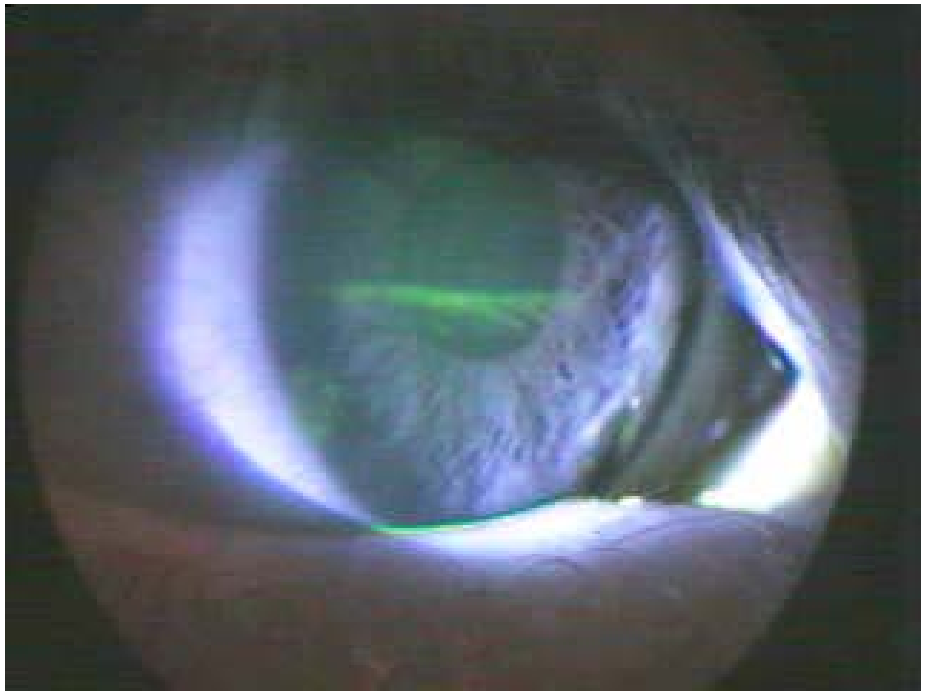
A. Preservative free artificial tears, liberally. Make an appointment with ophthalmologist next week.

B. Gentamicin antibiotic eye drops and topical anesthetic drops prn

C. Erythromycin eye ointment and patch for 24 hours

D. Ophthalmology consultation

Corneal abrasion



- Pain, redness, foreign body sensation
- Positive fluorescein staining with blue light
- Tight patch x 24 hours with erythromycin ointment for 3 days
- No need for ophthalmology referral

Case 6

An 18 year old man is evaluated for a 3 day history of pain, swelling, and redness of the left eye. He cannot open his eye because of the swelling. One week ago, he developed a fever with sinus congestion and post nasal drainage. Except for a continued subjective fever, these symptoms have resolved. He has no history of eye trauma or surgery. He takes no medications.

On physical examination, temperature is 38.0 C (100.4 F), blood pressure is 100/62 mm Hg, and pulse rate is 88/min. BMI is 23. Examination of the right eye shows red and edematous upper and lower lids with conjunctival erythema. Pupillary reflex to light is intact. Inspection reveals no foreign bodies. He is unable to move the eye. A limited fundoscopic examination is normal. The right eye is normal, and the remainder of the physical examination is unremarkable.

Which of the following is the most likely diagnosis?

A. Blepharitis

B. Endophthalmitis

C. Orbital cellulitis

D. Preseptal cellulitis

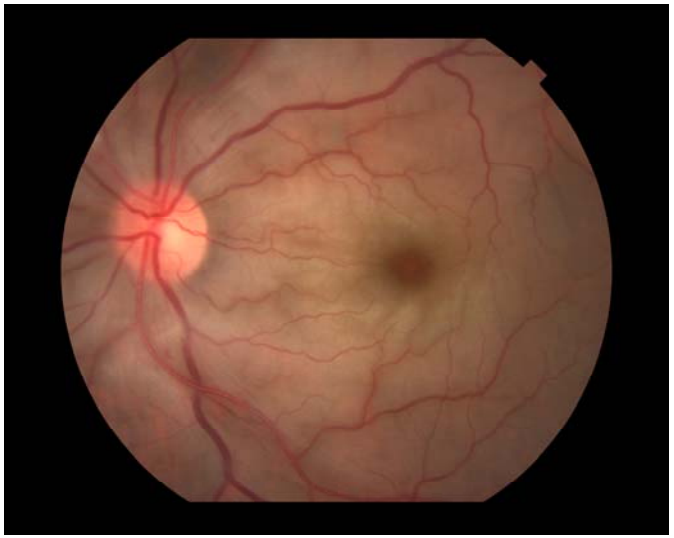
Orbital cellulitis vs. Preseptal cellulitis

- Marked edema on upper and lower lids
- Pain with extra-ocular movement
- Possible afferent pupillary defect, decreased vision
- CT> abscess in muscle cone behind the eye
- Admit
- IV antibiotics (vancomycin, unasyn)
- Call ophtho consult

Case 7

A 75 year-old man with a history of CAD and peripheral vascular disease, diabetes type 2, and hypertension presents with sudden, profound vision loss in his right eye for the past 2 hours. He denies pain or redness in the eye.

On physical exam, the patient has a blood pressure of 160/90 mm Hg, HR 80, and is afebrile. He can only perceive hand movement in the right eye, and the left eye is 20/20 with his glasses. There is an afferent pupil defect in the right eye and the fundoscopic exam is shown.



Which of the following is the most likely diagnosis?

A. Central retinal vein occlusion
B. Central retinal artery occlusion
C. Acute retinal detachment
D. Dry age-related macular degeneration

CRAO vs. CRVO