Assessment of red eye

The right clinical information, right where it's needed
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Acute red eye is a common presenting complaint to primary care physicians.[1] A detailed history of the presenting symptoms and previous ophthalmological and medical history can narrow the differential diagnosis and aid in the interpretation of key examination findings. The lack of specialist equipment in the primary care setting, along with a very broad differential diagnosis, can cause difficulty in establishing the correct diagnosis, and in such cases a specialist ophthalmological opinion should be sought.[2] Serious vision-threatening conditions that present as red eye are rare and can occasionally be overshadowed by associated systemic symptoms; in light of this they should always be considered within the differential and excluded on examination.[3]
Aetiology

The causes of acute red eye can be considered within the following categories:[4]

Adnexal causes

- Trichiasis: posterior misdirection of the eyelashes from the normal site of origin [Fig-1]
- Entropion: inward turning of the eyelid margin [Fig-2]
- Ectropion: outward turning of the eyelid margin [Fig-3]
- Blepharitis: inflammation of the eyelid margin [Fig-4]
- Dry eye: symptoms or signs consistent with a deficiency of the precorneal tear film. [Fig-5]

Conjunctival causes

- Bacterial conjunctivitis: inflammation of the conjunctiva caused by bacterial infection [Fig-6]
- Viral conjunctivitis: inflammation of the conjunctiva caused by viral infection [Fig-7]
- Allergic (vernal) conjunctivitis: inflammation of the conjunctiva occurring during an allergic response [Fig-8]
- Neonatal conjunctivitis: inflammation of the conjunctiva within the first month of life
- Subconjunctival haemorrhage [Fig-9]
- Subtarsal foreign body [Fig-10]
- Conjunctival foreign body.

Corneal causes

- Bacterial corneal ulcer: corneal epithelial defect caused by bacterial infection [Fig-11]
- Viral corneal ulcer: corneal epithelial defect caused by viral infection [Fig-12]
- Fungal corneal ulcer: corneal epithelial defect caused by fungal infection
- Contact lens-related
- Corneal foreign body [Fig-13]
- Corneal abrasion: corneal epithelial defect usually caused by trauma. [Fig-14]

Inflammatory causes

- Anterior uveitis: inflammation of the anterior portion of the uveal tract

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Assessment of red eye

Overview

• Scleritis: inflammation of the sclera

• Episcleritis: inflammation of the episclera.

Traumatic causes

• Physical

• Chemical.

Other

• Angle-closure glaucoma: closure of the iridocorneal angle leading to an acute rise in intra-ocular pressure.

Most common conditions

Those commonly presenting to a primary care physician are:

• Infective conjunctivitis

• Allergic conjunctivitis

• Dry eye and other adnexal problems.

Sight-threatening causes

Causes of red eye that can threaten vision by leading to reduced visual acuity include:

• Angle-closure glaucoma

• Chemical injuries

• Conditions affecting the cornea

• Trauma

• Anterior uveitis.

Causes of red eye that can threaten vision by leading to globe rupture or perforation include:
• Scleritis
  [Fig-16]
• Physical trauma
• Corneal ulceration
• High-velocity foreign bodies.

These are discussed further with initial management in Emergencies: Urgent Considerations.

Risk factors

Risk factors associated with specific causes of red eye include:

• Anterior uveitis:
  [Fig-15]
  human leukocyte antigen-B27 histocompatibility complex-positive patients, tuberculosis, syphilis, Lyme
disease, sarcoidosis, Behcet's disease, and pauciarticular juvenile chronic arthritis.
• Scleritis:
  [Fig-16]
  connective tissue disorders including rheumatoid arthritis, granulomatosis with polyangiitis (formerly
  known as Wegener's granulomatosis), systemic lupus erythematosus (SLE), and relapsing
  polychondritis.
• Episcleritis:
  [Fig-17]
  connective tissue disorders including rheumatoid arthritis, granulomatosis with polyangiitis (formerly
  known as Wegener's granulomatosis), and SLE.
• Angle-closure glaucoma:
  [Fig-19]
  hypermetropia, mydriatics, and systemic anticholinergic medications.
• Subconjunctival haemorrhage:
  [Fig-9]
  hypertension, systemic anticoagulation, bleeding abnormalities (leukaemia, clotting disorders),
  conjunctival vascular lesion, trauma (including contact lens-related injury), and diabetes.
• Dry eye:
  [Fig-5]
  connective tissue disorders including Sjogren's syndrome, rheumatoid arthritis, and SLE.
Urgent considerations

(See Differential diagnosis for more details)

Patients suspected of having any one of the following immediately sight-threatening conditions should be referred urgently for a same-day assessment by an ophthalmologist.

**Angle-closure glaucoma**

This is a vision-threatening condition. Symptoms suggestive of angle-closure glaucoma include:

- Pain in the affected eye
- Blurred vision
- Halos around lights seen from one eye
- Headache
- Associated nausea or vomiting.

The cornea can appear hazy if corneal oedema is present, and the pupil may be fixed and mid-dilated. If angle-closure glaucoma is suspected, then immediate referral for an ophthalmological opinion and treatment should be sought. Delay in the diagnosis and referral of angle-closure glaucoma has been shown to be detrimental to the final outcome.[7]

Immediate treatment consists of carbonic anhydrase inhibitors, such as acetazolamide or methazolamide, to decrease aqueous humour formation.

[Fig-19]

**Trauma: chemical injury**

Chemical injuries, especially from alkali-based solutions, are potentially extremely serious and can lead to long-term ocular surface problems. Immediate irrigation with water or 0.9% saline solution to remove the reservoir of chemicals from the eye should be attempted before any other procedures.[8] The amount of irrigation required is dependent on the pH of the tear film. After the pH has normalised, referral for further ophthalmological management is advised.[9]

[Fig-11]

[Fig-12]

[Fig-18]

**Corneal ulcer**

Bacterial, viral, or fungal corneal ulcers are vision-threatening conditions that need to be referred to an ophthalmologist urgently to ensure appropriate treatment to limit corneal scarring. Corneal ulcer can lead to perforation of the eye.

[Fig-11]

**Contact lens-related red eye**

This is potentially a vision-threatening condition and needs to be referred to an ophthalmologist to ensure appropriate treatment to limit corneal scarring. The patient should be advised to cease use of their contact lenses and take the contact lenses to the local eye hospital where they are seen.
**Corneal foreign body**

Any history of a high-velocity injury (hammer usage) should be referred for appropriate and immediate imaging, as any high-velocity foreign body may penetrate the globe. This, and non-penetrating corneal foreign bodies, are potentially vision-threatening conditions and require referral to an ophthalmologist to ensure appropriate treatment.

**Penetrating ocular trauma**

Very gentle initial examination is required to prevent possible expulsion of intra-ocular contents. Prompt specialist treatment is required to reduce the risk of sight- and eye-threatening complications.

**Scleritis**

Scleritis is potentially a vision-threatening condition. Certain forms of scleritis can lead to perforation of the globe and reduced visual acuity.[10] If global perforation is suspected, the eye should be shielded and palpation should be avoided. It should be evaluated further by an ophthalmologist. Scleritis is commonly associated with connective tissue disorders including rheumatoid arthritis, granulomatosis with polyangiitis (formerly known as Wegener’s granulomatosis), systemic lupus erythematosus, and relapsing polychondritis.

**Neonatal conjunctivitis**

Neonatal conjunctivitis (ophthalmia neonatorum) is usually a mild illness. However, untreated infection (for example with gonococcus, chlamydia, pseudomonas, or herpes) can lead to sight-threatening complications and potentially serious systemic infection.[11] [12] Complications of neonatal conjunctivitis due to chlamydia include superficial corneal vascularisation, conjunctival scarring, and pneumonia. Complications due to gonorrhoeal infections include corneal scarring, ulceration, panophthalmitis, perforation of the globe, and permanent visual impairment.[11] [12] [13] Patients with suspected neonatal conjunctivitis should be referred immediately to an ophthalmologist.[12] [14]
Step-by-step diagnostic approach

Current history

When taking the presenting history of red eye, it is important to consider the serious vision-threatening diagnoses along with more common causes. By including key questions and noting down pertinent negative features, the differential diagnosis can be narrowed and a decision can be made on whether referral for further ophthalmological treatment is required or treatment can be given in the primary care setting.

Key questions to consider include:[15]

- When did the condition start?
- Is the condition unilateral or bilateral?
  - A foreign body or trauma is usually unilateral, whereas conjunctivitis may start as unilateral and then become bilateral.
- Was the onset of the symptoms acute or gradual?
  - Acute onset may indicate a corneal foreign body or abrasion or foreign body trauma.

The most important associated symptoms to note in the history are the presence of reduced visual acuity or a deep aching pain within the eye, indicating the presence of a more serious underlying diagnosis, such as angle-closure glaucoma, anterior uveitis, or scleritis.

If the patient reports a foreign body sensation, the possible diagnoses are conjunctivitis, conjunctival/subtarsal foreign body, corneal foreign body, keratitis, and corneal ulcer. If a foreign body is suspected, ask whether the patient has undertaken any recent activity that could have resulted in this and, if so, whether he or she was wearing eye protection. The nature of the activity will also point to potential penetrating injuries: for example, the use of mechanical saws and hammering can produce high-velocity foreign bodies, which have the ability to penetrate the surface of the globe and become intra-ocular.

If the patient wears contact lenses, contact lens-related red eye should be referred for further ophthalmological review, as corneal ulceration must be excluded.
If there is any discharge present, factors that can help to identify the presence of conjunctivitis and the possible underlying aetiology are:[16]

- Watery, purulent, or mucopurulent discharge; for example:
  - A watery discharge is seen in viral conjunctivitis
  - A profuse mucous discharge is seen in chlamydial conjunctivitis
  - A purulent discharge is seen in gonococcal conjunctivitis
- Discharge that is worse in the morning:
  - May be due to allergy
- Presence of itch:
  - Usually due to allergy
  - Minimal itch may be present in chlamydial conjunctivitis
- History of atopy.

If the patient is photophobic, this can indicate possible underlying anterior uveitis or corneal epithelial disturbance. The systemic associations of photophobia, such as meningitis, should always be considered in an unwell patient.[17]

Past medical and past ophthalmological history

The physician should consider whether the patient has had previous similar episodes or whether there are any underlying systemic associations of conditions known to cause red eye, such as:

- Human leukocyte antigen-B27 histocompatibility complex-positive patients
- Reactive arthritis
- Tuberculosis, syphilis
- Lyme disease
- Sarcoidosis
- Behçet's disease
- Pauciarticular juvenile chronic arthritis
- Connective tissue disorders (including rheumatoid arthritis, Sjogren's syndrome, and systemic lupus erythematosus)
- Granulomatosis with polyangiitis (formerly known as Wegener's granulomatosis)
- Relapsing polychondritis
- Hypertension.

Drug history

The current use of any ophthalmological medications as well as any systemic medications known to precipitate causes of red eye should be noted. These include mydriatics and systemic anticholinergic medications. Patients on anticoagulants may be predisposed to subconjunctival haemorrhage. Persistence of conjunctivitis despite topical antibiotics should prompt evaluation for a different aetiology.
Examination

Examination of the eye in a primary care setting requires the use of a Snellen chart, a light source, fluorescein, and a cotton wool bud to evert the upper lid. A step-wise approach can be used, with consideration of the differential diagnosis from the history.

1. Visual acuity should be checked in all patients, as a reduction may indicate a more serious underlying cause for the red eye.

2. Inspection of the lids and brow should be performed to exclude peri-orbital injury. The position of the lid margins should be checked for the presence of trichiasis, an entropion, or an ectropion. If any discharge can be seen, conjunctivitis should be considered. If the condition is bilateral with purulent discharge, it should be treated as conjunctivitis. A vesicular rash around the eye could indicate varicella zoster or herpes simplex infection.

3. On inspection of the ocular surface and subtarsal surface, the pattern of redness (an important feature) should be assessed. Segmental injection may indicate episcleritis or the presence of a foreign body. Ciliary or limbal (junction of the cornea and sclera) injection occurs in anterior uveitis and corneal conditions. Redness that is localised and well demarcated with quiet surrounding conjunctiva is seen in subconjunctival haemorrhage, prompting the patient's blood pressure to be checked. Generalised injection, with engorgement of the deeper scleral vessels and pain on palpation of the globe, indicates the presence of scleritis. The tarsal conjunctiva should be inspected for papillae, seen in allergic conjunctivitis, or follicles, seen in chlamydial conjunctivitis. If there is a history of a foreign body, the upper lid should be everted with a cotton wool bud to exclude a subtarsal position. If the foreign body cannot be found and the activity during the incident may have produced a high-speed foreign body, then further ophthalmological opinion should be sought to exclude an intraocular position. Instilling fluorescein during inspection of the ocular surface can allow the visualisation of foreign bodies, corneal abrasions, and corneal ulcers. If there is fluorescein staining present on the cornea or the cornea appears cloudy (seen in angle-closure glaucoma), referral for further ophthalmological examination is advised. Rose bengal stain can be used in patients in whom dry eye is suspected as the underlying cause.
4. Pupillary reactions. The physician should observe for anisocoria (unequal pupil size), and if this is present should refer for further ophthalmological assessment.[19] Using a pen torch (or equivalent light source), the direct and consensual pupillary responses should be checked. If the pupillary response is abnormal in the presence of red eye, anterior uveitis and angle-closure glaucoma need to be excluded. If the patient is photophobic on examination, further referral is also advised.[20]

Investigations
Swabs for bacterial, viral, and chlamydial culture can be taken in patients with suspected conjunctivitis. Investigation into the underlying systemic causes of red eye should be performed in a specialist clinic after a definite ophthalmological diagnosis has been given. Certain local causes of red eye including ectropion, entropion, corneal ulcer, contact lens-related red eye, corneal abrasion, corneal foreign body, penetrating and chemical trauma, scleritis, and angle-closure glaucoma should be evaluated further by an ophthalmologist.

Computed tomography imaging of the orbits should be performed if a high-velocity penetrating injury is suspected.

If acute glaucoma is suspected, intra-ocular pressure should be measured in the emergency department.
## Differential diagnosis overview

### Common

- Trichiasis
- Entropion
- Ectropion
- Blepharitis
- Dry eye
- Corneal ulcer (bacterial, viral, or fungal)
- Contact lens-related red eye
- Herpes zoster ophthalmicus
- Keratitis
- Corneal foreign body
- Corneal abrasion
- Subtarsal conjunctival foreign body
- Allergic conjunctivitis
- Bacterial conjunctivitis
- Viral conjunctivitis
- Non-traumatic subconjunctival haemorrhage

### Uncommon

- Angle-closure glaucoma
- Chlamydial conjunctivitis
- Neonatal conjunctivitis
- Penetrating ocular trauma
## Uncommon

<table>
<thead>
<tr>
<th>Condition</th>
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</thead>
<tbody>
<tr>
<td>Chemical trauma</td>
</tr>
<tr>
<td>Episcleritis</td>
</tr>
<tr>
<td>Scleritis</td>
</tr>
<tr>
<td>Anterior uveitis</td>
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</tbody>
</table>
## Differential diagnosis

### Common

<table>
<thead>
<tr>
<th>Diamond icon</th>
<th>Trichiasis</th>
<th>Exam</th>
<th>1st Test</th>
<th>Other tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>History</td>
<td>insidious onset of ocular unease; patient may describe localised ocular irritation; no discharge present</td>
<td>an aberrant lash/cluster of lashes may be seen; corneal fluorescein stain seen; normal visual acuity and pupillary reactions</td>
<td>» clinical diagnosis: no initial test</td>
<td>Presence of an aberrant lash/cluster of lashes is noted. [Fig-1]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diamond icon</th>
<th>Entropion</th>
<th>Exam</th>
<th>1st Test</th>
<th>Other tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>History</td>
<td>sudden onset of ocular unease as the eyelid turns in; may result in the eyelashes rubbing on the cornea, causing localised irritation and watering</td>
<td>lower eyelid may be turned in; fluorescein stain may be present if the eyelashes have been rubbing on the cornea; normal visual acuity and pupillary reactions</td>
<td>» specialist clinic review: To determine the underlying cause: involutional, cicatricial, or congenital (child). [Fig-2]</td>
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<table>
<thead>
<tr>
<th>Diamond icon</th>
<th>Ectropion</th>
<th>Exam</th>
<th>1st Test</th>
<th>Other tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>History</td>
<td>patient may report ocular irritation and unease with associated watering; no discharge</td>
<td>the lower eyelid may be seen to be coming away from the globe; no fluorescein stain seen; normal visual acuity and pupillary reactions</td>
<td>» specialist clinic review: To determine the underlying cause: involutional, cicatricial, or paralytic. [Fig-3]</td>
<td></td>
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</tbody>
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<table>
<thead>
<tr>
<th>Diamond icon</th>
<th>Blepharitis</th>
<th>Exam</th>
<th>1st Test</th>
<th>Other tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>History</td>
<td>patient may report an intermittent foreign body sensation, burning, or grittiness; symptoms often worse in the mornings but</td>
<td>inflamed crusting of the lid margins; normal visual acuity and pupillary reactions; no fluorescein stain visible</td>
<td>» clinical diagnosis: no initial test</td>
<td>Inflamed crusting of the lid margins is noted. [Fig-4]</td>
</tr>
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</table>
## Diagnosis

### Common

<table>
<thead>
<tr>
<th>♦ Blepharitis</th>
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<tbody>
<tr>
<td><strong>History</strong></td>
</tr>
<tr>
<td>may flare at any time; no discharge present</td>
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<table>
<thead>
<tr>
<th>♦ Dry eye</th>
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<tbody>
<tr>
<td><strong>History</strong></td>
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<tr>
<td>patient may report irritation, burning, foreign body sensation, or non-specific ocular unease; photophobia and stringy discharge may also be described</td>
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</table>

<table>
<thead>
<tr>
<th>≈ Corneal ulcer (bacterial, viral, or fungal)</th>
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<tr>
<td><strong>History</strong></td>
</tr>
<tr>
<td>patient may initially report a foreign body sensation, which progresses to photophobia, blurred vision, pain, and discharge; the eyelids may also swell</td>
</tr>
</tbody>
</table>

[Fig-5] [Fig-11] [Fig-12]
### Contact lens-related red eye

**History**
contact lens wearer may initially report a foreign body sensation that progresses to photophobia, blurring, pain, and discharge; the eyelid may also swell

**Exam**
reduced visual acuity; severe conjunctival injection may be present; a swollen eyelid and discharge may be visible; corneal fluorescein stain seen

**1st Test**
» corneal scrape for microscopy culture and sensitivity: positive in bacterial or fungal cause
To be performed in a specialist clinic. In the case of a suspected bacterial ulcer, samples of the infiltrate within the ulcer are taken, using a blade or needle bevel, and sent for Gram stain and culture (2 blood agar plates, 1 chocolate agar, and 1 Sabouraud plate).[4]

**Other tests**

### Herpes zoster ophthalmicus

**History**
burning or stinging pain in ophthalmic division of trigeminal nerve dermatome; maculopapular erythematous rash, which develops into clear vesicles; eye pain; more common in immunosuppressed patients

**Exam**
reduced visual acuity; corneal ulcer; cells in the anterior chamber on slit-lamp biomicroscopy; Hutchinson’s sign (rash involving the side, tip, or root of the nerve) indicates increased risk of ocular inflammation[21]

**1st Test**
» clinical diagnosis: no initial test
The rash morphology and distribution is often diagnostic.

**Other tests**
» viral swab: positive for varicella zoster DNA

### Keratitis

**History**
patient may report intense pain, discharge, photophobia, increased lacrimation; the eyelid may also swell

**Exam**
corneal ulcer that may be bacterial, viral, or fungal; reduced visual acuity; a swollen eyelid and discharge may be visible

**1st Test**
» corneal scrape for microscopy culture and sensitivity: positive in bacterial or fungal cause
### Common

#### Keratitis

<table>
<thead>
<tr>
<th>History</th>
<th>Exam</th>
<th>1st Test</th>
<th>Other tests</th>
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<tbody>
<tr>
<td>To be performed in a specialist clinic. In the case of a suspected bacterial ulcer, samples of the infiltrate within the ulcer are taken, using a blade or needle bevel, and sent for Gram stain and culture (2 blood agar plates, 1 chocolate agar, and 1 Sabouraud plate).&lt;sup&gt;[4]&lt;/sup&gt; Ulcer may be bacterial, viral, or fungal in aetiology.</td>
<td></td>
<td></td>
<td>[Fig-11] [Fig-12]</td>
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#### Corneal foreign body

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<thead>
<tr>
<th>History</th>
<th>Exam</th>
<th>1st Test</th>
<th>Other tests</th>
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</thead>
<tbody>
<tr>
<td>A foreign body sensation progressing to photophobia and pain may be reported; the sensation is frequently preceded by a gust of wind or following use of hammering or grinding equipment</td>
<td>A foreign body may be seen either on the cornea, under the upper lid, or within the lower fornix; normal visual acuity and pupillary reactions</td>
<td>Imaging with CT of the orbits: intra-ocular foreign body may be present Imaging of the orbit is required to exclude an intra-ocular foreign body in cases of high-velocity injuries.&lt;sup&gt;[22]&lt;/sup&gt; Foreign bodies may also be noted clinically on examination of the cornea, upper lid conjunctiva, or lower fornix.</td>
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</table>
# Assessment of red eye

## Common

### Corneal abrasion

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<thead>
<tr>
<th>History</th>
<th>Exam</th>
<th>1st Test</th>
<th>Other tests</th>
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<tbody>
<tr>
<td>acute onset of ocular unease; this may have been preceded by a history of minor trauma</td>
<td>reduced visual acuity; normal pupillary reactions; single eye, conjunctival injection with corneal fluorescein stain seen; the eyelid may be swollen; no discharge</td>
<td><strong>clinical diagnosis:</strong> no initial test Corneal abrasion can be seen with fluorescein stain. [Fig-14]</td>
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</table>

### Subtarsal conjunctival foreign body

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<tr>
<th>History</th>
<th>Exam</th>
<th>1st Test</th>
<th>Other tests</th>
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<tbody>
<tr>
<td>often reduced vision; small particle foreign body into eye, often wind-blown with low velocity; persistent sharp scratching foreign body sensation, worse on blinking; watering, often profuse; no discharge</td>
<td>possible reduced visual acuity; injected conjunctiva, often localised; foreign body visible on conjunctiva on eversion of eyelid (either upper or lower), often best visualised with fluorescein staining; corresponding fine linear corneal abrasions; normal pupil response</td>
<td><strong>clinical diagnosis with fluorescein staining:</strong> fluorescein staining positive Foreign body can be visualised with fluorescein staining. [Fig-10]</td>
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### Allergic conjunctivitis

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<th>History</th>
<th>Exam</th>
<th>1st Test</th>
<th>Other tests</th>
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<tbody>
<tr>
<td>history of allergen exposure (could include topical eye medication); possible seasonal recurrence or associated atopic symptoms (vernal); rapid onset after exposure; itch; watery, stringy discharge</td>
<td>normal visual acuity; diffusely injected conjunctiva; chemosis (bulging of the clear/ injected conjunctival layer with fluid underneath, often described as looking like jelly on the white of the eye); fine velvety papillae on tarsal conjunctiva, may develop giant cobblestone appearance (vernal); clear cornea, no fluorescein stain; erythema and oedema</td>
<td><strong>clinical diagnosis:</strong> no initial test Vernal conjunctivitis may develop a cobblestone appearance. [Fig-8]</td>
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### Common

#### ◊ Allergic conjunctivitis

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<thead>
<tr>
<th>History</th>
<th>Exam</th>
<th>1st Test</th>
<th>Other tests</th>
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<tr>
<td>Allergic conjunctivitis</td>
<td>to lids; normal pupil response; no pre-auricular lymph nodes palpable</td>
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#### ◊ Bacterial conjunctivitis

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<th>History</th>
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<th>Other tests</th>
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<tbody>
<tr>
<td>Bacterial conjunctivitis</td>
<td>diffusely injected conjunctiva; mucoid or purulent discharge; clear cornea, no fluorescein stain; normal visual acuity and pupil response</td>
<td>conjunctival swabs for microscopy culture and sensitivity including Chlamydia: positive</td>
<td>Positive cultures taken from the conjunctivae or discharge can enable treatment to be initiated or changed appropriately. [Fig-6]</td>
</tr>
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#### ◊ Viral conjunctivitis

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<thead>
<tr>
<th>History</th>
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<tr>
<td>Viral conjunctivitis</td>
<td>diffusely injected conjunctiva; tarsal conjunctival follicles; clear cornea initially, possible small patches of sub-epithelial infiltrates developing 2 to 3 weeks after onset; occasionally palpable pre-auricular lymph nodes; no corneal fluorescein stain; normal visual acuity and pupil response</td>
<td>conjunctival swabs for microscopy culture and sensitivity including Chlamydia: positive in bacterial or fungal cause Viral conjunctivitis is usually a clinical diagnosis. [Fig-7]</td>
<td>Conjunctival swabs are performed to exclude bacterial or fungal diagnoses. Positive cultures can enable</td>
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### Common

#### Viral conjunctivitis

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<tr>
<th>History</th>
<th>Exam</th>
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<tbody>
<tr>
<td>◊ Viral conjunctivitis</td>
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<td>treatment to be initiated or changed as needed.</td>
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### Non-traumatic subconjunctival haemorrhage

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<th>History</th>
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<th>Other tests</th>
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<tr>
<td>spontaneous; occasionally history of Valsalva manoeuvre, coughing, sneezing, or heavy lifting; usually asymptomatic; occasional mild discomfort, or popping sensation at onset; possible association with systemic hypertension or anticoagulant medication</td>
<td>well-circumscribed area of confluent haemorrhage underneath conjunctiva (if the posterior border cannot be seen then it may originate from intracranial haemorrhage, which warrants immediate emergency referral),[23] often sectorial; cornea clear, no fluorescein stain; normal visual acuity and pupil response; possible systemic hypertension; blood pressure should be measured in all patients and managed as per guidelines[24]</td>
<td>»clinical diagnosis: no initial test Subconjunctival haemorrhage is seen as a well-circumscribed area of confluent haemorrhage underneath conjunctiva. [Fig-9]</td>
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#### Uncommon

#### Angle-closure glaucoma

<table>
<thead>
<tr>
<th>History</th>
<th>Exam</th>
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<tr>
<td>severe ocular pain often associated with vomiting; blurred vision and halos around light sources; the patient’s past ocular, medical, and drug history should be reviewed to exclude any known associations</td>
<td>reduced visual acuity; cloudy cornea and a fixed, semi-dilated oval pupil; on gentle digital palpation the globe feels hard</td>
<td>»intra-ocular pressure measurement: elevated intra-ocular pressure Evaluation for angle-closure glaucoma should be performed by an ophthalmologist.</td>
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## Uncommon

### Angle-closure glaucoma

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<tr>
<th>History</th>
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<tr>
<td>Normal intra-ocular pressure is 12 to 21 mmHg.</td>
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### Chlamydial conjunctivitis

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<tr>
<td>Discomfort, foreign body sensation; mucus discharge, often profuse; usually initially unilateral, becoming bilateral; chronic symptoms despite topical antibiotics; rarely associated genitourinary symptoms of inflammation or discharge; vision minimally or unaffected; minimally or not itchy</td>
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<tr>
<td>Diffusely injected conjunctiva; large tarsal conjunctival follicles; clear cornea, no fluorescein stain; normal visual acuity and pupil response</td>
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<td>Conjunctival swab/scrape specifically for Chlamydia: positive</td>
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<td>Positive cultures taken from the conjunctivae or discharge can enable treatment to be initiated or changed as needed.</td>
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### Neonatal conjunctivitis

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<tbody>
<tr>
<td>Vaginal delivery, presentation within 1 month of birth; purulent or mucoid discharge, often profuse, usually bilateral; occasionally associated genitourinary symptoms of inflammation or discharge in the mother</td>
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<tr>
<td>Diffusely injected conjunctiva; purulent discharge; clear cornea, no fluorescein stain; normal pupil response; tarsal conjunctival follicular reaction does not occur in neonates, even with chlamydial infection</td>
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<tr>
<td>Conjunctival swabs for microscopy culture and sensitivity including chlamydial: positive for Chlamydia</td>
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<tr>
<td>Positive cultures can enable treatment to be initiated or changed as needed.</td>
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## Assessment of red eye

### Uncommon

#### Penetrating ocular trauma

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<tbody>
<tr>
<td>identification of the nature, force, and time of the injury, particularly with high-velocity small fragments (e.g., produced by metal-on-metal hammering or power tools); often reduced vision; pain from onset, can be minor</td>
<td>reduced visual acuity; conjunctival injection; subconjunctival haemorrhage, often extensive; conjunctival or corneal laceration at entry site, with possible uveal tissue prolapse (dark pigmented tissue); shallow anterior chamber (space between cornea and iris) compared with the other eye; hyphaema (blood in the anterior chamber); irregular pupil; cataract; reduced red reflex; associated lid and facial injuries</td>
<td>&quot;CT head/orbits: observation of radio-opaque foreign body&quot; Imaging of the orbit is required to exclude an intra-ocular foreign body, especially in cases of high-velocity injuries. [22] Clinically, penetration can be noted by laceration at entry site with possible uveal tissue prolapse. [Fig-18]</td>
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</table>

#### Chemical trauma

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<tr>
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<tbody>
<tr>
<td>history of irritant chemical instillation; exact details of the time, duration, pH, and constituents of the chemical are vital, as well as any treatment provided acutely; often reduced vision; pain from onset, can be severe; watering, often profuse</td>
<td>possible reduced visual acuity; injected conjunctiva, areas of pallor could indicate severe burn; particles may be observed and removed from fornices on lid eversion; epithelial fluorescein staining to conjunctiva and cornea; corneal haze with obscuring of iris details if severe; lid erythema, oedema, and burns; normal pupil response</td>
<td>&quot;pH of tear film: pH = 7 in normal tear film; therefore may be elevated in alkali injury and lowered in acid injury&quot;</td>
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#### Episcleritis

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<th>History</th>
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<tbody>
<tr>
<td>acute onset of redness and pain; often the patient describes</td>
<td>sectorial redness in one or both eyes; a nodule can be present over</td>
<td>&quot;FBC: result depends on underlying cause&quot;</td>
<td></td>
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<tr>
<td>History</td>
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<tr>
<td>the redness in a specific area of the eye and may have noticed a small nodule adjacent to this area; no discharge; patient may have associated underlying rheumatoid arthritis, granulomatosis with polyangiitis (formerly known as Wegener's granulomatosis), or systemic lupus erythematosus</td>
<td>the area; no fluorescein stain; normal visual acuity and pupillary reactions</td>
<td>Evaluation for causes of episcleritis should be performed in a specialist clinic to evaluate for underlying autoimmune disease. [Fig-17]</td>
<td></td>
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</table>

» **urea and electrolytes**: result depends on underlying cause
Evaluation for causes of episcleritis should be performed in a specialist clinic to evaluate for underlying autoimmune disease. [Fig-17]

» **erythrocyte sedimentation rate**: elevated in inflammatory conditions
Evaluation for causes of episcleritis should be performed in a specialist clinic to evaluate for underlying autoimmune disease. [Fig-17]

» **CRP**: elevated in inflammatory conditions
Evaluation for causes of episcleritis should be performed in a specialist clinic to evaluate for underlying autoimmune disease. [Fig-17]

» **rheumatoid factor**: positive in some patients with...
## Uncommon

### Episcleritis

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<tr>
<th>History</th>
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</thead>
<tbody>
<tr>
<td>severe ocular pain and redness (prominent feature); no discharge;</td>
<td>deep scleral vessel engorgement and pain on ocular palpation; no</td>
<td>rheumatoid arthritis, systemic lupus erythematosus</td>
<td>Evaluation for causes of episcleritis should be performed in a specialist clinic to evaluate for underlying autoimmune disease.</td>
</tr>
<tr>
<td>past medical history should be reviewed for any known systemic</td>
<td>fluorescein stain; visual acuity and pupillary reactions may be</td>
<td></td>
<td>[Fig-17]</td>
</tr>
<tr>
<td>associations such as connective tissue disorders including rheumatoid</td>
<td>abnormal depending on the position of the scleritis on the globe</td>
<td>«c-antineutrophil cytoplasmic antibody (c-ANCA): positive in granulomatosis with polyangiitis (formerly known as Wegener's granulomatosis)</td>
<td></td>
</tr>
<tr>
<td>arthritis, granulomatosis with polyangiitis (formerly known as</td>
<td>(anterior or posterior)</td>
<td>Evaluation for causes of episcleritis should be performed in a specialist clinic to evaluate for underlying autoimmune disease.</td>
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<tr>
<td>Wegener's granulomatosis),</td>
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<td>[Fig-17]</td>
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## Scleritis

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<tr>
<td>severe ocular pain and redness (prominent feature); no discharge;</td>
<td>deep scleral vessel engorgement and pain on ocular palpation; no</td>
<td>«FBC: result depends on underlying cause</td>
<td>Evaluation for causes of scleritis should be performed in a specialist clinic to evaluate for underlying autoimmune disease.</td>
</tr>
<tr>
<td>reduced visual acuity may be present; past medical history should be</td>
<td>fluorescein stain; visual acuity and pupillary reactions may be</td>
<td></td>
<td>[Fig-16]</td>
</tr>
<tr>
<td>reviewed for any known systemic associations such as connective tissue</td>
<td>abnormal depending on the position of the scleritis on the globe</td>
<td>«urea and electrolytes: result depends on underlying cause</td>
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<tr>
<td>disorders including rheumatoid arthritis, granulomatosis with</td>
<td>(anterior or posterior)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>polyangiitis (formerly known as Wegener's granulomatosis),</td>
<td></td>
<td>«urea and electrolytes: result depends on underlying cause</td>
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### Scleritis

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<tbody>
<tr>
<td>systemic lupus erythematosus, and relapsing polychondritis</td>
<td>Evaluation for causes of scleritis should be performed in a specialist clinic to evaluate for underlying autoimmune disease. [Fig-16]</td>
<td>» erythrocyte sedimentation rate: elevated in inflammatory conditions Evaluation for causes of scleritis should be performed in a specialist clinic to evaluate for underlying autoimmune disease. [Fig-16]</td>
<td></td>
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<tr>
<td></td>
<td>» CRP: elevated in inflammatory conditions Evaluation for causes of scleritis should be performed in a specialist clinic to evaluate for underlying autoimmune disease. [Fig-16]</td>
<td>» rheumatoid factor: positive in some patients with rheumatoid arthritis, systemic lupus erythematosus Evaluation for causes of scleritis should be performed in a specialist clinic to evaluate for underlying autoimmune disease. [Fig-16]</td>
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### Uncommon

#### Scleritis

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<tbody>
<tr>
<td>- pain and photophobia within the affected eye; the pain may be exacerbated when reading or performing close work; reduced vision, depending on the severity; past history of similar episodes; past medical history should be reviewed for any known systemic associations, such as HLA-B27 histocompatibility complex-positive patients, tuberculosis, syphilis, Lyme disease, sarcoidosis, Behcet's disease, and pauciarticular juvenile chronic arthritis</td>
<td>- visual acuity may be reduced; ciliary flush pattern of redness in the affected eye; close examination of the cornea and anterior chamber may show the presence of keratic precipitates (cellular aggregates on the inner corneal surface), inflammatory cells, and flare (increased protein within the anterior chamber, allowing visualisation of the light beam within the aqueous), and in severe cases a hypopyon; the pupillary margin may appear irregular and reactions abnormal if posterior synechiae (adhesion of the iris to the anterior lens capsule) are present</td>
<td>- c-antineutrophil cytoplasmic antibody (c-ANCA): positive in granulomatosis with polyangiitis (formerly known as Wegener's granulomatosis)</td>
<td>Evaluation for causes of scleritis should be performed in a specialist clinic to evaluate for underlying autoimmune disease. [Fig-16]</td>
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#### Anterior uveitis

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>- FBC: result depends on underlying cause Evaluation for anterior uveitis should be performed in a specialist clinic to evaluate for underlying autoimmune disease or other aetiology. [Fig-15]</td>
<td>- urea and electrolytes: result depends on underlying cause Evaluation for anterior uveitis should be performed in a specialist clinic to evaluate for underlying autoimmune disease or other aetiology. [Fig-15]</td>
<td>- anterior uveitis</td>
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## Uncommon

### Anterior uveitis

<table>
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<tr>
<td></td>
<td>» <strong>CRP</strong>: elevated in infectious and inflammatory conditions</td>
<td>Evaluation for anterior uveitis should be performed in a specialist clinic to evaluate for underlying autoimmune disease or other aetiology.</td>
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<tr>
<td></td>
<td>» <strong>syphilis serology</strong>: positive in syphilis</td>
<td>Evaluation for anterior uveitis should be performed in a specialist clinic to evaluate for underlying autoimmune disease or other aetiology.</td>
<td></td>
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<tr>
<td></td>
<td>» <strong>angiotensin-converting enzyme</strong>: elevated in sarcoidosis</td>
<td>Evaluation for anterior uveitis should be performed in a specialist clinic to evaluate for underlying autoimmune disease or other aetiology.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>» <strong>HLA-B27 histocompatibility complex</strong>: positive in affected patients</td>
<td>Evaluation for anterior uveitis should be performed in a specialist clinic to evaluate for underlying autoimmune disease or other aetiology.</td>
<td></td>
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</table>
Assessment of red eye

Diagnosis

Uncommon

Anterior uveitis

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<td></td>
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<td>autoimmune disease or other aetiology. [Fig-15]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>»auto-antibody screen: positive according to underlying autoimmune disease</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Evaluation for anterior uveitis should be performed in a specialist clinic to evaluate for underlying autoimmune disease or other aetiology. [Fig-15]</td>
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Diagnostic guidelines

Europe

Sub-conjunctival haemorrhage

Published by: The College of Optometrists (UK)
Last published: 2019

North America

Conjunctivitis

Published by: American Academy of Ophthalmology
Last published: 2018
Key articles


References


### References


Assessment of red eye

Images

Figure 1: Trichiasis
Private collection - courtesy of Mr Hugh Harris

Figure 2: Entropion
Private collection - courtesy of Mr Hugh Harris

Figure 3: Ectropion
Private collection - courtesy of Mr Hugh Harris

Figure 4: Blepharitis
Private collection - courtesy of Mr Hugh Harris

Figure 5: Dry eye (stained with rose bengal)
Assessment of red eye

Private collection - courtesy of Mr Hugh Harris

**Figure 6:** Bacterial conjunctivitis

Private collection - courtesy of Mr Hugh Harris

**Figure 7:** Viral conjunctivitis

Private collection - courtesy of Mr Hugh Harris

**Figure 8:** Allergic (vernal) keratoconjunctivitis

Private collection - courtesy of Mr Hugh Harris

**Figure 9:** Subconjunctival haemorrhage

Private collection - courtesy of Mr Hugh Harris

**Figure 10:** Subtarsal foreign body: vertical corneal abrasions seen with fluorescein stain
Figure 11: Corneal ulcer seen with fluorescein stain
Private collection - courtesy of Mr Hugh Harris

Figure 12: Dendritic ulcer seen with fluorescein stain
Private collection - courtesy of Mr Hugh Harris

Figure 13: Corneal foreign body
Private collection - courtesy of Mr Hugh Harris

Figure 14: Corneal abrasion seen with fluorescein stain
Private collection - courtesy of Mr Hugh Harris
Assessment of red eye

Figure 15: Anterior uveitis with posterior synechiae
Private collection - courtesy of Mr Hugh Harris

Figure 16: Scleritis
Private collection - courtesy of Mr Hugh Harris

Figure 17: Episcleritis
Private collection - courtesy of Mr Hugh Harris

Figure 18: Penetrating corneal injury with iris prolapse
Private collection - courtesy of Mr Hugh Harris

Figure 19: Angle-closure glaucoma: central corneal oedema with an oval-shaped mid-dilated pupil.
Private collection - courtesy of Mr Hugh Harris

Figure 20: Chlamydial conjunctivitis
Figure 21: Gonococcal conjunctivitis

CDC Image Library/Joe Miller
Figure 22: Gonorrhoeal conjunctivitis: resulted in partial blindness

CDC Image Library
Assessment of red eye

**Figure 23: Conjunctivitis: consequence of reactive arthritis**

CDC Image Library/Joe Miller

**Figure 24: A patient with left herpes zoster ophthalmicus affecting the forehead and side of the nose (positive Hutchinson’s sign; yellow arrows). The crusted skin rashes follow the V1 dermatomal distribution and do not cross the vertical midline**

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Contact us
+ 44 (0) 207 111 1105
support@bmj.com

BMJ
BMA House
Tavistock Square
London
WC1H 9JR
UK
Contributors:

// Authors:

Jonathan Smith, FRCOphth, MRCP
Consultant Ophthalmologist
Sunderland Eye Infirmary, Sunderland, UK
DISCLOSURES: JS declares that he has received travel and meeting costs from Novartis and Bayer.

Philip Severn, FRCOphth, MRCP
Consultant Ophthalmologist
James Cook University Hospital, Middlesbrough, UK
DISCLOSURES: PS declares that he has served on the advisory boards of and received travel grants from Bayer and Novartis. He has also received travel grants from Allergan.

Lucy Clarke, MRCS, FRCOphth
Consultant in Ophthalmology
Royal Victoria Infirmary, Newcastle-upon-Tyne, UK
DISCLOSURES: LC declares that she has no competing interests.

// Peer Reviewers:

Michael P. Ehrenhaus, MD
Assistant Professor of Ophthalmology
Cornea External Disease and Refractive Surgery Local Director, Long Island College Hospital Eye Center, Brooklyn, NY
DISCLOSURES: MPE declares that he has no competing interests.

Usha Chakravarthy, MBBS, FRCS, PhD
Professor of Ophthalmology and Vision Sciences
Centre for Vision Science, Queen's University Belfast, Belfast, UK
DISCLOSURES: UC declares that she has no competing interests.