BMJ Best Practice

Trachoma

Straight to the point of care

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Summary

Trachoma is a keratoconjunctivitis caused by ocular infection with particular serovars of *Chlamydia trachomatis* .

Antibiotics, in conjunction with facial cleanliness campaigns and environmental improvements targeted at communities at risk, aim to reduce the reservoir of infection within a population.

Occurs predominantly in children. Poor facial cleanliness may be the most important modifiable risk factor in children who develop trachoma.

Children who have had multiple or severe episodes of active trachoma may develop cicatricial disease in later life.

Trachomatous cicatricial disease is characterised by tarsal conjunctival scarring, predominantly of the upper lid, although scarring may be sub-epithelial and not always patent. It may ensue over the subsequent decades and lead to trachomatous trichiasis, corneal opacity, and subsequent loss of vision.

Prompt surgery must be offered to all patients who have trichiasis in order to prevent blindness.

Definition

Trachoma is a keratoconjunctivitis caused by ocular infection with *Chlamydia trachomatis* (serovars A, B, Ba, and C). Inflammatory episodes in adults tend to be shorter and less severe than in children. Repeated infections lead to recurrent episodes of chronic inflammation that may progress to scarring of the upper tarsal conjunctiva. The scarring results in distortion of the upper eyelid, and this can cause lashes to turn inwards and abrade the cornea. This is called trachomatous trichiasis and, unless surgically corrected, will rapidly lead to corneal opacity and blindness.

Chlamydial conjunctivitis caused by the sexually transmitted strains of *C trachomatis* (serotypes D to K) is a separate, self-limiting infection.

THEORY

Epidemiology

Worldwide, trachoma is known to be endemic in 42 countries, although some countries remain to be fully assessed.[1] It is confined to regions of disadvantage, largely in Africa but also in the Middle East, Asia, Latin America, the Pacific Islands, and remote Aboriginal and Torres Strait Islander communities in Australia.[2] As of 2022, elimination of trachoma as a public health problem has been validated by the World Health Organization in 17 countries. A further five countries report having achieved the prevalence targets for elimination.[3]

Trachoma is responsible for blindness or visual impairment in 1.9 million people; approximately 125 million people live in areas where they are at risk of blinding trachoma.[1] The prevalence of active trachoma can reach 60% to 90% among preschool-aged children in endemic areas.[1]

There are currently no reports of blinding trachoma in the US. It was eliminated from major US cities in the early 1900s as hygiene improved. However, it was not eliminated from all the American Indian reservations until the 1960s, when large-scale antibiotic treatment programmes were undertaken using oral sulfonamide drugs.[4]

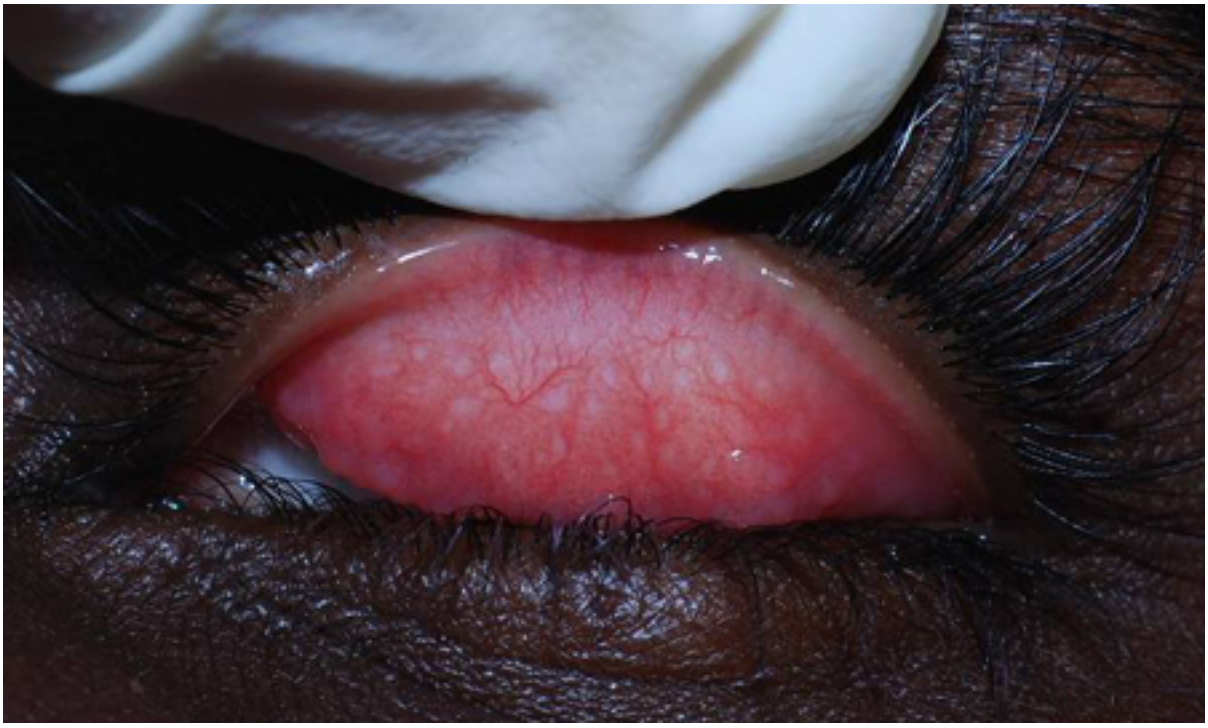
Aetiology

Trachoma is a keratoconjunctivitis caused by ocular infection with *Chlamydia trachomatis* (serovars A, B, Ba, and C).

Pathophysiology

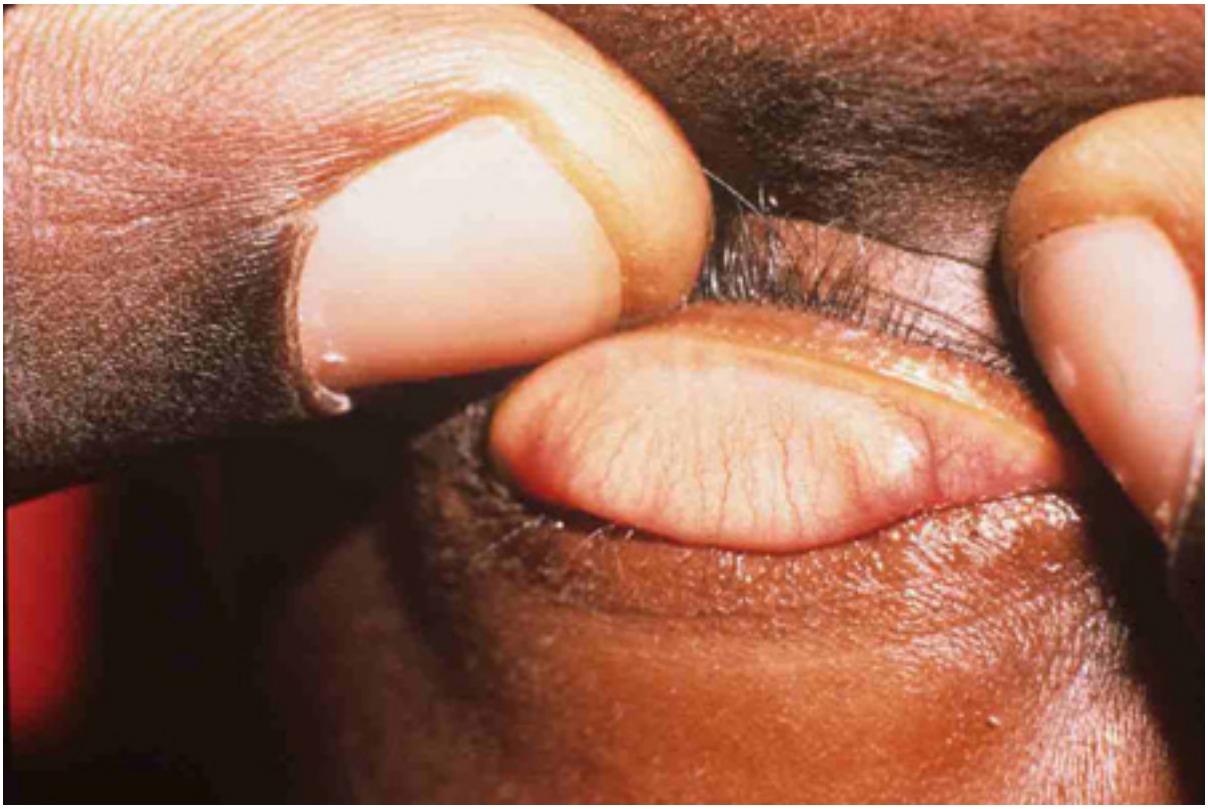
A single episode of infection with the obligate intracellular gram-negative bacterium *Chlamydia trachomatis* (serovars A, B, Ba, and C) causes a self-limiting conjunctivitis, which can be acute or silent. The disease is spread by contact with ocular and nasal secretions. Flies are a putative vector.

Children who are repeatedly infected develop a typical follicular inflammatory response of the tarsal conjunctiva. It is this typical pathological response that characterises active trachoma and over time may lead to pathological scarring. Repeated episodes of intense conjunctival inflammation seem to be the most important predictor of subsequent morbidity.[5] Progressive scarring of the conjunctiva alters the architecture of the eyelid, thereby pulling the eyelid margin inwards and causing lashes to rub on the globe (trichiasis). The constant abrasive effect of the lashes on the corneal surface, if left untreated, will rapidly induce scarring and subsequent corneal opacification, leading to irreversible vision loss.



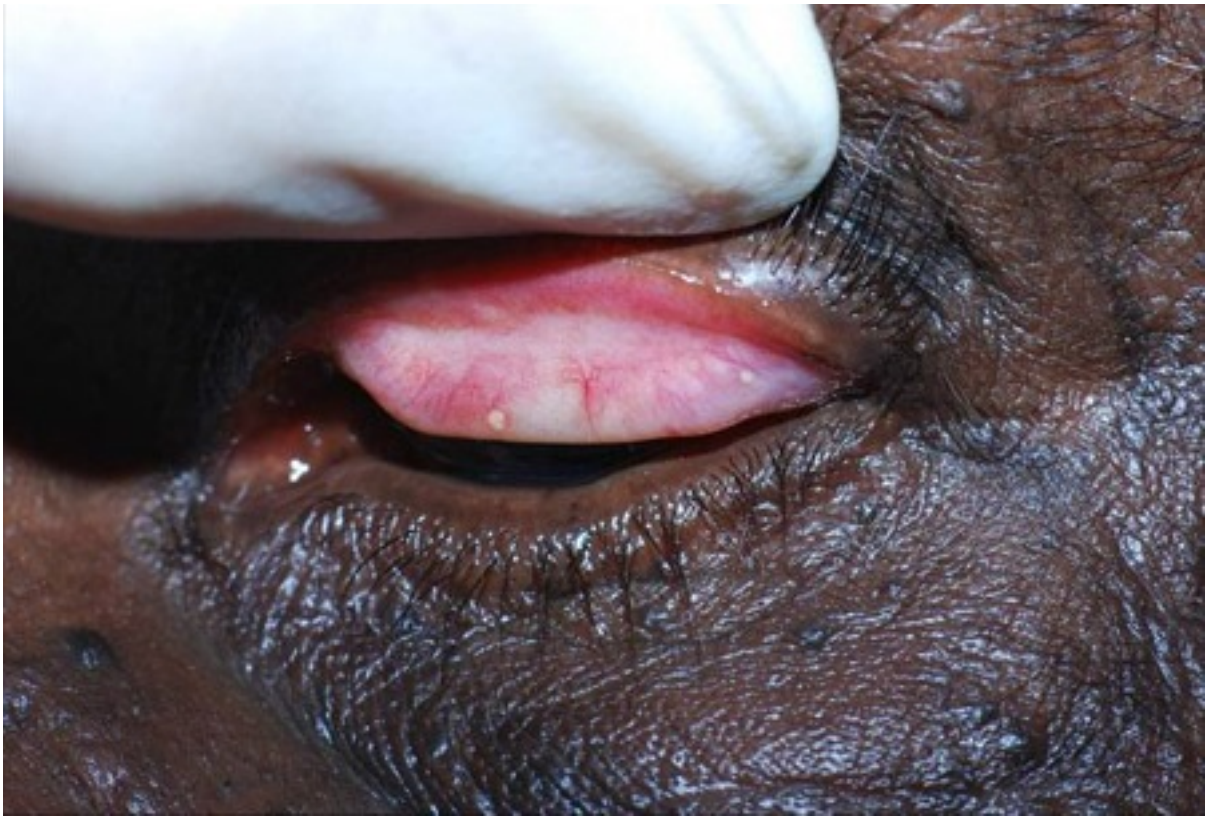
Eyelid eversion demonstrating follicles on the upper tarsal conjunctiva

From the collection of Dr Hugh R. Taylor



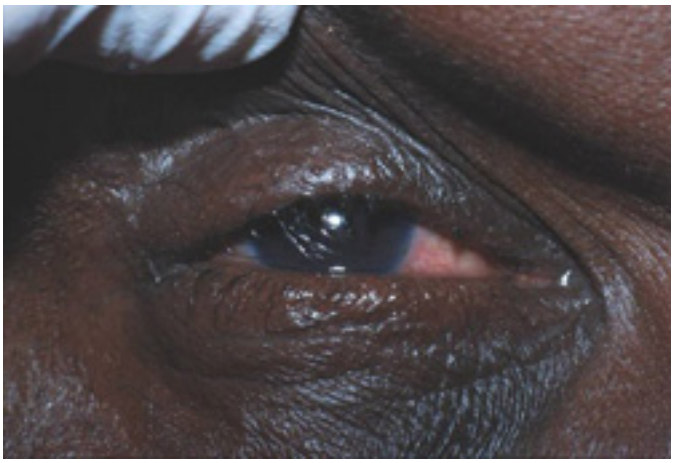
A normal eyelid

From the collection of Dr Hugh R. Taylor



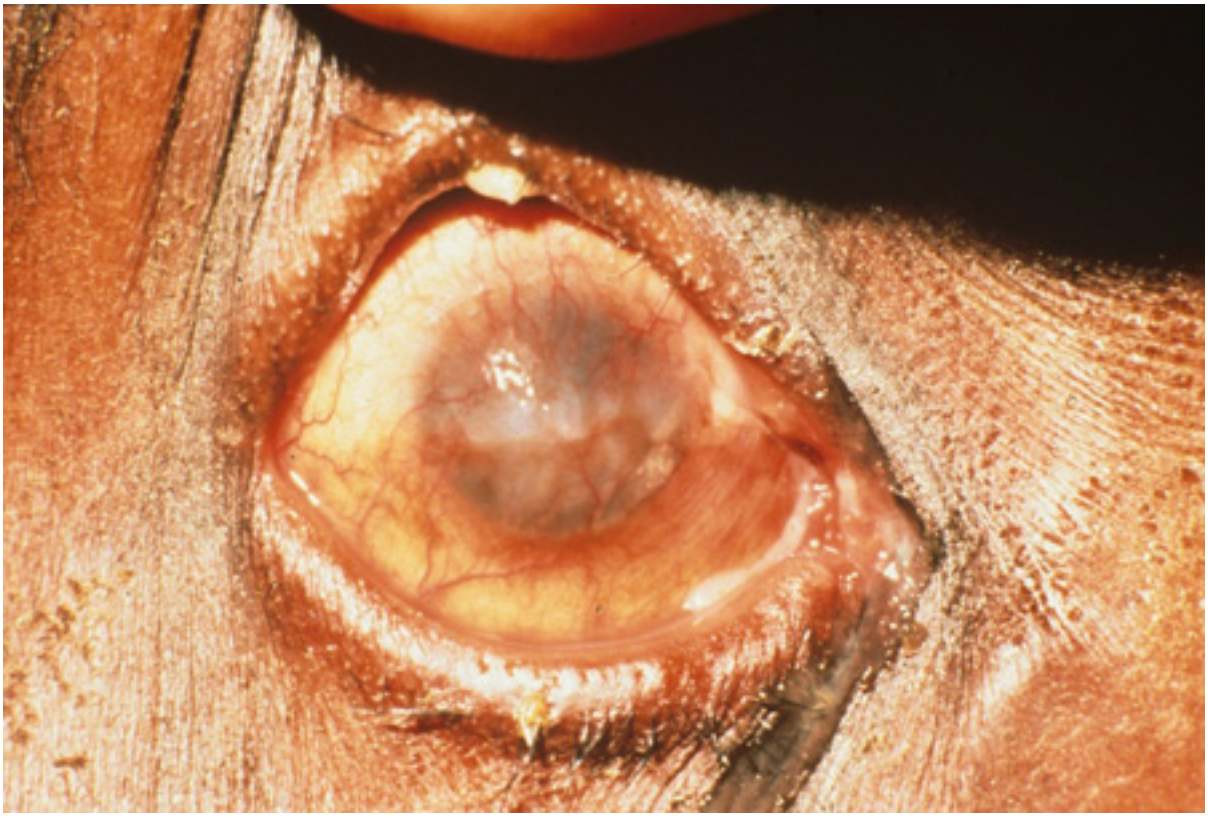
Eyelid eversion demonstrating scars on the tarsal conjunctiva

From the collection of Dr Hugh R. Taylor



A red eye due to at least 1 inturned eyelash touching the globe (trachomatous trichiasis)

From the collection of Dr Hugh R. Taylor



Corneal opacity due to trachoma

From the collection of Dr Hugh R. Taylor

When a cohort of individuals with trachomatous scarring was followed over 12 years in a hypo-endemic environment, 6% were found to have developed trichiasis, and 3% had corneal visual impairment.[6] Presentation of scarring and disease progression will be much faster in areas of high prevalence.[7] There are few longitudinal studies that provide estimates of trachoma progression rate.[8]

Classification

Classification according to stage of disease

- Active trachoma: an inflammatory reaction to infection with *Chlamydia trachomatis* , seen predominantly in children.
- Cicatricial disease: the late stage of the disease, typically characterised by scarring of the tarsal conjunctiva and alterations to lid morphology that can lead to trachomatous trichiasis and entropion. Trachomatous trichiasis can present in the absence of patent scarring, entropion, or signs of active trachoma.

Case history

Case history #1

A 5-year-old girl is brought by her grandmother into a remote clinic in Ethiopia, having been bitten by a dog. The physician notices that she has a very unclean face with significant nasal discharge. Eversion of

the eyelids and examination of the superior tarsal conjunctiva, with the aid of a loupe and a torch, reveals the presence of numerous discrete white follicles.

Case history #2

A 50-year-old man comes into a remote clinic in the mountains of northern Vietnam for a routine health check. Eversion of the eyelids reveals trachomatous scarring, and an annual follow-up is arranged. Around 5 years later he returns for his review. On examination, several of his eyelashes are abrading his cornea. No opacity has developed on the cornea as yet.

Other presentations

Trachoma is confined to regions of disadvantage in Africa, the Middle East, Asia, Latin America, the Pacific Islands, and remote Aboriginal and Torres Strait Islander communities in Australia. Healthcare workers practising in non-endemic areas may occasionally need to consider the diagnosis of trachoma in an individual who has been living in, or has emigrated or is visiting from, a trachoma-endemic region.

Chlamydial conjunctivitis caused by the sexually transmitted strains of *Chlamydia trachomatis* (serotypes D to K) is a separate, self-limiting infection.

Approach

The diagnosis of trachoma will differ depending on the geographical area. Trachoma almost exclusively occurs in resource-poor settings, where expensive tests are not available.

Presence of risk factors

Risk factors for trachoma at any stage of the disease include:[1] [9] [10][11] [12] [14] [16] [17] [18][19]

- Children (aged 1 to 9 years)
- Poor facial hygiene
- Female sex
- Poverty
- Poor community hygiene
- Crowded households
- Residence in, or emigration from, an area where trachoma is endemic
- Eye-seeking flies

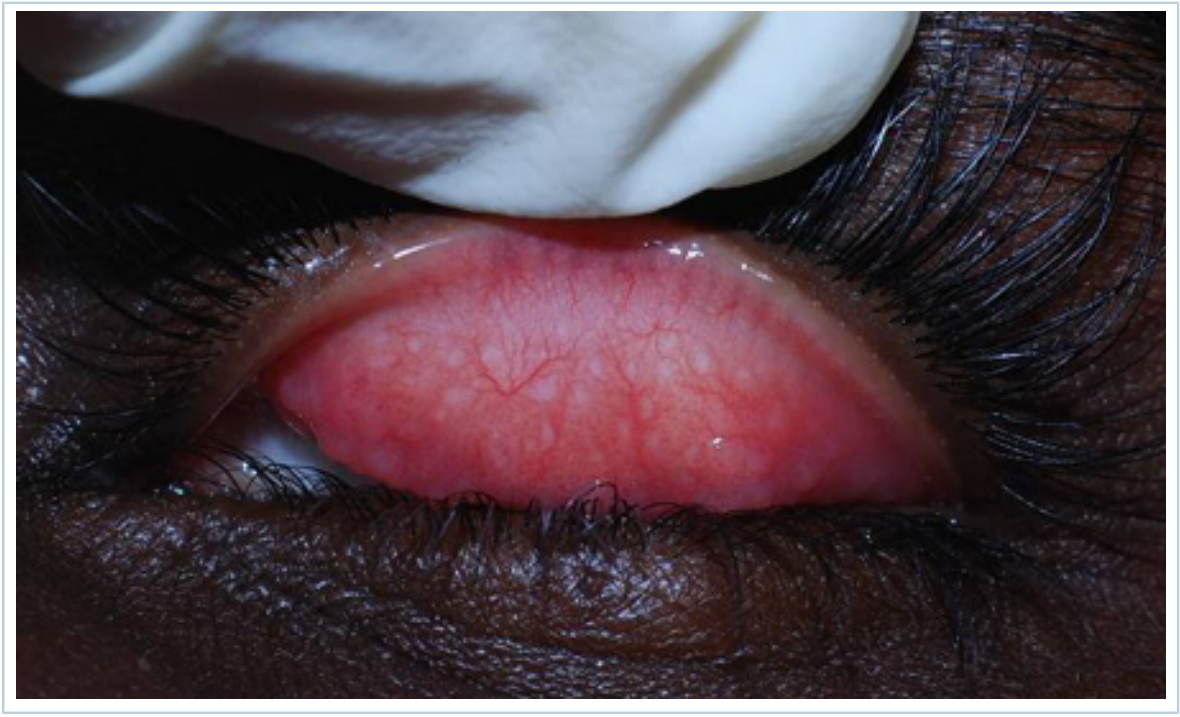
Active trachoma occurs predominantly in children.

Assessment in a typical setting where trachoma is endemic

In areas with poor resources, the diagnosis of trachoma is generally made in an asymptomatic individual as part of a screening programme. People who live in or come from trachoma-endemic areas should be examined for trachoma as part of routine health examination.

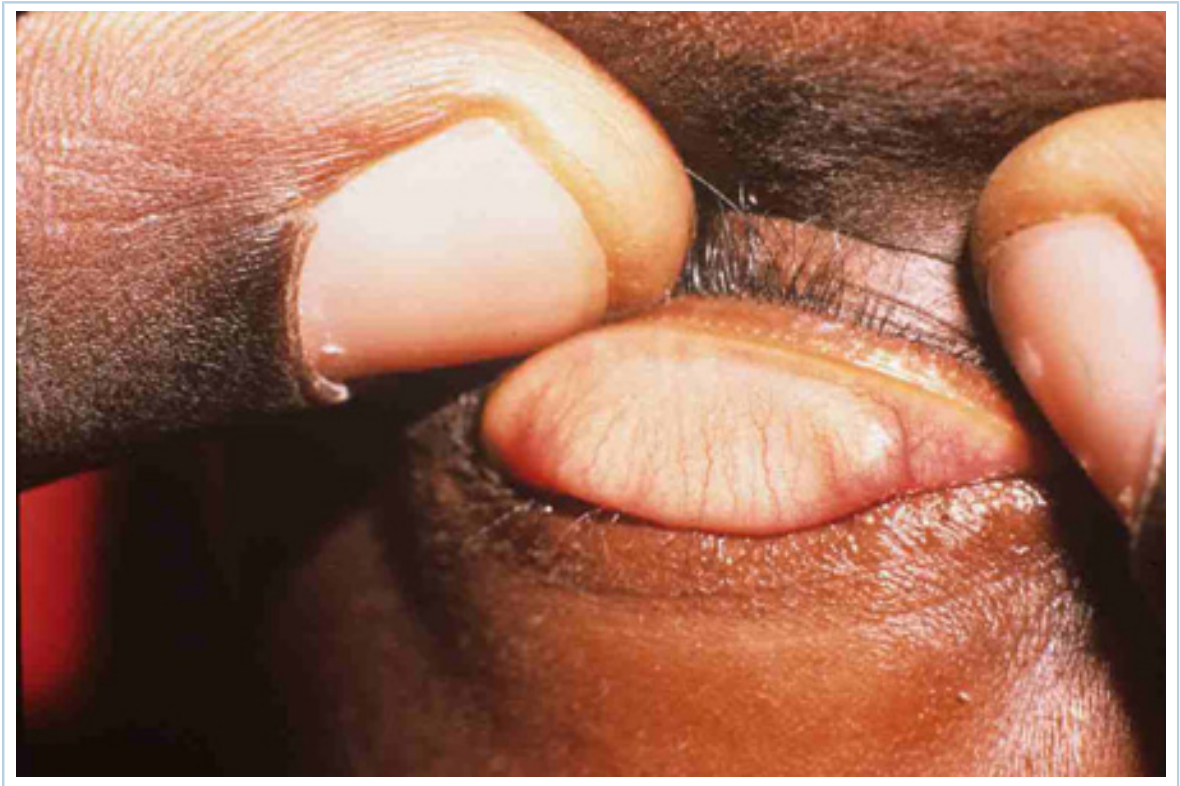
Diagnosis is generally based on clinical grading using the Simplified WHO grading system, with the aid of a good light source and a loupe with adequate magnification:[30] [31]

- Trachomatous inflammation, follicular (TF): 5 or more follicles greater than 0.5 mm on the upper tarsal (eyelid) conjunctiva.



Eyelid eversion demonstrating follicles on the upper tarsal conjunctiva

From the collection of Dr Hugh R. Taylor



A normal eyelid

From the collection of Dr Hugh R. Taylor

- Trachomatous inflammation, intense (TI): papillary hypertrophy and inflammatory thickening of the upper tarsal conjunctiva obscuring more than half of the deep tarsal vessels.

Eyelid eversion demonstrating intense inflammation of the upper tarsal conjunctiva

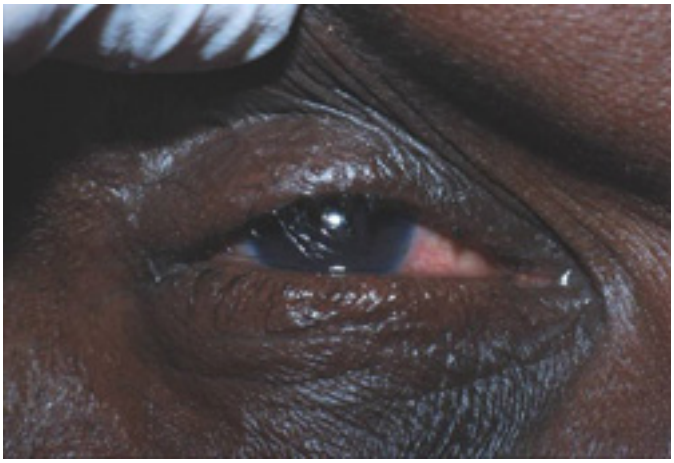
From the collection of Dr Hugh R. Taylor

- Trachomatous conjunctival scarring (TS): the presence of scarring on the tarsal conjunctiva.

Eyelid eversion demonstrating scars on the tarsal conjunctiva

From the collection of Dr Hugh R. Taylor

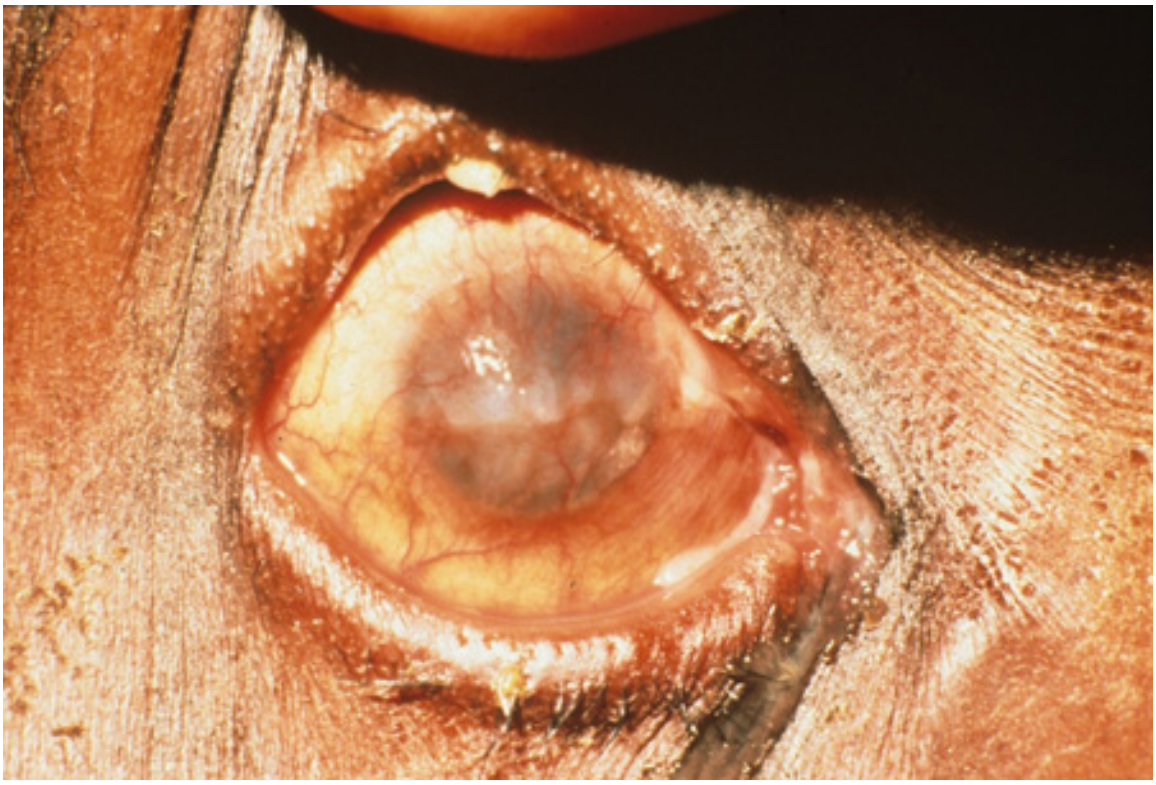
- Trachomatous trichiasis (TT): at least one eyelash from the upper eyelid touching the globe, or evidence of recent epilation of inturned eyelashes from the upper eyelid.



A red eye due to at least 1 inturned eyelash touching the globe (trachomatous trichiasis)

From the collection of Dr Hugh R. Taylor

- Corneal opacity (CO): corneal opacity blurring part of the pupil margin.



Corneal opacity due to trachoma

From the collection of Dr Hugh R. Taylor

During examination, the upper lid is everted and examined with the aid of 2.5 times loupes and a good light source. Each component of the grading system is individually marked as present or absent. The diagnosis of an individual with trachoma should trigger a community-wide assessment of the prevalence of trachoma, which may indicate the need for a public health intervention.

A diagnosis of trachoma should be considered in an individual who has been living in, or has emigrated or is visiting from, a trachoma-endemic region. Australia is the only developed country that still has endemic trachoma, where it is confined to remote Aboriginal and Torres Strait Islander communities.[2] Trachoma does not occur in developed cities.

History and examination findings

Children with active disease may be asymptomatic or present with foreign body sensation, ocular discharge, or a red eye. Adults may present with a painful watery eye, but are often asymptomatic. Signs of active infection include:

- Subtarsal follicles
- Limbal follicles
- Subtarsal inflammation
- Pannus (vessels growing over the clear cornea, generally from the superior aspect).

Recurrent episodes of inflammation will lead to the development of scar tissue on the superior tarsal conjunctiva. Examination may reveal subtarsal scarring, possibly with a superior transverse condensation called an Arlt line; however, this is not always visible.

Eyelid eversion demonstrating scars on the tarsal conjunctiva

From the collection of Dr Hugh R. Taylor

Pannus is common and Herbert's pits (small pits around the margin of the cornea), the result of limbal follicles, are pathognomonic for trachoma. Trichiasis and corneal opacity should be looked for in patients.

Eventually scarring will become sufficient to alter the architecture of the eyelid, rolling the lid margin inwards and causing one or more lashes to abrade the cornea. Trichiasis is painful and can cause symptoms of epiphora (watering eye) or dry eye. Adults with scarring must be followed up regularly to assess for the development of trichiasis. The consistent trauma of lash on cornea leads to corneal scarring. Late presentation may be with corneal opacities or vision loss. Blindness due to trachoma is almost always irreversible as patients are not good candidates for corneal transplant. Adults with trichiasis must be immediately referred to an ophthalmologist (or trained eye health worker) for consideration of corrective lid surgery to prevent vision loss.

Polymerase chain reaction (conjunctival swab)

The diagnosis can be confirmed with nucleic acid amplification tests such as polymerase chain reaction (PCR).

PCR may be used to determine population prevalence, particularly in hyper-endemic regions, and the effect of public health interventions. Cost and availability may inhibit the routine use of laboratory tests in trachoma-surveillance programmes in resource-poor settings.

Microbiological tests such as Giemsa stain, direct fluorescent antibody testing, and culture are no longer routinely used.[32]

Novel molecular and serological tests

Include point of care lateral flow testing for chlamydial lipopolysaccharide (optimised for use with conjunctival swabs); a rapid diagnostic device that amplifies DNA from the chromosomal porB gene of *Chlamydia trachomatis* ; and immunoassays to measure antibodies to the *C trachomatis* Pgp3 antigen.[33] [34][35]

Community survey in resource-poor settings

A community survey should be conducted in an area known or suspected to have endemic trachoma, or in response to the discovery of trachoma in an individual within a community suspected of having endemic trachoma.

Assessment in a resource-rich setting

The clinical signs and symptoms will be largely the same as those in a resource-poor setting. A history of having lived in a trachoma-endemic area should be present. PCR should be ordered; however, this is unlikely to be positive in cicatricial disease.

DIAGNOSIS

History and exam

Key diagnostic factors

presence of risk factors (common)

- Risk factors strongly associated with trachoma include: residence in or emigration from an area known to have endemic trachoma, poor community hygiene, poor facial hygiene, poverty, and female gender.
- Children are predominantly at risk of active infection.

residence in or emigration from an endemic area (common)

- Trachoma is confined to those living in the poorest conditions (where hygiene is poor) or those growing up in an area where the disease is endemic.
- Trachoma remains endemic in at least 42 countries.[1] It is confined to regions of disadvantage in Africa, the Middle East, Asia, Latin America, the Pacific Islands, and remote Aboriginal and Torres Strait Islander communities in Australia. There are some countries that require further assessment.

at-risk demographic (common)

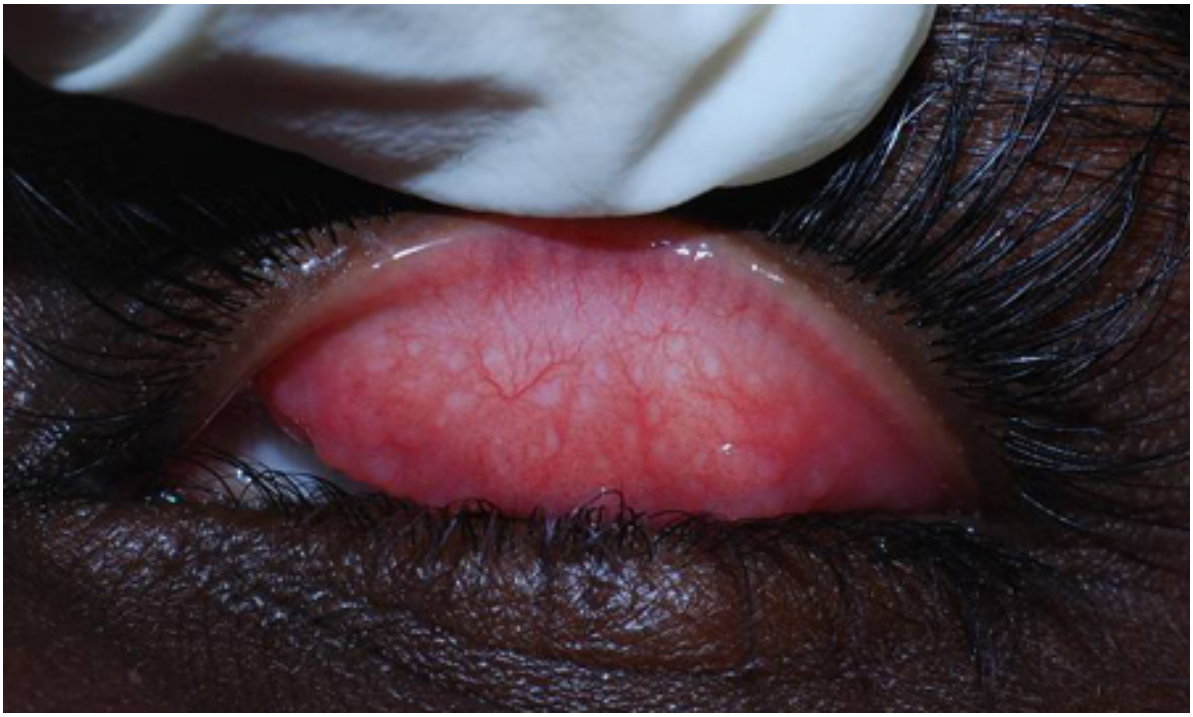
- Active trachoma occurs predominantly in children.[9][10] Children who have had multiple or severe episodes of active trachoma may develop cicatricial disease in later life.
- Trachoma blinds a disproportionate number of women.[1] [14] This is most likely due to the fact that they have a greater lifetime exposure to young children, which may lead to increased episodes of infection, inflammation, and subsequent scarring.[15]

subtarsal conjunctival inflammation (common)

- In severe inflammation the entire conjunctiva may become oedematous and take on a velvety appearance that can obscure the underlying conjunctival vessels.

subtarsal follicles (common)

- Pale, raised, discrete circular follicles on the subtarsal conjunctiva are the hallmark of active disease.

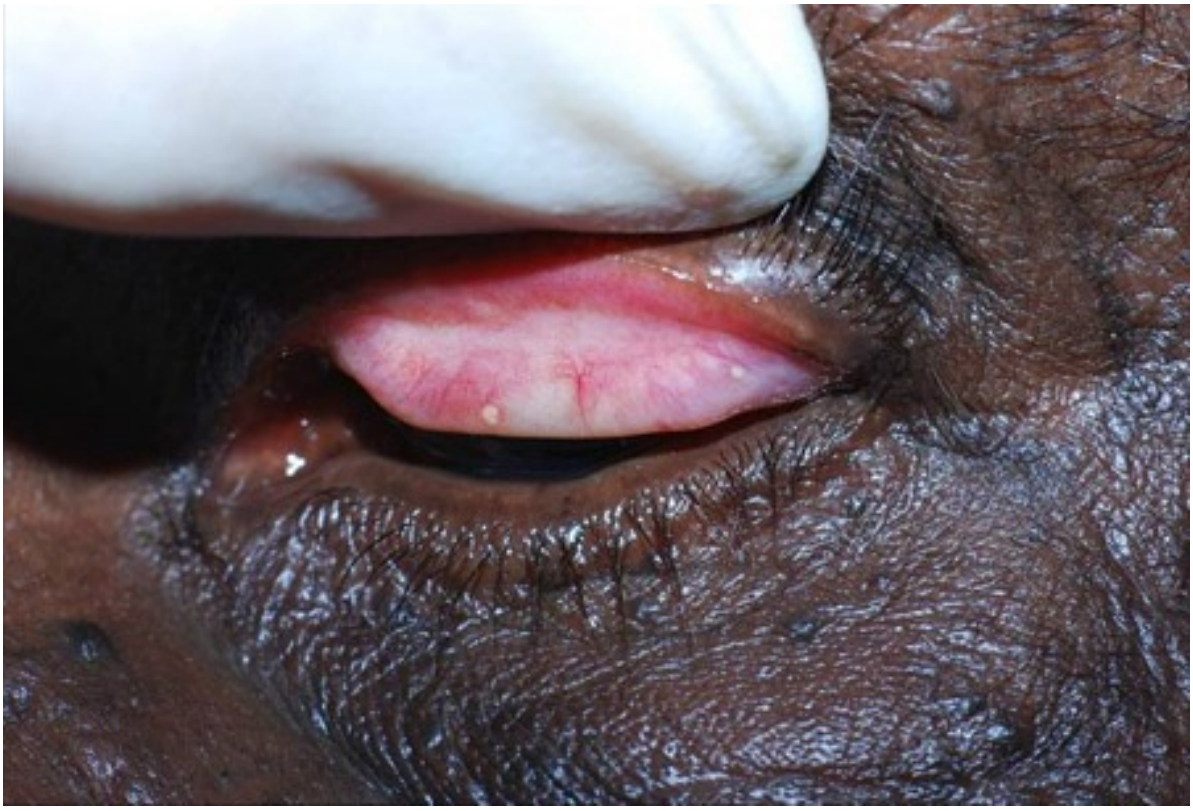


Eyelid eversion demonstrating follicles on the upper tarsal conjunctiva

From the collection of Dr Hugh R. Taylor

subtarsal conjunctival scarring (common)

- Initially appearing as fine linear scars that eventually coalesce to form a dense basket-weave pattern called an Arlt line.



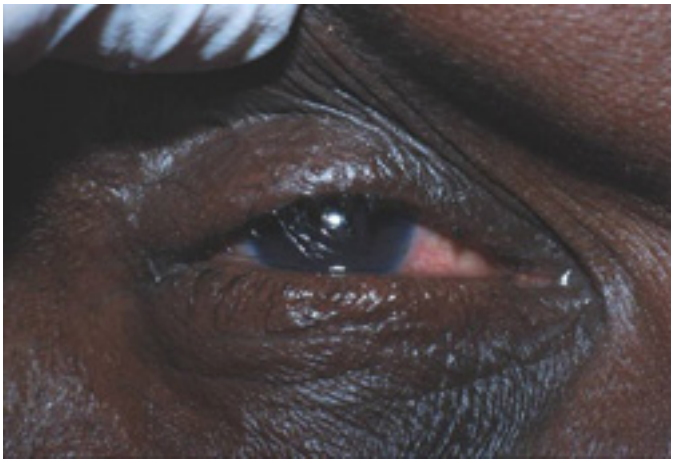
Eyelid eversion demonstrating scars on the tarsal conjunctiva

From the collection of Dr Hugh R. Taylor

- The scarring may not always be visible.
- Scarring is the prelude to cicatricial disease and the pathological process that leads to trichiasis.

trichiasis (common)

- Scarring becomes sufficient to alter the architecture of the eyelid, rolling the lid margin inwards and causing one or more lashes to abrade the cornea.



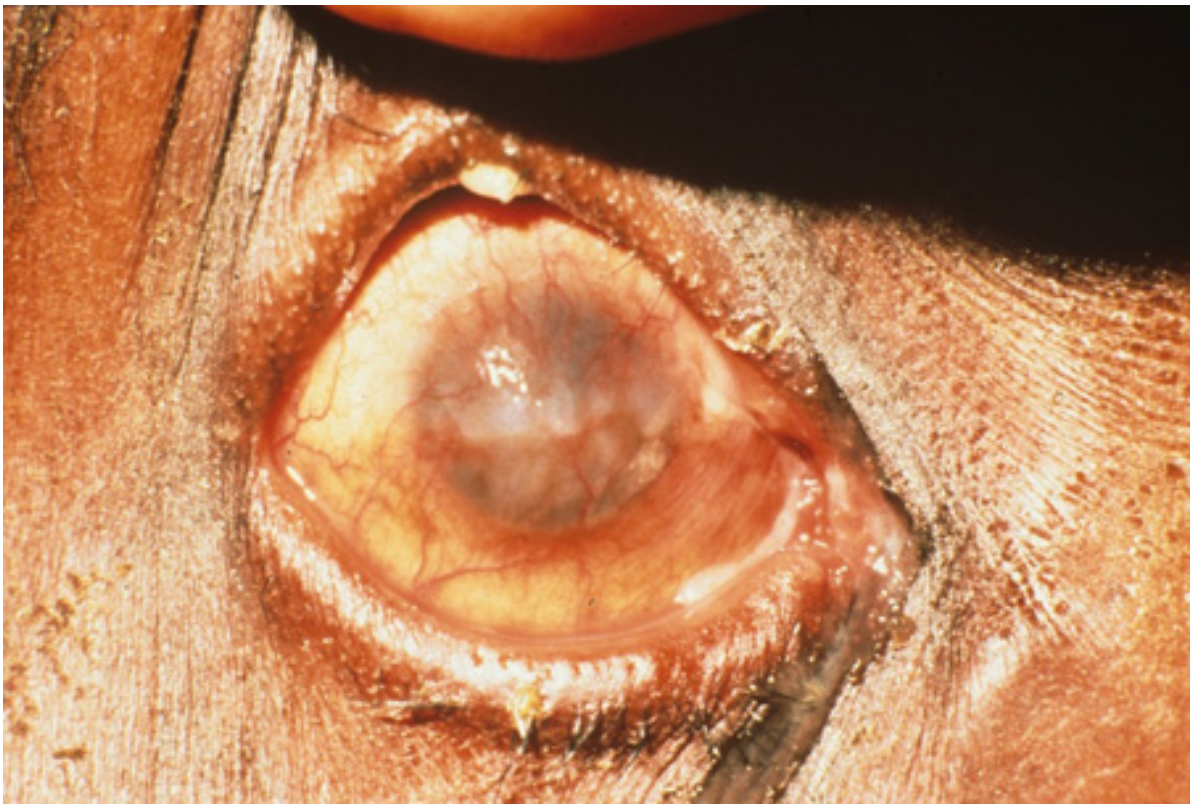
A red eye due to at least 1 inturned eyelash touching the globe (trachomatous trichiasis)

From the collection of Dr Hugh R. Taylor

- In hyper-endemic settings, trichiasis may be present in the absence of visible scarring or entropion.
- Can be painful and can cause symptoms of epiphora (watering eye) or dry eye.
- It is the abrasion of lashes on the cornea that leads to scarring of the cornea and opacification.

corneal opacification and visual loss (common)

- The scarred cornea will appear white.



Corneal opacity due to trachoma

From the collection of Dr Hugh R. Taylor

- Unlike the white of an eye with cataract, the scarring will not be confined to the pupil and will obscure part of the iris-pupil margin.

Herbert's pits (uncommon)

- Small pits around the margin of the cornea. Represent healed limbal follicles and are pathognomonic of previous episodes of active trachoma.
- Although pathognomonic, they are not part of the Simplified WHO grading scheme for trachoma.

Other diagnostic factors

asymptomatic (common)

- Active trachoma is generally relatively asymptomatic but may present with a discharging, irritated, or red eye.
- In resource-poor settings, the diagnosis of trachoma is typically made in an asymptomatic individual as part of a screening programme or as part of a routine health check.

ocular and nasal discharge (common)

- Children with active disease may present with this symptom, but more commonly the condition is detected in asymptomatic individuals.

red eye (common)

- Children with active disease may present with this symptom, but more commonly the condition is detected in asymptomatic individuals.

painful watery eye (common)

- Adults with trichiasis may present with this symptom, but more commonly the condition is detected in asymptomatic individuals.

limbal follicles (uncommon)

- At times, follicles may form along the superior limbus.

pannus (uncommon)

- Vessels grow generally from the superior aspect over the clear cornea.

Risk factors

Strong

children (aged 1 to 9 years)

- Active trachoma occurs predominantly in children.[9] [10] Children who have had multiple or severe episodes of active trachoma may develop cicatricial disease in later life.

poor facial hygiene

- Poor facial cleanliness is probably the most important risk factor in the transmission of trachoma, particularly among children. Studies consistently demonstrate an association between unclean faces and trachomatous inflammation.[9] [11][12] [13]
- Facial cleanliness is important because it is readily modifiable.

female sex

- Trachoma blinds a disproportionate number of women.[1] [14] Cross-sectional studies have demonstrated this sex imbalance in many countries.
- Women have a greater lifetime exposure to young children and this may account for increased episodes of infection, inflammation, and subsequent scarring.[15]
- Young boys growing up in poor rural areas tend to be sent away from the family unit to work the land, thus separating them from the young children who harbour the majority of infection. This protects them from repeated inoculation with chlamydia.

poverty

- Trachoma is found in the poorest regions of the world, where hygiene remains poor. It is a disease that progressively disappeared from the developed world as community and personal hygiene improved. Blinding trachoma further compounds the vicious circle of poverty as blind relatives must be cared for, further entrenching disadvantage.[16] [17]

poor community hygiene

- Poor access to good-quality drinking water, lack of adequate latrines for disposal of faecal material, inadequate refuse disposal, the co-existence of animals and humans within the household, and fly

density are all risk factors for trachoma.[9][18] [19] These various risk factors can be considered under the broader umbrella of environmental community hygiene, and are targeted by public health interventions designed to eliminate trachoma.

crowded households

- Facilitates contact between infected individuals.[1]

residence in or emigration from an endemic area

- Trachoma is confined to those living in the poorest conditions or those growing up in an area where the disease is endemic. Trachoma is known to be endemic in 42 countries.[1] It is confined to regions of disadvantage in Africa, the Middle East, Asia, Latin America, the Pacific Islands, and remote Aboriginal and Torres Strait Islander communities in Australia. There are some countries that require further assessment.

Weak

eye-seeking flies

- Putative vectors. Control of flies (Musca sorbens) is associated with reduced trachoma prevalence.[18] [20]

Investigations

1st test to order

Test	Result
clinical diagnosis • Trachoma almost exclusively occurs in resource-poor settings, where expensive tests are not available. Diagnosis is therefore generally based on clinical grading using the Simplified WHO grading system, with the aid of a good light source and a loupe with adequate magnification.[30]	**trachomatous inflammation, follicular; trachomatous inflammation, intense; trachomatous conjunctival scarring; trachomatous trichiasis; corneal opacity**

Other tests to consider

Test	Result
polymerase chain reaction (conjunctival swab) • Confirms chlamydial infection. • Cost and availability may inhibit the routine use of laboratory tests in trachoma-surveillance programmes in resource-poor settings.	**positive for *Chlamydia trachomatis* in active disease**

Emerging tests

Test	Result
novel molecular and serological tests • Include point of care lateral flow testing for chlamydial lipopolysaccharide (optimised for use with conjunctival swabs); a rapid diagnostic device that amplifies DNA from the chromosomal porB gene of *Chlamydia trachomatis* ; and immunoassays to measure antibodies to the *C trachomatis* Pgp3 antigen.[33] [34] [35]	**positive**

Differentials

Condition	Differentiating signs / symptoms	Differentiating tests
Chlamydial inclusion conjunctivitis	• Generally occurs in adults not living in areas where trachoma is endemic.	• Swab culture detects genital strains of *Chlamydia trachomatis* .
Viral conjunctivitis	• A common cause of conjunctival follicles. • It can be distinguished from trachoma by an acute history and mucopurulent discharge. • Herbert's pits or pannus are absent. • Both conditions may lead to tarsal conjunctival scarring.	• A swab for HSV and adenovirus could be considered.
Bacterial conjunctivitis	• Bacterial infection such as *Moraxella* can be a rare cause of follicle formation. • Absence of Herbert's pits.	• Microscopy, culture, and sensitivity testing on a conjunctival swab may reveal a bacterial cause.
Hypersensitivity conjunctivitis	• A careful history may reveal exposure to allergens (e.g., chronic exposure to drugs or eye cosmetics). • Absence of Herbert's pits.	• If conjunctival swab is performed, the culture is negative for hypersensitivity conjunctivitis.
Vernal conjunctivitis	• As an allergic disorder, patients often have associated atopy. • Symptoms include itching, lacrimation, photophobia, foreign body sensation, and burning. • Appearance of everted conjunctiva is 'cobblestone' and different from the characteristic follicles of trachoma. • Absence of Herbert's pits.	• Giemsa cytology of conjunctival scrapings shows many eosinophils.
Parinaud oculoglandular syndrome	• This rare ophthalmic condition may also cause follicles. • There may be an associated condition such as cat-scratch fever, tuberculosis, syphilis, lymphogranuloma venereum, or glandular fever. • Absence of Herbert's pits.	• Specific tests are required for each suspected associated condition, depending on history and clinical setting.
Trauma or chemical injury to eye	• History of trauma or chemical contact with eye. • Both conditions may lead to tarsal conjunctival scarring.	• Differentiated clinically.

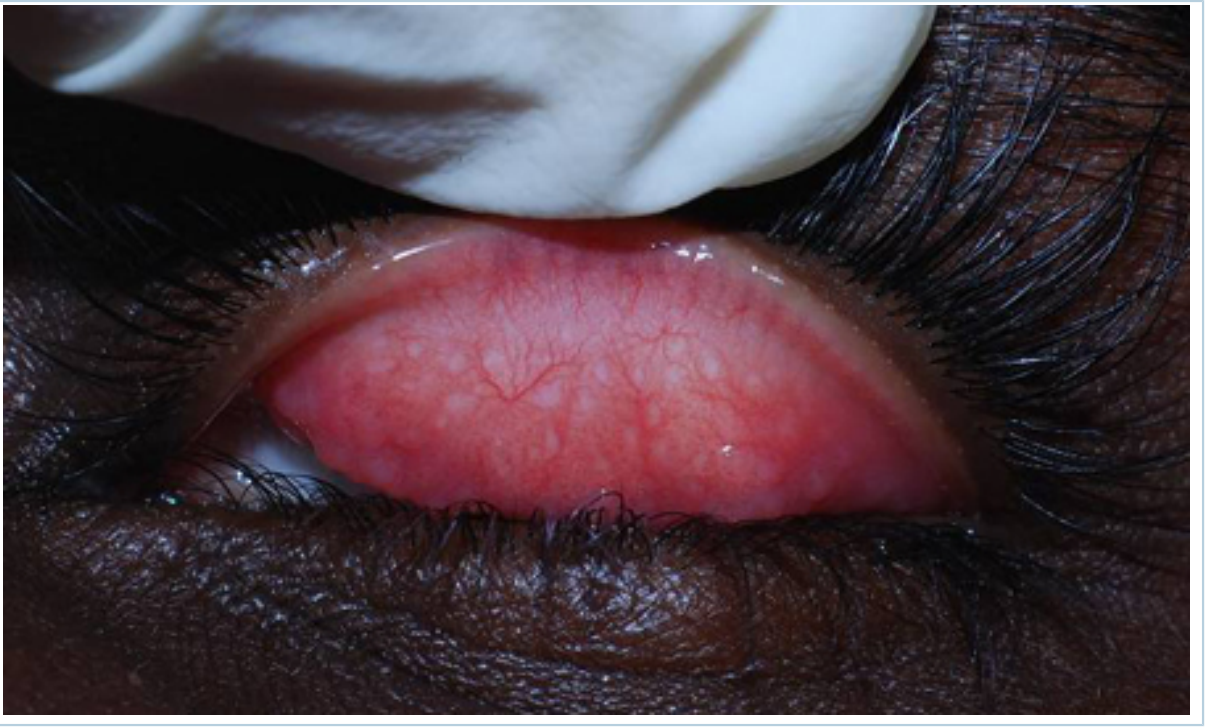
Condition	Differentiating signs / symptoms	Differentiating tests
	• Absence of Herbert's pits.	
Stevens-Johnson syndrome	• Other signs and symptoms typically include the sudden appearance of a rash or a rash appearing after a new medicine has been commenced. • Both conditions may lead to tarsal conjunctival scarring. • Absence of Herbert's pits. • Trachoma is more likely in an area where it is endemic.	• Differentiated clinically.
Ocular cicatricial pemphigoid	• Pemphigoid has scarring in the bulbar conjunctiva and the plica; trachoma may show Herbert's pits in the superior cornea. • Both conditions may lead to tarsal conjunctival scarring. • Trachoma is more likely in an area where it is endemic.	• Differentiated clinically.
Idiopathic trichiasis	• May be difficult to differentiate clinically from trichiasis due to trachoma, although it is unlikely to have tarsal scarring. • Absence of Herbert's pits. • Trachoma is more likely in an area where it is endemic.	• Differentiated clinically.
Trichiasis due to other chronic inflammatory conditions	• Trichiasis can be idiopathic or secondary to a large range of chronic inflammatory diseases such as blepharitis and chronic conjunctivitis. • Absence of Herbert's pits. • Trachoma is more likely in an area where it is endemic.	• Differentiated clinically.
Corneal opacity due to other causes	• There are many other causes of corneal opacity. • However, when seen in conjunction with trichiasis and other signs of trachoma in a patient who has spent a significant amount of their life in a trachoma-endemic area, a diagnosis of trachomatous corneal opacity is likely.	• Differentiated clinically.

Criteria

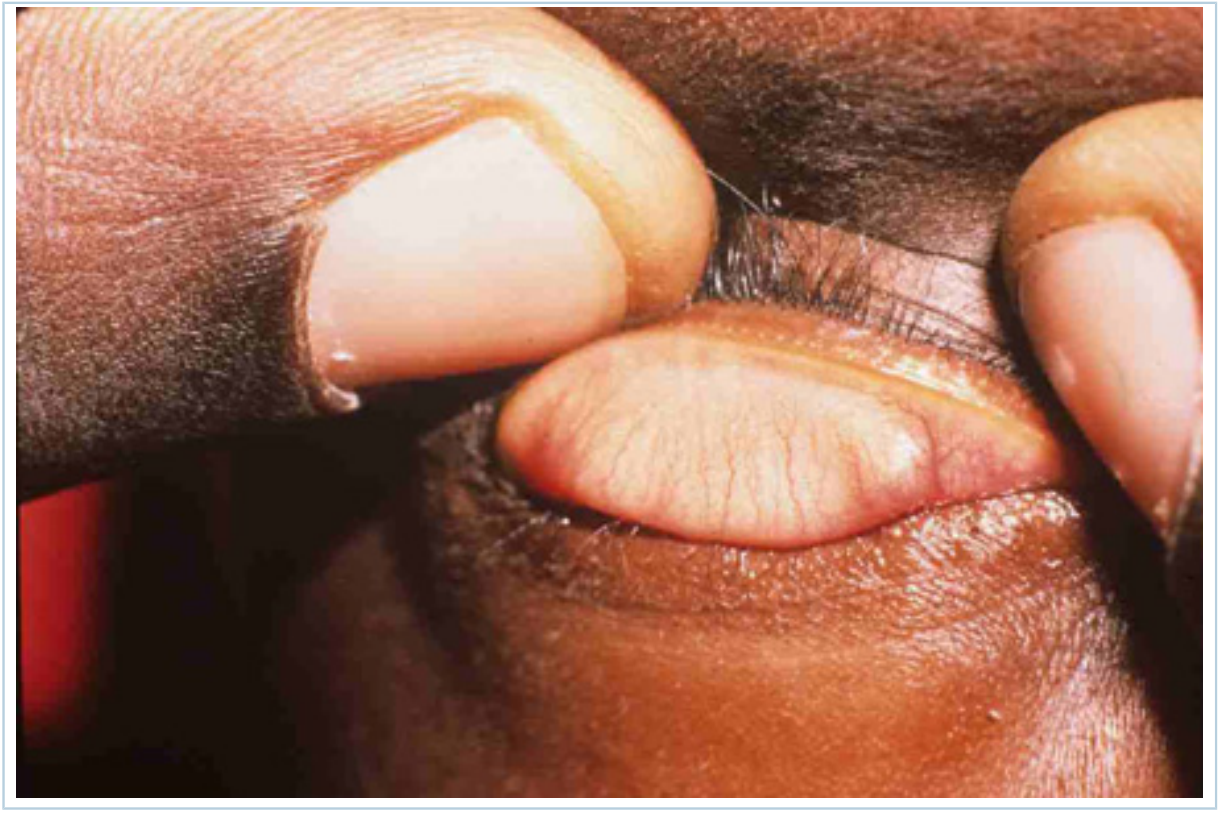
The Simplified WHO Grading Scheme[30]

This is a grading scheme that creates arbitrary definitions of active and cicatricial disease. It is useful in a practical sense because of its simplicity; however, it is not necessarily useful in diagnosing an individual and has limitations when used in research. It must be remembered that this system was designed for use in fieldwork by health workers.

- Trachomatous inflammation, follicular (TF): 5 or more follicles greater than 0.5 mm on the upper tarsal conjunctiva.



Eyelid eversion demonstrating follicles on the upper tarsal conjunctiva
From the collection of Dr Hugh R. Taylor

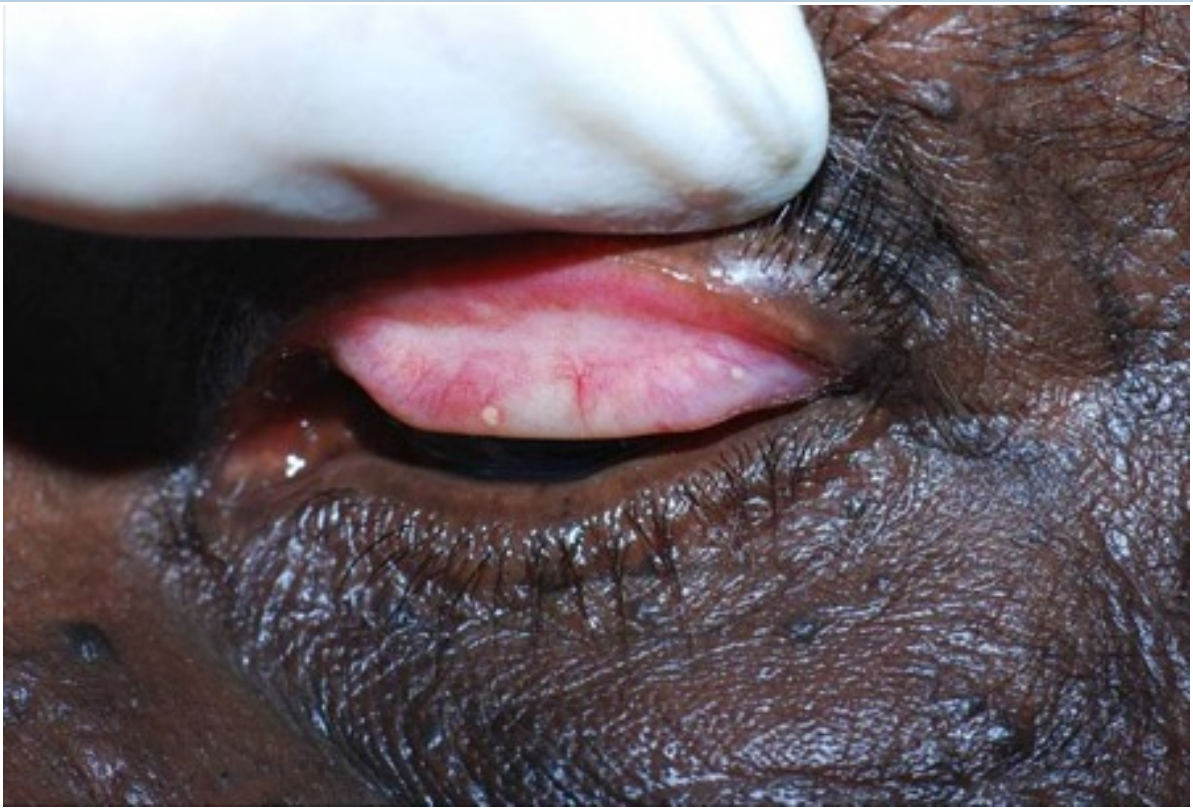


A normal eyelid
From the collection of Dr Hugh R. Taylor

- Trachomatous inflammation, intense (TI): papillary hypertrophy and inflammatory thickening of the upper tarsal conjunctiva obscuring more than half of the deep tarsal vessels.

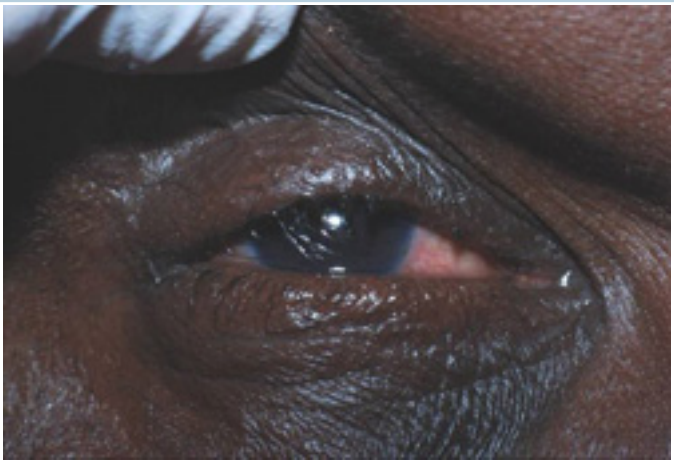
Eyelid eversion demonstrating intense inflammation of the upper tarsal conjunctiva
From the collection of Dr Hugh R. Taylor

- Trachomatous conjunctival scarring (TS): the presence of scarring on the tarsal conjunctiva.



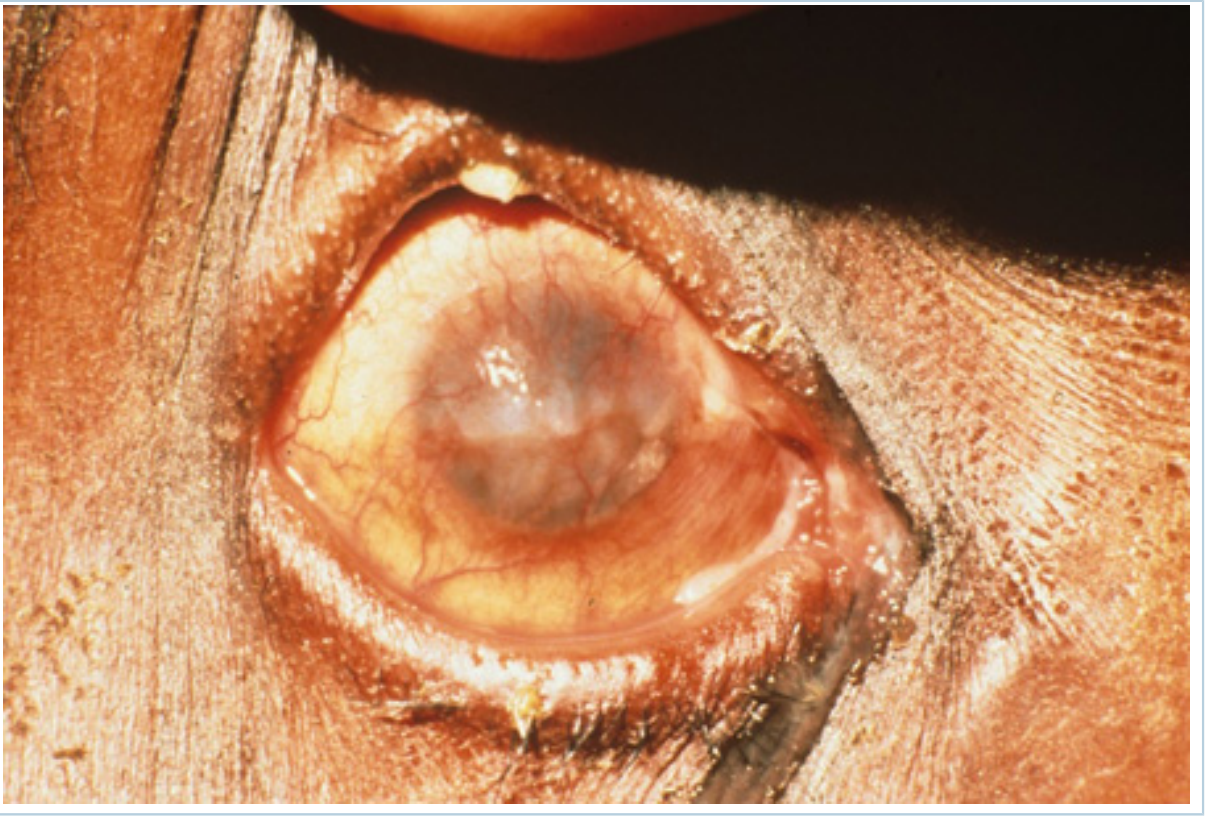
Eyelid eversion demonstrating scars on the tarsal conjunctiva
From the collection of Dr Hugh R. Taylor

- Trachomatous trichiasis (TT): at least one eyelash from the upper eyelid touching the globe, or evidence of recent epilation of inturned eyelashes from the upper eyelid.



A red eye due to at least 1 inturned eyelash touching the globe (trachomatous trichiasis)
From the collection of Dr Hugh R. Taylor

- Corneal opacity (CO): corneal opacity blurring part of the pupil margin.



Corneal opacity due to trachoma
From the collection of Dr Hugh R. Taylor

WHO Grading Scheme[30]

This is a detailed grading scheme that can only be reliably used by ophthalmologists or experienced trachoma workers. For this reason its practical use is limited. However, the system may have an important place in clinical research.

Screening

The World Health Organization (WHO) recommends the initiation of public health interventions if the prevalence of active disease in children aged 1 to 9 years is more than 10%.[36] It recommends the initiation of a surgical programme if the prevalence of trichiasis in people aged over 15 years is more than 1%.[22]

Screening is a key component of the attempt to eliminate trachoma. Communities where trachoma is known or suspected to be endemic must be screened. The diagnosis of trachoma in an individual should lead to a community-wide assessment of the prevalence of trachoma. Individual treatment alone is futile; because of the facile transmission of trachoma, an individual may be rapidly re-infected and not all patients with ocular chlamydial infection will present with signs of disease and those with signs of disease may not have infection. Therefore, a community-wide intervention is the best approach to treat endemic trachoma within a community.

Community survey method (recommended by WHO)

A community survey should be conducted in an area known or suspected to have endemic trachoma, or in response to the discovery of trachoma in an individual within a community suspected of having endemic

trachoma. Communities that historically had trachoma and are thought to have eliminated it should also be monitored.

Community prevalence is the key diagnostic determinant for initiating a trachoma control programme. Community-wide screening can be undertaken. However, this may be unnecessary in large communities where a sample of people will provide the necessary information.

The WHO recommends that trachoma screening be undertaken at the administrative health district level; this approximates to a region containing about 100,000 people. The burden of disease should be estimated by sampling the district. The process for determining the sample to be examined is complex and has been outlined by the WHO.[30] Estimates on the cost of trachoma monitoring are available.[37]

Other survey methods

A variety of survey methods have been trialled, each with their own strengths and weaknesses.[30] [38] [39] A technique based on Lot Quality Assurance Sampling continues to examine children until either a predetermined cut-off has been reached or 50 children have been examined: the rationale being that if the cut-off point is reached, an intervention is called for, and to continue sampling is an inefficient use of resources. If the cut-off is not reached, then no intervention is required.[30]

Alternatively, Trachoma Rapid Assessment (TRA) is a technique that attempts to identify those most likely to have trachoma by sampling those who live in the poorest conditions or have the greatest risk factors for trachoma. This does not necessarily provide an estimate of prevalence, but it helps to prioritise communities within a district for intervention. Furthermore, TRA may be a powerful tool to quickly confirm whether trachoma has been eliminated from a region.[38]

Approach

The neglected tropical diseases road map 2021-2030, endorsed by the World Health Assembly in 2020, has set 2030 as the target date for global elimination of trachoma.[1] [21]

The public health approach recommended by the World Health Organization (WHO) to prevent and treat trachoma is called the SAFE strategy.[22] This acronym stands for:

- Surgery for trichiasis
- Antibiotics for active infection
- Facial cleanliness
- Environmental improvements

Interventions tailored to the local epidemiology may be of benefit in areas where persistent disease remains.[1] [23] [24]

Trachoma almost exclusively occurs in resource-poor countries of the world, so treatment programmes (e.g., the SAFE strategy) have been developed for this setting. However, physicians in resource-rich countries may encounter people who have been living in, or have emigrated or are visiting from, a trachoma-endemic region, requiring treatment for this condition. The approach to treatment in these two settings differ.

[International Coalition for Trachoma Control: about trachoma] (http://www.trachomacoalition.org/about-trachoma)

Resource-poor endemic area: recommendations for mass antibiotic treatment

When trachoma is suspected, it should lead to a community-wide assessment of the prevalence of trachoma. The decision concerning treatment will depend on the results of this survey. Individual treatment alone is futile; because of the facile transmission of trachoma, an individual will be rapidly re-infected. Therefore, a community-wide intervention is the best approach to treat endemic trachoma within a community.[40]

If the prevalence of active trachoma is greater than 10% in children aged 1 to 9 years, WHO recommends treatment of all members of a community older than aged 6 months with mass antibiotic distribution on an annual basis for a total of 3 years.[36] This approach is supported by randomised controlled trials.[41] [42] Infants aged 1 to 6 months are an important reservoir of infection and there is growing opinion that they should be included within any mass treatment programme.[43] [44] Antibiotic distribution should be undertaken in conjunction with a range of public health measures.[45]

The WHO recommendations for criteria to treat a community are ideal, but the actual approach taken must be decided on a community-by-community basis. If those affected are confined to several large families within a small community, it may be possible to target those large families.

Treatment of children without treating households

One cluster-randomised trial reported that 3-monthly treatment of children aged 1 to 9, for one year, not only dramatically reduced the prevalence of infection in the target group (from 48.4% to 3.6%), but that this also resulted in a reduced prevalence of infection in other untreated adults (from 15.5% to 8.2%).[46] One subsequent study concluded that biannual treatment of children (6 months to 12 years) was non-

inferior to annual treatment of the entire community.[47] Children aged <6 months received topical tetracycline ointment.

Various antibiotic regimens exist:

- A single dose of oral azithromycin
- Tetracycline eye ointment twice daily for 6 weeks
- A 2-week course of erythromycin.

Azithromycin is at least as effective as tetracycline eye ointment twice daily for 6 weeks in resolving active trachoma, and the single dose has an obvious compliance benefit, making it first choice for treatment if available.[48] Azithromycin has a favourable adverse-effect profile, and chlamydial resistance has not been documented, making it suitable for mass distribution.[49] [50] An increase in macrolide resistance in *Streptococcus pneumoniae* has been reported immediately following treatment.[50] Resistance appears to dissipate with time, but monitoring for resistance in non-target organisms is required during mass azithromycin distribution programmes.

Observational data suggest that skin and soft tissue infections, acute respiratory illness, diarrhoeal illness, and rheumatic heart disease may be incidentally treated during mass azithromycin administration, thereby reducing childhood mortality.[51] [52] The mechanism remains unclear.

Optimal distribution strategy

Important unanswered questions remain with respect to the optimal distribution strategy (mass treatment versus targeted treatment), and the timing of treatment.[46] [47] Given the almost universal recrudescence of infection a year after a single dose of azithromycin, 6-monthly or even 3-monthly treatment may be appropriate. However, 6-monthly treatment does not show a longer term benefit compared with annual treatment.[53] Further research is required to elucidate the optimal timing of treatment and the exact group to target.

Guidance on preferred practices for trachoma MDA is available.[54]

Resource-poor endemic area: public health measures

Evidence to support the efficacy of interventions targeting facial cleanliness and environmental improvements is limited.[55] Facial cleanliness, in conjunction with mass antibiotic treatment, may be effective in reducing severe active trachoma.[55] Washing with soap may remove ocular discharge more effectively than washing with water alone.[56] There is no conclusive evidence to support face washing in isolation.[55] One cluster-randomised trial reported no reduction in ocular chlamydia prevalence among both intervention and control groups 36 months after the implementation of a facial cleanliness plus environmental improvement programme.[29] The trial is ongoing.

Access to a clean water supply, adequate latrines and refuse disposal, and attempts to minimise fly density are all potentially important factors for trachoma control.[9] [18] [19] However, delivered in isolation (e.g., in the absence of an educational campaign, or concurrent antibiotic therapy) these measures are unlikely to be effective.[29] [57] [58]

WHO, as part of their roadmap tackling neglected tropical diseases by 2030, have recommended that future research focus on identifying critical facial cleanliness and environmental improvement interventions to reduce trachoma transmission.[21]

Resource-poor endemic area: management of trachomatous trichiasis

Adults with trichiasis must be immediately referred for consideration of corrective lid surgery to prevent vision loss.

Trichiasis itself is a cause of significant disability and reduced quality of life.[59] [60] However, it is the corneal opacity that develops in 33% of individuals with untreated trichiasis over 1 year that causes blindness.[61]

In a resource-poor setting, surgical intervention can be undertaken by nurses trained in the appropriate procedure (where permitted). Posterior lamellar tarsal rotation is the preferred procedure and is recommended by the WHO.[62] [63]

Surgery for trichiasis is safe to be performed at the village level to minimise the cost to the patient and related logistics for a programme. Very high recurrence rates have been reported, but lower rates (≤10%) are achievable with meticulous surgical procedure.[64] [65] Adjunctive azithromycin given at the time of surgery may help decrease postoperative recurrence in areas with high levels of infection.[66] [67] Posterior lamellar tarsal rotation surgery is associated with significantly lower rates of recurrence than bilamellar tarsal rotation surgery.[63]

As surgery only corrects the architecture of the eyelid (but does not alter the pathological process, which may continue), some degree of recurrence is probably inevitable due to the natural history of trachomatous trichiasis and the ongoing scarring of the tissue. Poor surgical uptake rates may be improved by addressing negative attitudes towards surgical treatment, providing surgical services at existing health clinics, and community-based promotion.[68] [69]

Epilation (eyelash removal) may be associated with protection from corneal opacity in the eyes with moderate or severe entropion, but is usually not recommended. Epilation gives no long-term relief and broken lashes are likely to abrade and damage the cornea.[70] It may be a useful treatment for patients who are suffering from minor trichiasis who decline surgery, are difficult to access, or are awaiting surgery.[71] [72]

Resource-rich non-endemic area: acute infection of individual or family member

Trachoma almost exclusively occurs in resource-poor settings. However, physicians in resource-rich countries may encounter people who have been living in, or emigrated or are visiting from, a trachoma-endemic region, requiring treatment for this condition.

In this situation, azithromycin is given to the patient and the family, and they are followed up at 6-monthly intervals. Re-treatment can be given if necessary.

Resource-rich non-endemic area: management of trachomatous trichiasis

In a resource-rich setting, surgery should be undertaken by an experienced oculoplastic surgeon. A variety of different techniques are available, and surgery will be tailored to the individual situation to take into account the full clinical picture.

The decision regarding whether or not to give peri-operative antibiotics and about which antibiotic to use varies between individual surgeons.

Treatment algorithm overview

Please note that formulations/routes and doses may differ between drug names and brands, drug formularies, or locations. Treatment recommendations are specific to patient groups: see disclaimer

Acute (summary)		
resource-poor endemic area: based on prevalence of active trachoma		
	1st	**azithromycin for patient and community (or family)**
	plus	**public health measures**
	2nd	**alternative antibiotic therapy for patient and community (or family)**
	plus	**public health measures**
resource-rich non-endemic area: infected individual and family contact		
	1st	**azithromycin for patient and family**

Ongoing (summary)		
resource-poor endemic area: trachomatous trichiasis		
	1st	**posterior lamellar tarsal rotation surgery**
	adjunct	**peri-operative azithromycin**
resource-rich non-endemic area: trachomatous trichiasis		
	1st	**surgery**

Treatment algorithm

Please note that formulations/routes and doses may differ between drug names and brands, drug formularies, or locations. Treatment recommendations are specific to patient groups: see disclaimer

Acute

resource-poor endemic area: based on prevalence of active trachoma

1st **azithromycin for patient and community (or family)**

Primary options

» azithromycin: children and adults: 20 mg/kg orally as a single dose given annually for a total of 3 years, maximum 1000 mg/dose

» Where trachoma is suspected, a community-wide assessment of trachoma prevalence should be undertaken. The decision concerning treatment will depend on the results of this survey. Individual treatment alone is futile; because of the facile transmission of trachoma, an individual will be rapidly re-infected. Therefore, a community-wide intervention is the best approach to treat endemic trachoma within a community.[40]

» It should be noted that active trachoma is often asymptomatic.

» If the prevalence of active trachoma is greater than 10% in children aged 1 to 9 years, the World Health Organization (WHO) recommends treatment of all members of a community older than aged 6 months with mass antibiotic distribution on an annual basis for a total of 3 years.[36] This approach is supported by randomised controlled trials.[41] [42] Infants aged 1 to 6 months are an important reservoir of infection and there is growing opinion that they should be included within any mass treatment programme.[43] [44] Antibiotic distribution should be undertaken in conjunction with a range of public health measures.[45]

» If those affected are confined to several large families within a small community, it may be possible to target those large families.

» A single observed dose of azithromycin should be given. Azithromycin has a favourable adverse-effect profile, and chlamydial resistance has not been documented, making it suitable for mass distribution.[49] [50]

plus **public health measures**

Acute

Treatment recommended for ALL patients in selected patient group

» Evidence to support the efficacy of interventions targeting facial cleanliness and environmental improvements is limited.[55] Facial cleanliness, in conjunction with mass antibiotic treatment, may be effective in reducing severe active trachoma.[55] Washing with soap may remove ocular discharge more effectively than washing with water alone.[56] There is no conclusive evidence to support face washing in isolation.[55] One cluster-randomised trial reported no reduction in ocular chlamydia prevalence among both intervention and control groups 36 months after the implementation of a facial cleanliness plus environmental improvement programme.[29] The trial is ongoing.

» Access to a clean water supply, adequate latrines and refuse disposal, and attempts to minimise fly density are all potentially important factors for trachoma control.[9] [18][19] However, delivered in isolation (e.g., in the absence of an educational campaign, or concurrent antibiotic therapy) these measures are unlikely to be effective.[29] [57] [58]

2nd **alternative antibiotic therapy for patient and community (or family)**

Primary options

» tetracycline topical: (1% ophthalmic ointment) apply to the affected eye(s) twice daily for 6 weeks with course repeated on an annual basis for a total of 3 years

Secondary options

» erythromycin base: children: 30-50 mg/kg/day orally given in divided doses every 6 hours for 7 days, with course repeated on an annual basis for a total of 3 years; adults: 250 mg orally every 6 hours for 2 weeks, with course repeated on an annual basis for a total of 3 years

» Patients without access to azithromycin (e.g., due to cost) should be treated with topical tetracycline ointment. If this is unavailable, oral erythromycin can be used. There is no proven difference in benefit between the various antibiotic regimens.[48] If the prevalence of active trachoma is greater than 10% in children aged 1 to 9 years, the World Health Organization (WHO) recommends treatment of all members of a community older than aged 6 months

Acute

with mass antibiotic distribution on an annual basis for a total of 3 years.[36] This approach is supported by randomised controlled trials.[41] [42] Infants aged 1 to 6 months are an important reservoir of infection and there is growing opinion that they should be included within any mass treatment programme.[43] [44] Antibiotic distribution should be undertaken in conjunction with a range of public health measures.[45]

» If those affected are confined to several large families within a small community, it may be possible to target those large families.

plus **public health measures**

Treatment recommended for ALL patients in selected patient group

» Evidence to support the efficacy of interventions targeting facial cleanliness and environmental improvements is limited.[55] Facial cleanliness, in conjunction with mass antibiotic treatment, may be effective in reducing severe active trachoma.[55] Washing with soap may remove ocular discharge more effectively than washing with water alone.[56] There is no conclusive evidence to support face washing in isolation.[55] One cluster-randomised trial reported no reduction in ocular chlamydia prevalence among both intervention and control groups 36 months after the implementation of a facial cleanliness plus environmental improvement programme.[29] The trial is ongoing.

» Access to a clean water supply, adequate latrines and refuse disposal, and attempts to minimise fly density are all potentially important factors for trachoma control.[9] [18][19] However, delivered in isolation (e.g., in the absence of an educational campaign, or concurrent antibiotic therapy) these measures are unlikely to be effective.[29] [57] [58]

resource-rich non-endemic area: infected individual and family contact

1st **azithromycin for patient and family**

Primary options

» azithromycin: children and adults: 20 mg/kg orally as a single dose, maximum 1000 mg/dose

» Trachoma almost exclusively occurs in resource-poor countries of the world. However, physicians in resource-rich countries may

MANAGEMENT

Acute

encounter people who have been living in, or emigrated or are visiting from, a trachoma-endemic region, requiring treatment for this condition.

» In this situation azithromycin is given to the patient and the family as a single observed dose, and they are followed up at 6-monthly intervals.

» Re-treatment can be given if necessary.

Ongoing

resource-poor endemic area: trachomatous trichiasis

1st **posterior lamellar tarsal rotation surgery**

» Surgical intervention can be undertaken by nurses trained in the appropriate procedure (where permitted). Posterior lamellar tarsal rotation is the preferred procedure and is recommended by the World Health Organization (WHO).[62] [63]

» Surgery for trichiasis is safe to be performed at the village level to minimise the cost to the patient and related logistics for a programme. Very high recurrence rates have been reported, but lower rates (≤10%) are achievable with meticulous surgical procedure.[64] [65] Posterior lamellar tarsal rotation surgery is associated with significantly lower rates of recurrence than bilamellar tarsal rotation surgery.[63]

» As surgery only corrects the architecture of the eyelid but does not alter the pathological process, which may continue, some degree of recurrence is probably inevitable due to the natural history of trachomatous trichiasis and the ongoing scarring of the tissue.

» Absorbable sutures have the advantage that patients do not need to be seen so soon after surgery for the removal of sutures.[73]

» Epilation (eyelash removal) may be a useful treatment for patients who are awaiting surgery.[71]

adjunct **peri-operative azithromycin**

Treatment recommended for SOME patients in selected patient group

Primary options

» azithromycin: 1 g orally as a single dose

» Adjunctive azithromycin given at the time of surgery may help decrease postoperative recurrence in areas with high levels of infection.[66] [67]

resource-rich non-endemic area: trachomatous trichiasis

1st **surgery**

» For experienced oculoplastic surgeons there are a variety of surgical approaches that may offer particular benefits in different cases.

MANAGEMENT

Ongoing

» The decision regarding whether or not to give peri-operative antibiotics and about which antibiotic to use varies between individual surgeons.

Primary prevention

The neglected tropical diseases road map 2021-2030, endorsed by the World Health Assembly in 2020, has set 2030 as the target date for global elimination of trachoma.[1] [21]

The public health approach recommended by the World Health Organization (WHO) to prevent and treat trachoma is called the SAFE strategy.[22] This acronym stands for:

- Surgery for trichiasis
- Antibiotics for active infection
- Facial cleanliness
- Environmental improvements.

Interventions tailored to the local epidemiology may be of benefit in areas where persistent disease remains.[1] [23] [24]

Mass drug administration (MDA), representing the A component of SAFE, is effective in reducing active trachoma prevalence, though one systematic review noted that the effectiveness of azithromycin MDA was dependent on baseline prevalence.[25] [26] Enhanced MDA is probably needed in hyper-endemic areas in order to achieve and sustain trachoma elimination.[26] [27] [28]

WHO has recommended that future research focus on identifying critical F and E interventions to reduce trachoma transmission.[21] Evidence to support the efficacy of interventions targeting F and E components is limited. One cluster-randomised trial reported no reduction in ocular chlamydia prevalence among both intervention and control groups 36 months after the implementation of a facial cleanliness plus environmental improvement programme.[29] The trial is ongoing.

[International Coalition for Trachoma Control: about trachoma] (http://www.trachomacoalition.org/about-trachoma)

Secondary prevention

Surgery is part of the SAFE strategy (surgery, antibiotics, facial cleanliness, environmental improvements). Prompt surgery must be offered to all patients who have trichiasis in order to prevent blindness.

Patient discussions

Communities need to be advised about the importance of facial cleanliness. Children with clean faces are probably less likely to be targets for flies, a putative vector in the transmission of the disease.[74] Washing with soap may remove ocular discharge more effectively than washing with water alone.[56]

Patients need to be warned of the possibility of recurrence and asked to remain vigilant for the presence of inturned eyelashes. Patients should be prepared to present for an annual examination.

FOLLOW UP

Monitoring

Monitoring

Adults over the age of 40 years who live in a trachoma-endemic area should be assessed for scarring of the upper tarsal conjunctiva. If this sign is present they should be regularly assessed for the development of trichiasis. The timeframe of reviews will depend on resources and the severity of trachoma in that region.

Patients who have had surgery for trichiasis are at continued risk of recurrence and must be followed up on an annual basis.

People with severe tarsal scarring should be monitored every 1 to 2 years for the development of trichiasis.

Complications

Complications	Timeframe	Likelihood
corneal opacification and vision loss	**long term**	**high**
People with trichiasis can expect to develop corneal opacity within several years if left untreated. Corneal opacity can result in permanent visual loss if it affects the visual axis.		
recurrence of trichiasis post-surgery	**variable**	**low**
Likelihood is low with high-quality surgery. Very high recurrence rates have been reported, but lower rates (≤10%) are achievable with meticulous surgical procedure.[64] [65] Adjunctive azithromycin given at the time of surgery may help decrease postoperative recurrence in areas with high levels of infection.[66] [67] Posterior lamellar tarsal rotation surgery is associated with significantly lower rates of recurrence than bilamellar tarsal rotation surgery.[63] As surgery only corrects the architecture of the eyelid but does not alter the pathological process, which may continue, some degree of recurrence is probably inevitable due to the natural history of trachomatous trichiasis and the ongoing scarring of the tissue.		

Prognosis

When a cohort of individuals with trachomatous scarring was followed over 12 years, 6% were found to have developed trichiasis, and 3% had corneal visual impairment.[6]

Approximately 50% of those with trichiasis will develop corneal opacity within 2 years if left untreated. Corneal opacity that affects the centre of the cornea will result in permanent visual loss. Trichiasis can be painful and the constant abrasion on the cornea can lead to secondary corneal infections.

Post posterior lamellar tarsal rotation surgery

Patients who have had surgery for trichiasis are at a continued risk of recurrence. Posterior lamellar tarsal rotation surgery is associated with significantly lower rates of recurrence than bilamellar tarsal rotation surgery.[63]

As surgery only corrects the architecture of the eyelid but does not alter the pathological process, which may continue, some degree of recurrence is probably inevitable due to the natural history of trachomatous trichiasis and the ongoing scarring of the tissue.

Diagnostic guidelines

International

Trachoma control: a guide for programme managers (https://www.who.int/publications/i/item/9241546905)

Published by: World Health Organization **Last published:** 2006

Oceania

National guide to a preventive health assessment for Aboriginal and Torres Strait Islander people, third edition (https://www.racgp.org.au/the-racgp/faculties/atsi/guides)

Published by: National Aboriginal Community Controlled Health Organisation; Royal Australian College of General Practitioners **Last published:** 2018

Treatment guidelines

International

Trachoma control: a guide for programme managers (https://www.who.int/publications/i/item/9241546905)

Published by: World Health Organization **Last published:** 2006

Oceania

National guide to a preventive health assessment for Aboriginal and Torres Strait Islander people, third edition (https://www.racgp.org.au/the-racgp/faculties/atsi/guides)

Published by: National Aboriginal Community Controlled Health Organisation; Royal Australian College of General Practitioners **Last published:** 2018

Online resources

1. International Coalition for Trachoma Control: about trachoma (http://www.trachomacoalition.org/about-trachoma) *(external link)*

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Images

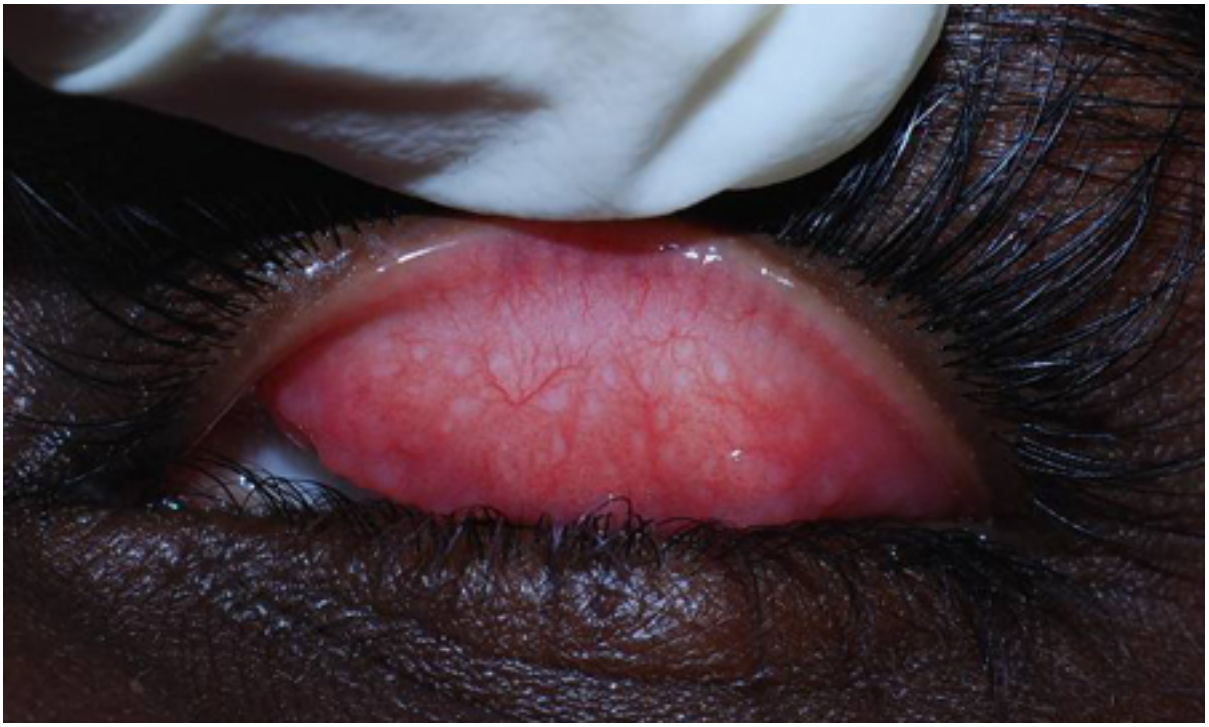

Figure 1: Eyelid eversion demonstrating follicles on the upper tarsal conjunctiva

From the collection of Dr Hugh R. Taylor

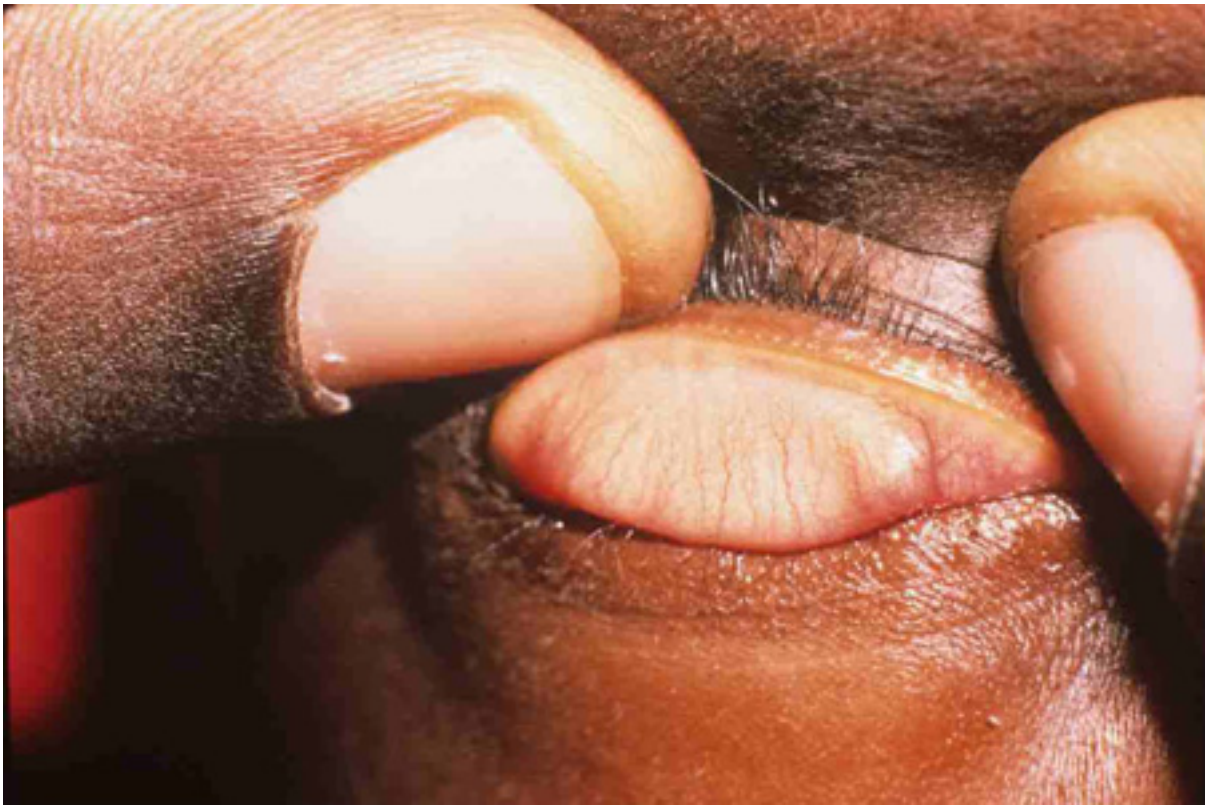

Figure 2: A normal eyelid

From the collection of Dr Hugh R. Taylor

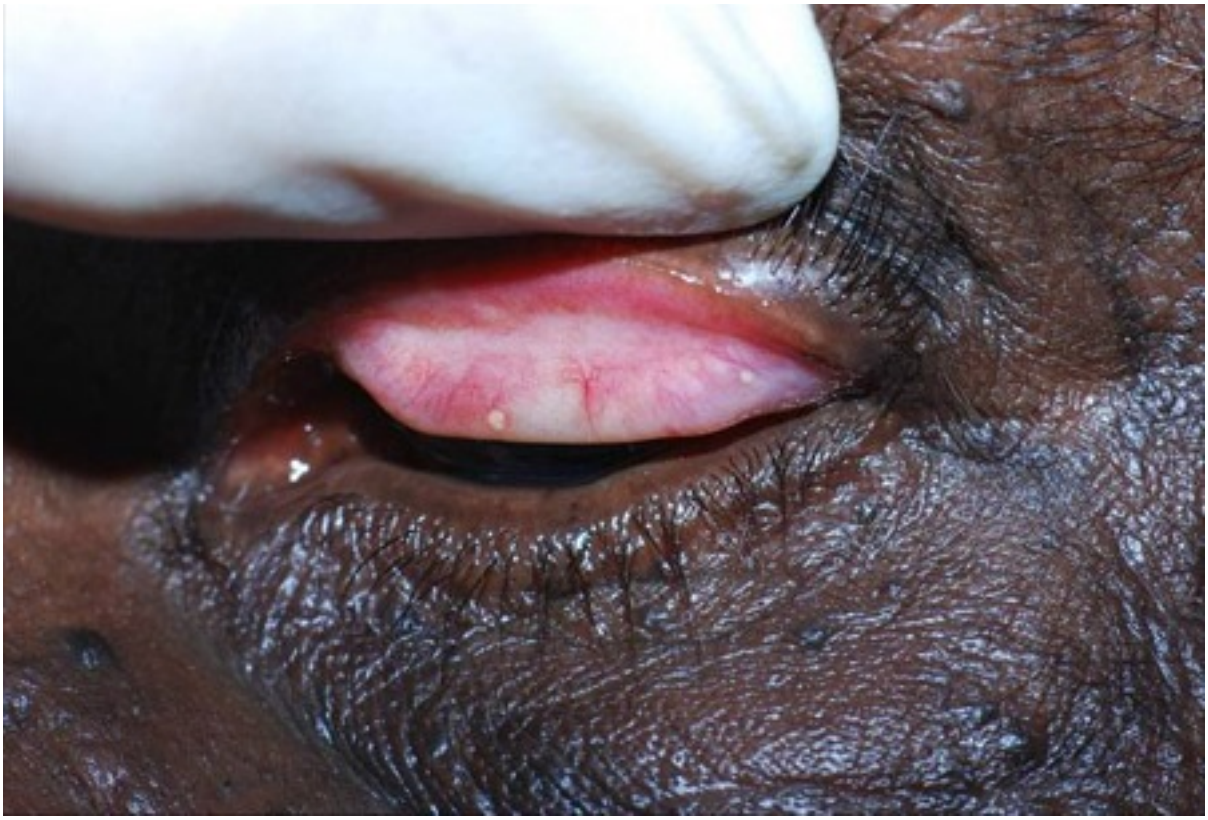

Figure 3: Eyelid eversion demonstrating scars on the tarsal conjunctiva

From the collection of Dr Hugh R. Taylor

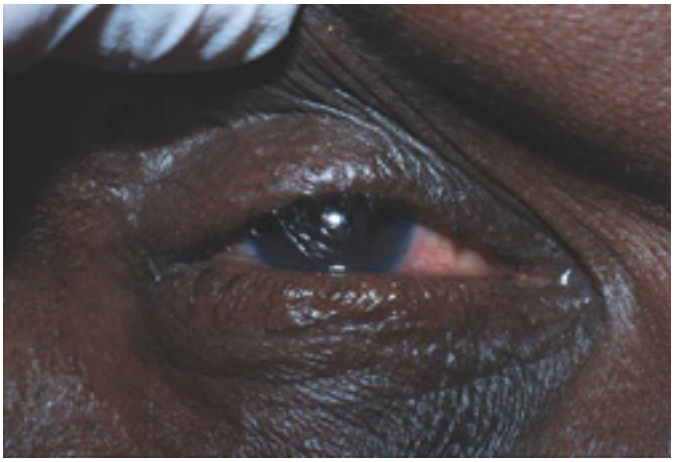

Figure 4: A red eye due to at least 1 inturned eyelash touching the globe (trachomatous trichiasis)

From the collection of Dr Hugh R. Taylor

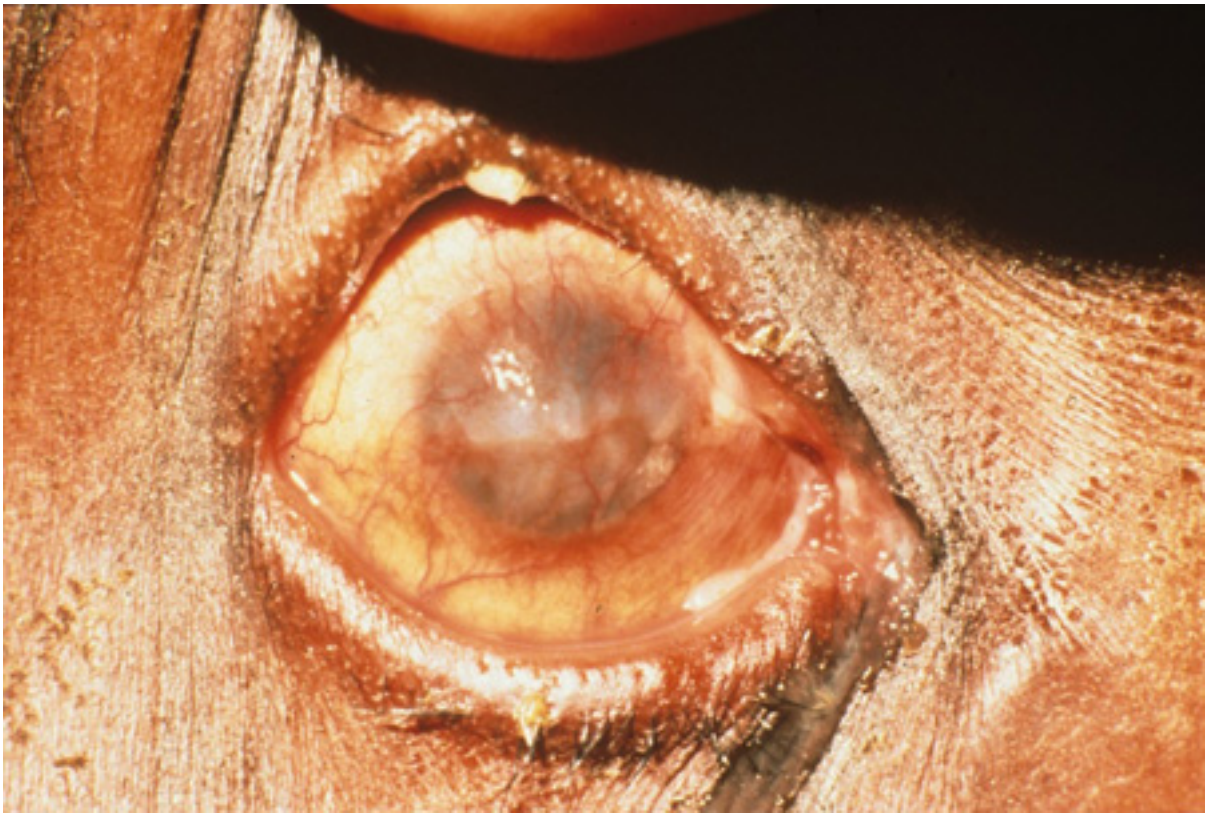

Figure 5: Corneal opacity due to trachoma

From the collection of Dr Hugh R. Taylor

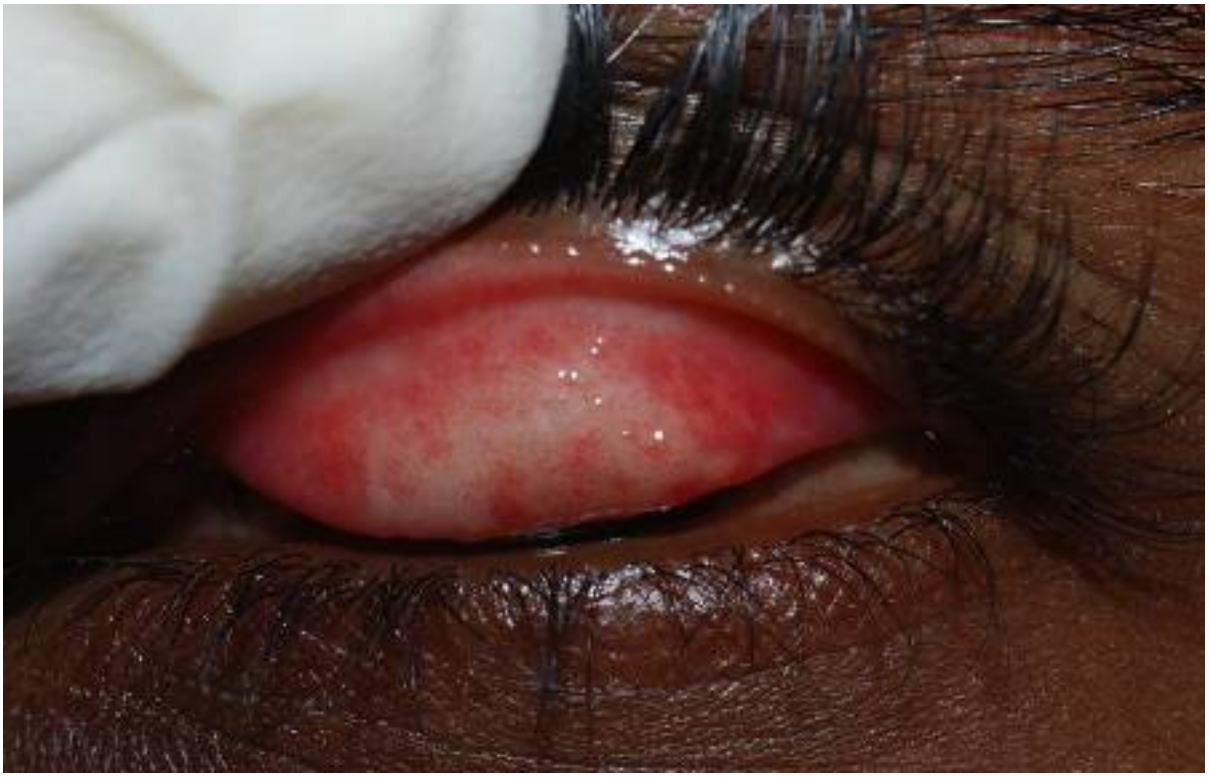

Figure 6: Eyelid eversion demonstrating intense inflammation of the upper tarsal conjunctiva

From the collection of Dr Hugh R. Taylor

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BMJ accepts no responsibility for misinterpretation of numbers which comply with this stated numerical separator standard.

This approach is in line with the guidance of the International Bureau of Weights and Measures Service.

Figure 1 – BMJ Best Practice Numeral Style

5-digit numerals: 10,000

4-digit numerals: 1000

numerals < 1: 0.25

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