PRACTICE POINTER

Approach to conjunctivitis in newborns

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What you need to know

• Consider neonatal conjunctivitis in all infants presenting with eye discharge within the first 4 weeks of life
• Carefully examine the conjunctiva: if red, refer to hospital eye services for same day review
• Investigations and treatment for suspected neonatal conjunctivitis in primary care are not necessary and may interfere with subsequent microbiology sampling
• Eye discharge with normal conjunctiva is likely due to congenital nasolacrimal duct obstruction

A 1 week old infant was brought to his general practitioner with red eyes and mild bilateral purulent discharge. The infant was born at term and had a spontaneous vaginal delivery with no complications. On examination, yellow discharge was noted with mild conjunctivitis of both eyes. The infant’s parents are concerned about the redness of the eyes. How should this patient be managed?

What is ophthalmia neonatorum?

Ophthalmia neonatorum, also known as neonatal conjunctivitis, describes conjunctivitis occurring within the first 28 days of life.1 It is chemical or infectious in origin, with infections usually contracted from the birth canal of infected mothers during delivery, or from postnatal caregivers. In 2011, analysis of hospital episode statistics from NHS hospitals in England revealed an incidence of 257 hospitalisations per 100 000 live births due to this condition.2 Untreated infections can cause permanent sight loss and can rapidly disseminate, causing considerable morbidity and even mortality.3 Not all neonatal eye discharge is due to conjunctivitis, however, with congenital nasolacrimal duct obstruction being a common and benign cause of sticky eyes in newborns.4 Distinguishing these conditions when babies present to primary care services helps avoid unnecessary referrals to secondary care and undue distress for new parents.

What causes it?

Infectious causes

Microorganisms responsible for causing infective conjunctivitis are commonly transferred to the baby during vaginal delivery. The American Academy of Pediatrics Committee on Infectious Diseases periodically publishes epidemiological data on neonatal conjunctivitis in the US, the last report being published in 2018.3 This identified Chlamydia trachomatis as the most common infective organism, responsible for 2-40% of cases of neonatal conjunctivitis (see table 1). Other microorganisms transmitted peri-partum include Neisseria gonorrhoeae and herpes simplex virus (HSV), each causing <1% of cases.

<table>
<thead>
<tr>
<th>Aetiology</th>
<th>Proportion of cases</th>
<th>Incubation period</th>
<th>Severity of conjunctivitis</th>
<th>Associations and complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlamydia trachomatis</td>
<td>2-40%</td>
<td>5-12 days</td>
<td>Moderate</td>
<td>Pneumonitis</td>
</tr>
<tr>
<td>Neisseria gonorrhoeae</td>
<td>&lt;1%</td>
<td>2-5 days</td>
<td>Severe</td>
<td>Disseminated infection, meningitis, sepsis</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>&lt;1%</td>
<td>Variable</td>
<td>Severe</td>
<td>Disseminated infection, meningitis, sepsis</td>
</tr>
<tr>
<td>Herpes simplex virus</td>
<td>&lt;1%</td>
<td>6-14 days</td>
<td>Moderate</td>
<td>Skin lesions, keratitis, encephalitis, disseminated infection</td>
</tr>
<tr>
<td>Other bacteria</td>
<td>30-50%</td>
<td>Variable</td>
<td>Mild</td>
<td>Variable</td>
</tr>
<tr>
<td>Chemical</td>
<td>Variable</td>
<td>24 hours</td>
<td>Mild</td>
<td>None</td>
</tr>
</tbody>
</table>

Neonates can also acquire infections postnatally from caregivers colonised with Staphylococcus aureus, Haemophilus influenzae, Streptococcus pneumoniae, Moraxella catarrhalis, and other Gram-negative bacteria.2 Combined, these make up the majority of culture-positive cases (30-50%). Pseudomonas aeruginosa may also be contracted postnatally and is now more common than gonococcal neonatal conjunctivitis.3 A substantial proportion of infective neonatal conjunctivitis is culture negative, however. A recent retrospective review of neonatal conjunctivitis cases over a five year period in southwest China found that only 46% of eye swabs yielded a positive result.5
Failure to achieve a positive culture is often due to antibiotic treatment before microbiology sampling, inadequate sampling, or contamination of samples with normal skin flora. Therefore, neonatal conjunctivitis remains a clinical diagnosis based on presenting features, with laboratory confirmation being a welcome adjunct.

Chemical causes
Chemical conjunctivitis typically occurs after the use of topical prophylactic agents, which many countries routinely apply to all babies shortly after birth to minimise the risk of infectious neonatal conjunctivitis. Silver nitrate solution was introduced as a prophylactic agent in 1880, leading to a dramatic reduction in blindness caused by gonococcal neonatal conjunctivitis in Europe and around the world. In 1975, however, a large cohort study across 100 maternity departments in Maryland, USA, identified a 90% incidence of chemical conjunctivitis in the first hours of life, which added to the growing body of evidence of this complication. Prophylaxis was subsequently abandoned in many countries in the 1980s or switched to topical antibiotics or povidone-iodine. Despite the withdrawal of silver nitrate solution from general use, chemical conjunctivitis remains an issue in countries that continue routine prophylaxis. In a 2002 survey of maternity units in Austria, 37/98 reported that chemical conjunctivitis is still observed, most commonly after the use of erythromycin eye ointment. Given the prevalence of this complication, the debate surrounding the use of topical prophylactic agents is ongoing.

How does a newborn with conjunctivitis present?
All cases of neonatal conjunctivitis present with discharge, conjunctival redness, and lid swelling, but the severity and timing of these features vary according to the aetiology. The examination of an infant with any of these signs should include visualisation of the lids, cornea, and tarsal and bulbar conjunctiva under direct illumination (Box 1). Instillation of fluorescein drops by the primary care practitioner is not necessary. If the conjunctiva is red and inflamed, infection can be assumed. This approach is supported by the National Institute for Health and Care Excellence (NICE).
Neisseria gonorrhoeae is a highly virulent organism that causes a more acute presentation. The newborn develops profound conjunctival redness and swelling, severe lid oedema, and purulent discharge (Fig 2). This is usually bilateral, typically occurring 2-5 days after birth, although it can occur later. Neonatal conjunctivitis caused by Pseudomonas aeruginosa has a similarly severe presentation that tends to affect preterm infants requiring treatment in neonatal intensive care.
Conjunctivitis caused by HSV typically presents 6-14 days after birth with moderate conjunctival redness and serosanguinous discharge (fig 3). The presence of characteristic vesicular skin lesions on the eyelid margins or a typical dendritic corneal ulcer following administration of fluorescein drops, support the diagnosis. However, these are often not evident at presentation.
Fig 3 | Conjunctivitis caused by herpes simplex virus, showing a corneal dendrite contiguous with a geographic ulcer centrally and temporally. Note the moderate conjunctival redness and serosanguinous discharge

Neonatal conjunctivitis caused by the skin, respiratory, or gastrointestinal tract bacteria of caregivers can occur at any time. Conjunctival redness is usually mild and associated with a moderate amount of purulent discharge (fig 4).
Chemical conjunctivitis occurs within the first 24 hours of life, after application of a topical prophylactic agent. The redness and discharge are mild and spontaneously resolve without treatment and with removal of the prophylactic agent.

What can happen if the condition is missed?

Depending on the causative organism, neonatal conjunctivitis can either resolve without complication or lead to permanent sight loss, disability, and even death. Topical antibiotic treatment alone is usually sufficient to treat simple infections contracted from postnatal caregivers, but infections contracted peri-partum require urgent systemic treatment to avoid complications.

If left untreated, chlamydial conjunctivitis can cause conjunctival scarring and corneal vascularisation, resulting in permanent vision loss. During delivery, *Chlamydia trachomatis* can also colonise the respiratory tract. This causes pneumonia 1-3 months after birth, which in 50% of cases may be preceded by conjunctivitis. The consequences of untreated *Neisseria gonorrhoeae* or *Pseudomonas aeruginosa* conjunctivitis are more serious; they include blindness and death. This is due to their ability to penetrate an intact corneal epithelium, rapidly causing corneal perforation, infection within the eye (endophthalmitis), and ultimately disseminated disease with meningitis and septicaemia.

Herpetic disease limited to the eyes, skin, or mucous membranes accounts for 45% of neonatal HSV infection. Disease can also involve the central nervous system (CNS) causing encephalitis or be disseminated at presentation. A large phase 2 trial investigating the safety and efficacy of high dose intravenous aciclovir in the treatment of neonatal HSV disease found that, even with the highest dose, CNS disease had a 4% mortality and 69% disability rate one year after disease onset. Disseminated disease caused death in 29% of cases.

When to refer a newborn with a sticky eye?

The role of primary care practitioners is to distinguish infective from non-infective causes of “sticky eye” in neonates, and refer all cases with suspected infection for same-day review by an ophthalmologist in secondary care. The distinction between infective and non-infective sticky eyes is made by identifying red conjunctiva, suggesting infection. NICE recommends urgent referral to ophthalmology for all cases of “sticky eye with redness in a neonate.” Commencing empirical treatment in the community is not advised and may interfere with subsequent microbiological sampling.

Sticky eye in newborns is a common presentation in primary care because of the prevalence of congenital nasolacrimal duct obstruction (fig 5). A large cohort study of all children born over a 10 year period in Olmsted County, Minnesota, USA, reported a
prevalence of 11.3%. This common and benign cause of sticky eyes in newborns requires no intervention unless it persists beyond 1 year of age. An exception is when acute dacryocystitis develops as a complication, manifesting as an inflamed palpable mass over the lacrimal sac area, as this requires urgent referral to secondary care.

What happens after referral?

Following referral, the infant is assessed, swabs are taken for microbiological testing, and empirical treatment is commenced. Assessment of the infant involves a detailed history, specifically including any previously treated sexually transmitted infections in the mother. A careful ocular examination is completed using a lid speculum, fluorescein staining, pupil dilation, and funduscropy.

Empirical treatment is started based on the clinical presentation. In cases of mild to moderate conjunctivitis with no history of maternal infection, lid hygiene and a broad spectrum topical antibiotic are commenced until microbiology results are available. Manage infants on an outpatient basis with regular review in the eye clinic to ensure adequate response to treatment.

If chlamydial infection is confirmed, treat infants with oral antibiotics according to local policies and monitor regularly for signs of respiratory illness. Severe cases with corneal involvement suggestive of gonococcal or pseudomonas infection are evaluated for disseminated disease and admitted for systemic treatment. If either Chlamydia or Gonorrhoea is confirmed, both the mother and partner require culture, treatment, and contact tracing.

Infants with features suggestive of herpetic infection are carefully evaluated for CNS involvement and disseminated disease. Even if disease is localised to the eye, admit the infant for high dose intravenous aciclovir treatment and careful monitoring.

Infants with gonococcal, pseudomonas or HSV infection are treated on an inpatient basis until adequate response to treatment has been observed. On discharge, they will be followed up regularly in the eye clinic until complete resolution. There is no need for follow-up with the primary care practitioner.

Case outcome

The infant was referred to the ophthalmologist on the same day. A diagnosis of neonatal conjunctivitis was made, and the infant started on empirical antibiotics. A swab of the eye discharge was taken, and the patient was followed up in the outpatient eye clinic.
How patients were involved in the creation of this article

Two parents whose child experienced sticky eyes in their newborn contributed to this article. They reviewed the manuscript and provided opinions and comments. They suggested discussing what happens after referral to secondary care, to aid primary care givers in preparing parents of a child needing urgent referral. This section was included following their input and we are grateful for their contribution.

Education into practice

• How can you share tips on how to examine the conjunctivae of a newborn with colleagues?
• Are you familiar with local pathways for arranging same-day ophthalmology review?
• How would you explain to parents the difference between nasolacrimal duct obstruction and conjunctivitis?

Contributors: GSLM conceived the article and is guarantor. All authors wrote and reviewed the article, created the boxes, and helped with the figures. GSLM was the contact for patient involvement. The authors thank Briony and James Davies who contributed to the article with valuable suggestions.

Competing interests: We have read and understood BMJ policy on declaration of interests and have no relevant interests to declare.

Provenance and peer review: Commissioned; externally peer reviewed.

Patient consent: Obtained.

8 Nishiha H, Risenbarg, HM. Silver nitrate ophthalmic solution and chemical conjunctivitis. Pediatrics 1975;56:368-73. DOI: 10.1542/peds.56.3.368