

Infections in the lacrimal drainage system —

Symptoms, clinical signs, & treatment

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First submitted: December 18, 2023
Revision accepted: September 26, 2024

Revision submitted: September 24, 2024
Published: Winter 2024

Peer reviewed

Introduction

Some infections in the lacrimal drainage system are easy to diagnose and treat. In others, while the diagnosis may be obvious, the best course of treatment may not be. Finally, some infections are initially missed, but once diagnosed are extremely quick and simple to treat. This article will describe the symptoms, clinical signs, and treatments for infantile dacryocystitis, dacryocystitis in adults, and canaliculitis. The recommendations given are in accordance with the newly published Swedish National guidelines for acquired epiphora and infections in the lacrimal drainage system in adults, and the Swedish National guidelines for congenital lacrimal drainage diseases.^{1,2} However, alternative recommendations may exist in other Nordic countries. All patients or parents of patients depicted have given their consent to publication.

Infantile Dacryocystitis

The definition of infantile dacryocystitis is an acute infection in the lacrimal sac in an infant with a congenital nasolacrimal duct obstruction.³ Dacryocystitis may occur in children due to acquired lacrimal drainage obstructions, such as posttraumatic obstruction or a foreign body; however, this is extremely rare and is not termed *infantile* dacryocystitis.^{2,3} Congenital nasolacrimal duct obstructions are common, especially in premature infants. In a study from 2019, including almost 18,000 newborns, the prevalence was 11%.⁴ Dacryocystocele is the number one predisposing factor for infantile dacryocystitis and occurs in 0.1-0.3% of all newborns with a congenital nasolacrimal duct obstruction. Of these, it is estimated that 11-85% develop an acute infection.⁵⁻⁸ The most common pathogen in infantile dacryocystitis is *Staphylococcus aureus*, followed by *Streptococcus pneumoniae*.⁹

In infantile dacryocystitis, the lacrimal

sac is distended and can be palpated below the medial canthal ligament (**Figure 1**). The surrounding tissues are swollen, erythematous, warm, and tender and the child is usually irritable and may not feed well (**Figure 1**).³ There may or may not be mucopurulent reflux when pressure is applied to the sac. Parents may not always notice epiphora prior to the onset of dacryocystitis.³ Preseptal cellulitis is a common complication of infantile dacryocystitis. Infants have relatively thin bony walls surrounding the orbit, lacrimal drainage system, and ethmoidal sinuses, in combination with an immature immune system; consequently, orbital cellulitis, meningitis, orbital and intracranial abscesses, and sepsis have all been described as complications of dacryocystitis.^{3,9}



Figure 1. Infantile dacryocystitis with edema beyond the lacrimal sac, erythema, and increased skin temperature in the affected area. Published with the patient's permission.

The difference between a non-infected dacryocystocele and a dacryocystitis is that in a dacryocystocele, the signs of acute infection are lacking and only a bluish distention of the lacrimal sac is seen (**Figure 2**).² In older children, the most common diagnosis is sinus infection with an orbital subperiosteal abscess or orbital cellulitis, and this should be the first suspect in children older than a couple of years without a history of epiphora since infancy.^{10,11} Preseptal cellulitis of other origin, such as a

skin wound or hordeolum, should also be considered.

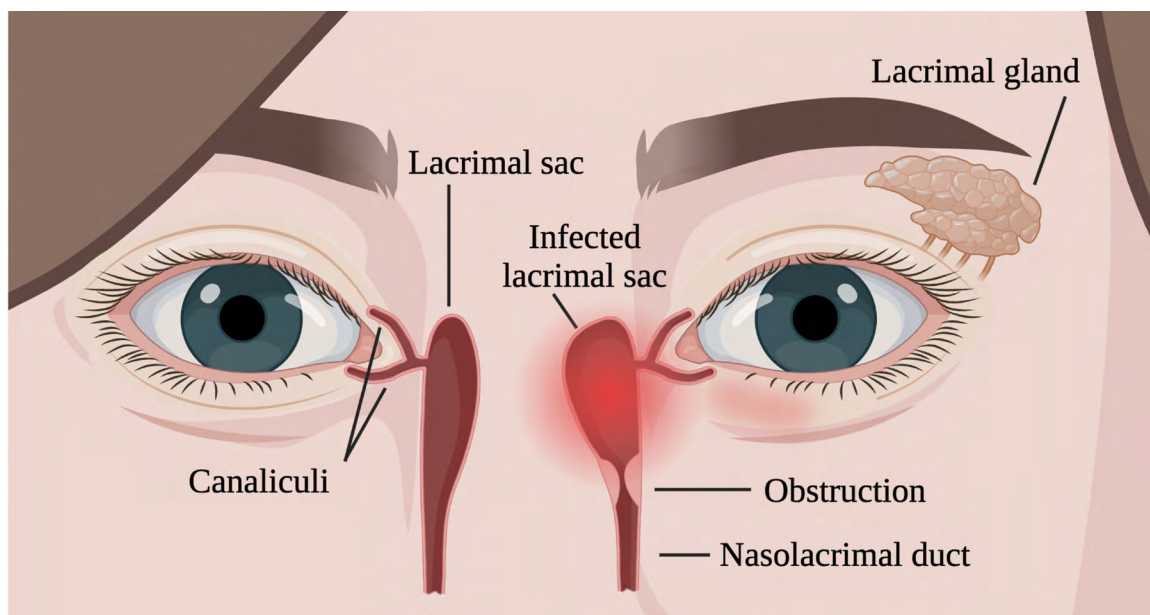
When taking the history and performing the clinical examination, it is important to establish the spread of the infection and the infant's general condition to determine whether the patient requires hospitalization or could be managed as an outpatient. Cultures are recommended for mucopurulent reflux.² Radiologic imaging is not routinely performed if there is no suspicion of complications.^{2,9}

In the case of a non-infected dacryocystocele, watchful waiting may be adopted for a couple of weeks in infants with no breathing or feeding problems (which may be caused by intranasal cysts, often found in a dacryocystocele).^{2,5} However, the parents should be informed to alert the treating physician at the earliest sign of infection. Infantile dacryocystitis requires systemic antibiotic treatment. If the infant has no problems feeding and is in good general condition, oral treatment with suspension flucloxacillin (15 mg/kg x 3) or a clindamycin mixture (7 mg/kg x 3) can be prescribed; the child should be seen every other day to monitor clinical status.² If there is a spread of the infection, worsening of the general condition, or doubts that the child can ingest the antibiotic mixture, hospitalization and intravenous antibiotic



Figure 2. Non-infected dacryocystocele with a non-tender distended lacrimal sac. Published with the patient's permission.

Figure 3. Anatomy of the lacrimal drainage system (left). Dacryocystitis in adults is often caused by a nasolacrimal duct obstruction (right). Created by Tanya Cross using BioRender.com.



treatment is advisable, preferably at a general pediatric clinic.² The benefit of early probing versus initial watchful waiting is debated in the literature, but the tradition in Sweden is to evaluate the effect of antibiotic treatment before initiating surgical intervention.^{2,3,5,9,12,13} If complications occur or there is no response to antibiotic treatment, surgery should be performed within days. Lacrimal probing in combination with endonasal endoscopy and marsupialization of any concurrent intranasal cysts has a high success rate in resolving the infection.^{3,9}

Dacryocystitis in adults

The causes of dacryocystitis in adults are different from those in children, and can present as a chronic or acute infection. Predisposing factors in adults are acquired nasolacrimal duct stenosis (**Figure 3**), most commonly primary acquired lacrimal duct obstruction (PANDO), dacryolith, or foreign bodies such as dislocated puntal plugs or remaining silicone stents.^{14,15} This prevents tear drainage from the lacrimal sac, leading to tears accumulating and becoming a breeding ground for bacteria.¹⁵ Gram-positive bacteria are the most common pathogens, especially *S. aureus* and *S. epidermidis*, but Gram-negative bacteria such as *Klebsiella spp.*, *E. Coli*, and *Hemophilus influenzae* may also be found.¹⁶ Gram-negative bacteria and unusual/virulent strains are more common in acute dacryocystitis, compared to the chronic variant.¹⁶

The symptoms of acute dacryocystitis are edema, erythema, and increased skin temperature over the medial canthal area. Sometimes dacryocystitis is complicated by preseptal cellulitis, and signs of infection

also involve the upper and lower eyelids (**Figure 4**). Very rarely, the infection spreads intraorbitally. In chronic dacryocystitis, only a distended lacrimal sac is found, without signs of infection; mucopurulent discharge may be regurgitated upon sac pressure. The diagnosis of dacryocystitis is often straightforward and the clinical examination should establish the spread of infection (i.e., is there a preseptal or orbital cellulitis?). However, irrigation of the lacrimal drainage system should be avoided in the acute variant, as it is painful and has little benefit. Irrigation in chronic



Figure 4. Acute dacryocystitis with preseptal spread. Note the distinct distended lacrimal sac and the erythema over the medial canthal area as well as the medial parts of the eyelids and upper part of the cheek. Published with the patient's permission.

dacryocystitis will yield mucopurulent reflux. No additional investigations are required if there is no suspicion of secondary lacrimal drainage obstruction causing the impaired drainage, such as a lacrimal sac tumor or granulomatosis with polyangiitis.

Acute dacryocystitis is treated with flucloxacillin (1 g x 3) for 10 days or, in case of penicillin allergy or therapy failure, clindamycin (300 mg x 3) for 10 days.¹ When complications include widespread preseptal cellulitis or suspicion of orbital spread, broad-spectrum or intravenous antibiotics can be considered. If the lacrimal

sac becomes so distended that the skin thins over the lacrimal sac and a white-yellowish area appears, surgical drainage and culture from the sac is advisable.¹ Dacryocystorhinostomy (DCR; **Figure 5**) is often performed after the acute infection has resolved, although endonasal DCR may be performed in the acute phase if necessary.¹⁷ This surgical procedure removes the anatomical prerequisites for infections in the lacrimal sac. For patients with first-time dacryocystitis and no troublesome epiphora there is an option of wait and see, as the majority will not

experience a second acute dacryocystitis.¹⁸

In the case of chronic dacryocystitis, antibiotic treatment is not indicated, and surgical intervention with DCR is the treatment of choice.¹ However, sometimes dacryocystectomy may be considered, especially in older patients with troublesome chronic or recurrent acute dacryocystitis, or in patients in whom anticoagulant medication cannot be paused.¹ Probing and silicone stent intubation is not recommended in adult patients with dacryocystitis.

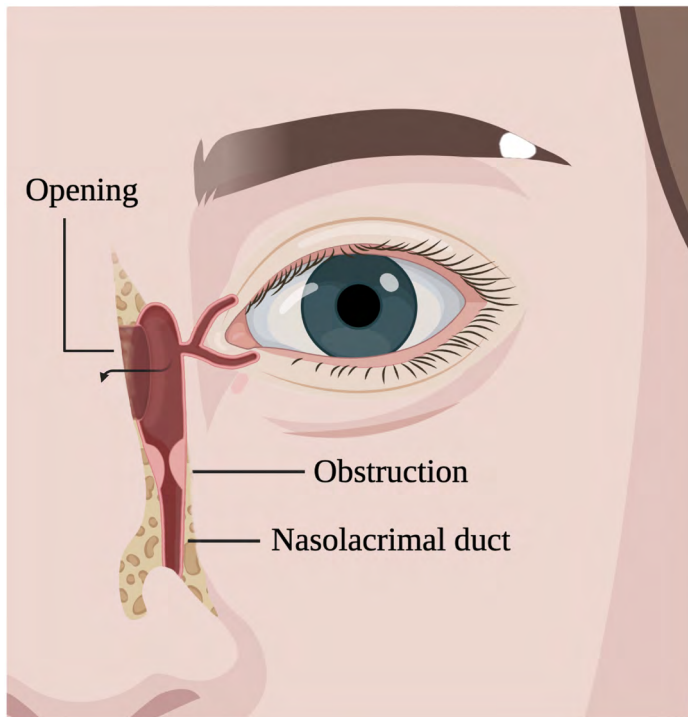


Figure 5. In dacryocystorhinostomy surgery, an anastomosis is created between the lacrimal sac and the middle meatus in the nose effectively bypassing the nasolacrimal duct obstruction. Created by Tanya Cross using BioRender.com.

Canaliculitis

The most elusive of the lacrimal drainage infections is canaliculitis. This diagnosis is often missed even by experienced ophthalmologists, and it is not unusual that the patient has received treatment for conjunctivitis for months before the correct diagnosis is made. The pathogen is often of the *Actinomyces* species, a facultative anaerobic species of Gram-negative bacteria that grows in a fungus-like pattern and creates concretions in the canaliculi which maintain the infection.^{19, 20} However, *Staphylococcal* species can also be found in cultures, and canaliculitis secondary to migrated punctal plugs is not unusual.¹⁹

Canaliculitis causes conjunctival injection and mucopurulent tears. The specific sign of canaliculitis is the swelling and erythema over one canaliculus, and often pus can be seen coming from the puncta (**Figure 6**). In canaliculitis there is no distention of the lacrimal sac.

The treatment of canaliculitis is very simple. After injection of local anesthetic, the canaliculus is opened with a pair of Westcott scissors, and concretions or migrated punctal plugs are extracted, preferably with a chalazion curette. Alternatively, a punctum-sparing incision can be made with an eleven-blade scalpel. Finally, the lacrimal system is irrigated to ensure patency. The canaliculus is left to secondary healing and there is no need for postoperative topical antibiotics.¹ The patient will notice improvement within a day or two, and does not usually have problems with postoperative epiphora despite the remaining slit in the canaliculus.

Summary

Infantile dacryocystitis needs close monitoring and systemic antibiotics due to the risk of spread of infection intraorbitally or intracranially. In adults, dacryocystitis is often an uncomplicated diagnosis to treat and DCR surgery has a very high success rate in preventing further infection. The most difficult aspect of canaliculitis is to remember to examine the canaliculi in patients with mucopurulent conjunctivitis; if it is present, the patient can be cured with a simple surgical procedure.



Figure 6. Canaliculitis in upper left canaliculus. Note the difference between the upper and lower canaliculi. Published with the patient's permission.

Key points:

- Dacryocystocele is the number one predisposing factor for infantile dacryocystitis.
- The infection in infantile dacryocystitis may spread intraorbitally or intracranially due to thin bony walls and an immature immune system.
- Antibiotic treatment is not indicated in chronic dacryocystitis.
- Dacryocystorhinostomy (DCR) removes the anatomical prerequisites for infections in the lacrimal sac.
- In mucopurulent conjunctivitis, look for signs of canaliculitis.

Conflict of interest

none

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