Lacrimal System Infections

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Dacryosystitis
Dacryocystitis

- Dacryocystitis is usually the result of lacrimal outflow obstruction and stasis of tears in the lacrimal sac.

- Outflow obstruction can be secondary to infection or anatomical anomalies.

- Infection of the lacrimal sac is usually bacterial and in only 1.2% of cases is a fungal organism the causative agent.
Dacryocystitis

• The lacrimal excretory system is prone to infection and inflammation for various reasons:

• This mucous membrane-lined tract is contiguous with 2 surfaces (conjunctival and nasal mucosal) that are normally colonized with bacteria.

• The functional purpose of the lacrimal excretory system is to drain tears from the eye into the nasal cavity. Stagnation of tears in a pathologically closed lacrimal drainage system can result in dacryocystitis.
Dacryocystitis

- Dacryocystitis can become a life-threatening infection with the potential to progress to orbital cellulitis and/or orbital abscess, meningitis, or cavernous sinus thrombosis.
Dacryocystitis has long been noted to occur more frequently on the left side than on the right side. In many instances, the nasolacrimal duct and lacrimal fossa formed a greater angle on the right side than on the left side.
• Acquired dacryocystitis can be acute or chronic. Acute dacryocystitis is heralded by the sudden onset of pain and redness in the medial canthal region. An insidious onset of epiphora is characteristic of chronic inflammation or infection of the lacrimal sac.
Dacryocystitis more common in:

- Individuals with skull anomalies (brachycephalic)
- This is because brachycephalic skulls demonstrate a narrower diameter of inlet into the nasolacrimal duct, the nasolacrimal duct is longer, and the lacrimal fossa is narrower
- Furthermore, patients with a flat nose and narrow face are at a higher risk for developing dacryocystitis, presumably because of the narrow osseous nasolacrimal canal.
• **Race:** Blacks rarely develop dacryocystitis because the nasolacrimal ostium into the nose is large. In addition, the lacrimal canal is shorter and straighter in blacks than in whites.

• **Sex:** In adults females are afflicted more commonly by dacryocystitis. Most studies demonstrate that 70-83% of cases of dacryocystitis occur in females. Congenital dacryocystitis occurs with equal frequency in both sexes.

• **Age:** Lacrimal sac infections and inflammations commonly occur in 2 discrete age categories, infants and adults older than 40 years. Acute dacryocystitis in newborns is rare, occurring in fewer than 1% of all newborns.
Causes

• In congenital dacryocystitis, incomplete canalization of the NLD. However, since the incidence of congenital dacryocystitis is much lower than the incidence of incomplete canalization, other factors than developmental ones appear to play a role in the pathogenesis.

• Both aerobic bacteria and anaerobic bacteria have been cultured from pediatric and adult patients with dacryocystitis. The most common organisms isolated from the lacrimal sacs of children with dacryocystitis include *Staphylococcus aureus*, *Haemophilus influenzae*, *beta-hemolytic streptococci*, and *pneumococci*. 
Causes

- Structural abnormalities of the midface also should be considered.
- Obstruction of the nasolacrimal duct by a tight inferior meatus has been noted in many infants.
- The etiology of dacryocystitis includes nasal disease and ectrodactyly-ectodermal dysplasia-clefting (EEC) syndrome
Causes

• In acquired dacryocystitis obstruction of the lower part of the nasolacrimal system frequently is present. Because of the intimate relationship of the nasolacrimal duct with the nose and paranasal sinuses, these structures are commonly associated as an etiologic factor in the pathogenesis of dacryocystitis.

• ethmoidal inflammation

• ocular origin

• impacted cilia

• Profuse secretion and stagnation of tears in the lacrimal sac, which may occur in uncorrected astigmatism and hypermetropia, may contribute to the development of dacryocystitis.
Nasal disease

- Sinusitis (maxillary, ethmoidal)
- Hypertrophic rhinitis
- Vasomotor rhinitis
- Syphilitic rhinitis
- Rhinitis ozaenosa
- Adenoids
- Eczema of nares
- Purulent rhinitis
- Nasal trauma
- Ethmoidal tumor
- Nasal tumor
- Atrophic rhinitis sicca
- Rhinitis fibrinosa
- Enlarged inferior turbinate
- Foreign body in the nose
- Septal deviation

- Frontal sinus neoplasm
- Nasal mucosal infection
- Diphtheria
- Measles
- Scarlatina
- Nasal septal abscess
- Ethmoidal mucocele
- Rhinolithiasis
- Bacterial: *Staphylococcus epidermidis* (most common), *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Pneumococcus*, *Propionibacterium acnes*, *Mycobacterium fortuitum*
- Tuberculosis, syphilis, trachoma

- Viral Infectious: *mononucleosis*
- Fungal - *Candida albicans*, *Aspergillus niger*
Fungal Dacryocystitis
• Silicone Punctal Plug Migration Resulting in Dacryocystitis and Canaliculitis
Lacrimal Tumors

- Acquired nasolacrimal duct obstruction and dacryocystitis may occasionally result from tumors of the nasolacrimal sac, inflammatory diseases such as Wegener granulomatosis and sarcoidosis.
- Mechanical causes such as compression of the excretory system from external tumors. Nasolacrimal Metastasis From Hepatocellular Carcinoma Masquerading as Dacryocystitis.
Dacryocystitis Forms

- Congenital dacryocystitis
- Acute dacryocystitis
- Chronic dacryocystitis
Congenital dacryocystitis

• is a very serious disease associated with significant morbidity and mortality. If not treated promptly and aggressively, newborn infants can experience orbital cellulitis (because the orbital septum is formed poorly in infants), brain abscess, meningitis, sepsis, and death.
Acute dacryocystitis

- sudden onset of pain, erythema, and edema overlying the lacrimal sac region.
- It is not uncommon for the sac to rupture and fistulize through the skin; this fistula commonly closes after a few days of drainage
- Conjunctival injection and preseptal cellulitis often occur in conjunction with acute dacryocystitis
- More serious sequelae of acute dacryocystitis include extension into the orbit with formation of an abscess and development of orbital cellulitis
chronic dacryocystitis

- Tearing is the most common presentation
- Mattering:
  A) This is caused by the obstruction of drainage of the mucous layer of the tear film with collection of debris and denuded epithelial cells from the surface of the eye.
  B) Frequently, it may be associated with conjunctivitis. This is attributed to the toxic nature of the debris to the surface of the eye or because of exotoxins produced by staphylococcal organisms
The conventional treatment of acute dacryocystitis with abscess formation includes the use of warm compresses, systemic antibiotics, percutaneous drainage of the abscess, and external dacryocystorhinostomy (DCR) following resolution of the acute infection.

Primary acute endonasal DCR offers potential advantages over standard treatment with rapid improvement in pain, earlier resolution of infection, and the economic benefits of reduced patient length of stay without the need for later readmission for external or indeed endonasal D.
Physical Signs

- Fever results from a fulminant bacterial or fungal infection in the lacrimal sac, which spreads to the surrounding tissues.
- Leukocytosis also is common in acute dacryocystitis.
- Cellulitis
- Altered visual acuity
- Conjunctivitis frequently is associated with acute and chronic dacryocystitis
- Medial canthal fullness and tenderness are common in both acute dacryocystitis and chronic dacryocystitis
Cellulitis

- Cellulitis is seen predominately in acute dacryocystitis
- Orbital cellulitis: This is a rare, but serious, complication of dacryocystitis. It is associated most commonly with acute dacryocystitis and congenital acute dacryocystitis
• Decreased visual acuity: the increased tear film on the surface of the eye.

• Periorbital edema: the inflammation associated with the buildup of toxic debris on the surface of the eye and exotoxins secreted by staphylococcal organisms living on the surface of the eye.
Lab Studies

- In most patients, physicians make a clinical diagnosis of dacryocystitis
- Supportive laboratory analysis
- Blood cultures and cultures of the ocular surface, nose, and lacrimal sac discharge may prove useful in determining the appropriate antibiotic therapy
- Antineutrophil cytoplasmic antibody testing may be useful in ruling out Wegener granulomatosis
- Antinuclear antibody (ANA) testing may be useful in the very rare cases of dacryocystitis caused by lupus
Imaging Studies

• Plain films: facial skeletal anomalies or foreign bodies, posttraumatic etiologies
• CT scans: an occult malignancy or mass, post-traumatic causes
• MRIs are not as useful as CT scans but can be helpful in differentiating cystic lesions from solid mass lesions. MRIs can be useful in identifying patients with lacrimal sac diverticuli,
Dacryocystography (DCG) & Dacryoscintigraphy

- are useful adjunctive diagnostic modalities when anatomical abnormalities of the nasolacrimal drainage system are suspected.
- Subtraction DCG with CT scan is also very sensitive to study the anatomy of the lacrimal sac and surrounding structures.
- Functional tests
The bacteriology of dacryocystitis

- The bacteriology of dacryocystitis mimics normal conjunctival flora in most instances.
- The most common aerobic organisms isolated from the lacrimal sacs in adults: *S. epidermidis*, *S. aureus*, and *Streptococcus, Pseudomonas, and Pneumococcus* species. *S. epidermidis* is the most common isolate followed by *S. aureus*.
- The most common anaerobic organisms: *Peptostreptococcus, Propionibacterium, Prevotella, and Fusobacterium* species.
- Gram-negative bacteria: in patients with copious discharge. The most common: *E. coli*.
- Rarely, fungi have been isolated from infected lacrimal sacs (commonly associated with dacryolith formation).
The Microbiologic Spectrum of Dacryocystitis (Acute Versus Chronic Infection)

- The Microbiologic Spectrum of Dacryocystitis: A National Study of Acute Versus Chronic Infection
- Gram-positive organisms were much more common than Gram-negative organisms overall, and the proportions did not differ significantly between the groups. *Staphylococcus* was the most common isolate in both groups, but there was a greater frequency of methicillin-resistant *Staphylococcus aureus* (MRSA) isolates in the acute group. The results of this study have important implications for the treatment of dacryocystitis.
A total of 180 strains were isolated from the 85 bacterial samples, including 150 strains of aerobic bacteria and 30 strains of anaerobic bacteria. Fungi were found in eight samples and actinomyces in three samples. The bacterial species that were most frequently found were Staphylococcus species, representing 34.5% of all strains, followed by Corynebacterium diphtheroides (15.5%).

Gram positive cocci was the predominant pathogen of chronic dacryocystitis. Levo-ofloxacin and amikacin had the best effect in vitro.
changing trends within the microbiologic spectrum

• Recent articles, however, have suggested the possibility of changing trends within the microbiologic spectrum of dacryocystitis. Specifically, an increased frequency of Gram-negative and MRSA infections has been suggested.

• Cephalosporins and amoxicillin/clavulanic acid combined (Augmentin) accounted for more than 75% of the initial systemic antibiotics chosen. The majority of cases (86.4%) treated with systemic antibiotics (empiric and secondary culture-guided) showed clinical improvement.

• The clinical suspicion for MRSA infection may certainly be increased in cases resistant to empiric antibiotic therapy.
Dacryolith formation

- in 14-16% of patients
- Patients with a history of acute dacryocystitis have a higher incidence of dacryolith formation than those with chronic dacryocystitis.
Management (Acute dacryocystitis)

- The treatment of dacryocystitis depends upon the clinical manifestations of the disease: with or without preseptal cellulitis and orbital cellulitis.

- The conventional treatment of acute dacryocystitis with abscess formation includes the use of warm compresses, systemic antibiotics, percutaneous drainage of the abscess, and external dacryocystorhinostomy (DCR) following resolution of the acute infection.
Medical Care
(Acute dacryocystitis)

- Treatment with warm compresses may aid in resolution of the disease
- Cephlosporine and amoxicillin. In penicillin allergic patients: clindamycin, ciprofloxacin and azithromycin
- Hospitalization with intravenous (IV) antibiotics.
- IV empiric antimicrobial therapy for penicillin-resistant *Staphylococcus* (nafcillin or cloxacillin) should be initiated immediately
- Blood cultures and cultures of the lacrimal secretions should be obtained prior to antibiotic therapy.
- Impending perforation should be treated with a stab incision of the skin
Endoscopic DCR in acute dacryocystitis

- Primary acute endonasal DCR offers potential advantages over standard treatment with rapid improvement in pain, earlier resolution of infection, and the economic benefits of reduced patient length of stay without the need for later readmission for external or indeed endonasal
Chronic Dacryocystitis

- oral antibiotics
- The treatment of choice is a dacryocystorhinostomy whether the patient is symptomatic or not. Probing should not be performed because mucoceles often are not sterile and probing may incite a cellulitis.
- Patients with chronic dacryocystitis caused by a partial or intermittent nasolacrimal duct obstruction may benefit from topical steroid drop treatment.
Congenital Chronic Dacryocystitis

- Congenital chronic dacryocystitis may resolve with lacrimal sac massage, warm compresses, and topical and/or oral antibiotics.
**Surgical Care**

- In general, dacryocystitis is a surgical disease. Surgical success rates in the treatment of dacryocystitis are approximately 95%.
- If caused by allergic rhinitis or mild mucosal inflammation of the nasolacrimal duct mucosa, chronic dacryocystitis may improve with topical steroid drops.
- Occasionally, infracturing of the inferior turbinate bone, submucous resection of the turbinate, and/or lacrimal outflow probing may be successful treatment of dacryocystitis.
Fistulae and Diverticula

- Congenital lacrimal system anomalies other than nasolacrimal duct obstruction are uncommon.

- Fistulae and diverticula can originate from the canaliculus, lacrimal sac, or the duct

- Both patients presented in adulthood and both had a history of recurrent presumed acute dacryocystitis without epiphora

- Congenital lacrimal drainage system anomalies should be considered in the diagnosis of recurrent dacryocystitis in cases where the lacrimal system appears patent. The infection can involve a fistula or diverticulum.

- Recommended treatment is excision of the outpouching with closure of its connection to the lacrimal system and dacryocystorhinostomy may be considered if nasolacrimal duct obstruction is present.
Medical/Legal Pitfalls

- Failure to recognize associated conditions, such as Wegener granulomatosis, lymphoma, basal cell carcinoma, melanoma, and foreign bodies.
- Failure to recognize signs and symptoms of dacryocystitis.
- Endophthalmitis after intraocular surgery due to unrecognized dacryocystitis.
Canaliculitis

- Challenge for patients and clinicians
- Caused by variety of bacteria, viruses and mycotic organism (Actinomyces israeli, Propionibacterium propionicus, and yeasts)
- Pain and swelling in the medial canthal region
- Persistent weeping, accompanied by follicular conjunctivitis
• The punctum is dilated or pouting and canaliculai and punctum are erythematus
• Thick granular discharge is often expressed from the punctum
• Dacryoliths often accompany inflammation in the region
• Canaliculitis tends to exhibit a female predominance
**Actinomyces sp**

- is an anaerobic Gram-positive bacillus present in normal flora of mucous membranes. It is the most common organism associated with canaliculitis.

- *Actinomyces sp.* has also been reported in association with concretions of the nasolacrimal system.
Dacryoliths
Treatment

- Difficult to eradicate
- Culture should be obtained
- Conservative management: warm compress, digital massage and topical antibiotics
- Symptoms can persist despite treatment with antibiotics until therapeutic treatment with canliculotomy and curettage.
- Recurrence after adequate treatment is rare
- Evaluation of obstruction before canliculotomy to prevent recurrence
• A case of chronic *Actinomyces* canalicularitis with associated pyogenic granuloma formation and bloody tears