Dacryocystitis

Introduction

The lacrimal excretory system drains tears from the eye into the nasal cavity. When the lacrimal drainage system gets closed, stagnation of tears occurs leading to dacryocystitis. The lacrimal excretory system is prone to infection and inflammation as this mucous membrane-lined tract is contiguous with 2 surfaces (conjunctival and nasal mucosal) that are normally colonized with bacteria.

Dacryocystitis can be acute or chronic. Acute dacryocystitis is characterized 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.

Pathophysiology

Dacryocystitis is more common on the left side than on the right side. It is possibly because the nasolacrimal duct and the lacrimal fossa form a greater angle on the right side than on the left side. The ectoderm in the region of the naso optic fissure becomes embedded in the mesenchyme between the lateral nasal and maxillary processes. This subsequently canalizes and opens into the conjunctival fornix prior to the opening of the nasal vestibule. Occasionally this opening into the nasal cavity is incomplete at birth. This leads to congenital nasolacrimal duct block. Canalization of the lacrimal excretory system begins in the superior portion first and is segmental, later coalescing to form a continuous lumen. A fold of mucosa called the valve of Rosenmuller marks the junction of the lacrimal sac and the common canaliculus. The valve of Hasner is located at the junction of the duct with the nasal mucosa.

Individuals with brachycephalic heads have a higher incidence of dacryocystitis than dolicocephalic or mesocephalic skulls. This is because brachycephalic skulls have 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 canal.

Morbidity

Acute dacryocystitis, can cause a lacrimal sac abscess and spread of infection. This is a serious condition. Chronic dacryocystitis causes predominantly chronic tearing and watering and is rarely associated with severe morbidity. Congenital dacryocystitis if not treated promptly can become severe enough to cause orbital cellulitis, brain abscess, meningitis, sepsis and death. When it is associated with an amniontocoele, it may cause airway obstruction. However, most cases are indolent and cause watering and matting of the lashes.

Age and Sex predilection

Congenital dacryocystitis affects both sexes equally. In adults, females are more commonly affected by dacryocystitis. Infections usually occur in two age groups- infants and older adults more than 40 years of age. In the adult group, it predominantly affects the females and peaks at the age of 60-70 years.

Clinical presentation

Acute dacryocystitis is manifested by sudden onset of pain, erythema and edema in the lacrimal sac region. There is tenderness in the medial canthal region with epiphora. Patients usually manifest fever. The sac may rupture and fistulize through the skin, this closes a few days after drainage. Conjunctival congestion and preseptal cellulitis often occur in conjunction with acute dacryocystitis. Serious sequelae include extension into the orbit with formation of an abscess and orbital cellulitis. Cellulitis occurs due to rupture of the wall of the lacrimal sac into the surrounding soft tissue. This presents as an inflamed painful eye with restricted motility, abnormal pupils and decreased visual acuity. When this occurs this leads to blindness and rarely if untreated cavernous sinus thrombosis and death.

Chronic dacryocystitis presents with tearing due to obstructed flow of tears and mattering due to collection of debris and epithelial cells. This may be associated with conjunctivitis due to staphylococcal toxins. Visual acuity is altered due to an abnormal tear film or corneal surface irregularities resulting from chronic inflammation. Medial canthal fullness may be present due to distension of the lacrimal sac and resultant infection of the lacrimal sac.

Congenital dacryocystitis commonly presents with watering, matting of the lashes and conjunctivitis.

Causes

In congenital dacryocystitis, incomplete canalization of the nasolacrimal duct at the valve of Hasner is the cause in most cases along with neonatal infection. The most common organisms isolated from the lacrimal sac of children include Staphylococcus aureus, Hemophilus influenzae, beta hemolytic Streptococci. Methicillin resistant Staphylococcus
 aureus is more common in patients with acute dacryocystitis than chronic dacryocystitis. Nasal pathology including a tight inferior meatus, hypertrophied inferior turbinate, deviated nasal septum, nasal polyp and allergic rhinitis can predispose to dacryocystitis. Structural abnormalities of the midface should also be considered as a potential cause.

In addition nasal disease like sinusitis, hypertrophic rhinitis, nasal tumors, ethmoidal tumors, enlarged turbinate, septal deviation can predispose to dacryocystitis. The ectodactyly-ectodermal dysplasia-clefting (EEC) syndrome can also predispose to dacryocystitis. An ocular origin for the lacrimal sac infection is uncommon. Ethmoid air cells on the other hand are closely associated with the lacrimal sac and are more commonly a source of infection.

The most common aerobic organisms isolated in cases of dacryocystitis include S epidermidis, S aureus, Streptococcus and Pneumococcus. The most common anaerobic organisms include Peptostreptococcus, Propionibacterium and Prevotella. Gram negative bacteria commonly isolated include E coli and infection is characterized by copious discharge.

Dacryolith formation can occur in nearly 15 % of patients with dacryocystitis and is more common in patients with acute dacryocystitis. When a tumor is present in the lacrimal sac, it is most commonly epithelial. Males are more predisposed to epithelial tumors. The most common non epithelial tumor is lymphoma.

**Differential diagnosis**

The common differentials include preseptal cellulitis, orbital cellulitis, chalazion, conjunctivitis, episcleritis and rarely basal cell carcinoma of the lid and squamous cell carcinoma. Differentiation is based on a thorough history and examination.

**Investigations**

The diagnosis is clinical in most cases. Blood counts may reveal leucocytosis in cases of acute infection. Anti neutrophilic cytoplasmic antibody testing may be useful to rule out Wegeners granulomatosis. Imaging is rarely needed. In most cases it may reveal enlargement of the sac or foreign bodies or masses. Post traumatic cases or cases suspected of harbouring an occult malignancy or mass need to be evaluated by a CT scan. MRI scan is useful in identifying patients with lacrimal sac diverticuli. Dacryocystography and dacryoscintigraphy are useful to detect anatomical abnormalities. Subtraction DCG with a CT scan is also useful in understanding anatomical features of the lacrimal sac and surrounding structures. The fluorescein dye disappearance test is useful in the clinic especially in those who cannot be syringed in the clinic. Prolonged retention of the dye usually more than 3-5 minutes indicates delayed drainage. The Jones test is useful to differentiate a functional block from an anatomical block. Nasal endoscopy is useful to rule out hypertrophy of the inferior turbinate, septal deviation and inferior meatal narrowing.

**Management**

**Medical**

Acute dacryocystitis needs treatment with systemic antibiotics. If there is associated orbital cellulitis hospitalization is necessary. A broad spectrum antibiotic which can be used for penicillin resistant staphylococcus like Cloxacillin can be initiated intravenously in case of orbital cellulitis. For an abscess with impending drainage a stab incision on the skin can be performed. Surgical exploration and drainage should be performed for focal collections of pus.

In case of purulent infection of the lacrimal sac and skin, one should use oral antibiotics like Augmentin. Surgical treatment by dacryocystorhinostomy will be eventually required once the inflammation subsides completely.

**Surgical care**

Surgical treatment by dacryocystorhinostomy (DCR) is eventually needed in most cases. In cases of acute dacryocystitis, external DCR is preferably performed once the inflammation has subsided.

DCR can be performed by the endonasal approach with or without laser. External DCR has the highest success rate reaching nearly 95-98%. Endonasal DCR has a slightly lower success rate as the ostium created is smaller and has a greater chance of getting occluded. Laser assisted DCR can be performed through the transcanalicular approach also using a KTP or CO2 laser. Success rates are not very high, around 80-85% and intubation is a useful adjunct in these cases. Balloon dacryoplasty has a role in circumscribed focal stenoses or occlusions of the nasolacrimal duct. Stenting or intubation can be performed especially in children and in cases with prior failed surgery or acute infection. Stents are removed usually about 2-4 months after placement.

Complications of DCR surgery include bleeding. This can be avoided by use of cottonoids soaked in adrenaline in the nose in the form of a nasal pack or gelfoam. The angular veins are the most common site of bleed and this can be avoided by careful dissection during surgery. CSF leak may rarely occur and can be serious complication. This occurs as the anterior cranial fossa and the cribiform plate lie just above the medial canthal tendon. Failure of DCR occurs most commonly due to inadequate osteotomy or fibrous closure of the surgical opening. Probing can be performed to enlarge the opening.

Congenital dacryocystitis usually resolves with conservative management in most cases. Sac massage is the first line of management before probing. About 10 strokes should be performed 2-4 times daily. The aim is to increase the hydrostatic pressure to rupture any membranous obstruction. An antibiotic drop like Vancomycin or Ciprofloxacin is prescribed if there is mucopurulent regurge. 80-95 % of
children get cured by 1 year of age with this treatment. It is a good idea to take a swab and send it for microbiological examination.

Considerable controversy exists about the timing of probing. Conservative management by massage can be done safely up to 1 year of age; the reason being most of the cases (96%) will resolve within the first year of life. The success of probing falls after 1 year of age. Hence in a child 1 year of age or more, it is best to recommend probing to the parents. Early probing is performed if the child is very symptomatic or needs intraocular surgical intervention. Sometimes infracture of the inferior turbinate is required if the block is beyond the NLD. About 5 to 10% of probings are unsuccessful and a repeat probing can be performed anytime, preferably after 6 weeks, if symptoms persist.

Nasolacrimal duct intubation using silicone stents is recommended after a failed second probing or when the patient is older than 18 months of age or when there is canalicular stenosis. Performed alone, success rate has been reported to be 82.5%, while in combination with infracture of the inferior turbinate it can be as high as 97%. The tube can be left in place for 3 to 6 months.

Balloon catheter dilatation is a useful adjunctive procedure in cases with incomplete NLD obstructions, where probing has failed especially in children older than 13 months of age. Inflation is done in the region of the nasolacrimal duct and at the sac duct junction. It is minimally invasive, has more than 90% success rate and does not leave any external scars.

External DCR is performed in cases of failed probing or intubation and cases of severe craniofacial anomalies. It is preferably done beyond the age of 1 year, usually by 3-4 years of age. The ostium should be at least 1 cm in diameter. Failures usually occur because of anatomic obstruction by granulation tissue. Success varies between 79-96%.

Endoscopic DCR has also been performed in children with good results comparable to that obtained in adults. Success rates of 76 – 88% have been reported.

**Steps of Probing**

**Figure 1:** The upper punctum is dilated with a Nettleship punctal dilator. The lower punctum is usually not chosen in children as this is the major source of drainage of tears.
Figure 6: Syringing is them performed to confirm the patency of the lacrimal passage. Fluorescein can be instilled in the fluid and syringing is performed.

Figure 7: Patency is established once the fluid reaches the nostril.

Steps of DCR

Figure 1: Either general or local anesthesia can be given. Decongestion of the nasal mucosa is achieved by placement of a nasal pack containing oxymetazoline 0.05% in the middle meatus followed by submucosal injection of 1% xylocaine containing 1:200000 epinephrine. Topical proparacaine is instilled in the conjunctival cul-de-sac. A 1:1 mixture of 2% xylocaine with 1:20000 epinephrine and 0.75% bupivocaine is administered to provide an infraorbital nerve block. Additional injections are given in the medial eyelids and medial canthus region. A nasal pack containing oxymetazoline and viscous xylocaine is placed in the middle meatus. The anterior lacrimal crest follows the inferior orbital rim if traced superiorly. The skin is incised in a curvilinear fashion.

Figure 2: The orbicularis muscle fibres are separated with a tenotomy scissors until one reaches the bare bone. Care is taken to ensure that the angular vein located here is not damaged.

Figure 3: The orbicularis muscle is likely to bleed, hence cautery is performed and the muscle fibres are cut.

Figure 4: Using blunt dissection, the periosteum is exposed. The medial palpebral ligament is seen as a white shiny band extending downwards and anteriorly.

Figure 5: The periosteum is incised and elevated exposing the lacrimal sac fossa. The sac and the periosteum are pushed laterally.
Figure 6: Using a periosteal elevator the thin bone, the lamina papyracea is broken. The bone punch is used to nibble on the bone of the lacrimal fossa, exposing the lacrimal sac mucosa.

Figure 10: The probe should pass freely through the canaliculus and be seen in the opening.

Figure 7: The cats paw retractor is used to pull the tissues medially.

Figure 11: The nasal mucosa is then cut to raise a flap which is hinged superiorly.

Figure 8: The bony ostium is enlarged exposing the nasal mucosa.

Figure 12: Once the flap is raised, it is apposed to the sac flap and the excess amount overriding is cut.

Figure 9: The lacrimal sac mucosa is then incised after tenting the sac with a Bowman’s probe.

Figure 13: In case intubation is needed, silicon stents are passed from the superior and inferior canaliculus to reach the sac area.
Figure 14: The silicon stents are passed from the superior and inferior canaliculus and pulled out through the nose.

Figure 15: The flaps may be fashioned as anterior and posterior flaps. The posterior flaps can be incised and the just the anterior flaps may be sutured together with 6-0 vicryl absorbable sutures.

Figure 16: The orbicularis muscle is sutured with 6-0 vicryl sutures.

Figure 17: The skin is sutured with 6-0 prolene sutures and the nasal pack is replaced with a dry one.

Figure 18: At the end
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Treatment is resumed with monthly injections when monitoring indicates a loss of visual acuity due to macular edema secondary to RVO and continued until stable visual acuity is reached again for three consecutive monthly assessments. In visual impairment due to macular edema secondary to branch RVO, Lucentis can be safely administered concomitantly with laser photocoagulation. When given on the same day, Lucentis should be administered at least 30 minutes after laser photocoagulation. Lucentis must be administrated by a qualified ophthalmologist using aseptic techniques. Broad-spectrum topical microbicide and anesthetic should be administered prior to the injection. The patient should be instructed to self-administer antiviral drops four times daily for 3 days before and after each injection. Not recommended in children and adolescents. 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Patients with known risk factors for stroke, including history of prior stroke or transient ischemic attack should be carefully evaluated by their physicians as to whether Lucentis treatment is appropriate and the benefit outweighs the potential risk. As with all therapeutic proteins, there is a potential for immunogenicity with Lucentis. Lucentis has not been studied in patients with active systemic infections or in patients with concurrent eye conditions such as retinal detachment or macular hole. Cautions should be exercised when prescribing to pregnant women; use of effective contraception recommended for women of childbearing potential; breast-feeding not recommended. Following treatment patients may develop transient visual disturbances that may interfere with their ability to drive or use machines. Patients should not drive or use machines as long as these symptoms persist. Interactions: No formal interaction studies have been performed. Adverse reactions: Very common adverse reactions are: intracocular inflammation, irritis, vitreous detachment, retinal haemorrhage, visual disturbance, eye pain, vitreous floaters, conjunctival haemorrhage, eye irritation, foreign body sensation in eye, lacrimation increased, blepharitis, dry eye, ocular hyperemia, eye pruritus, intraocular pressure increased, retinopathy, headache, arthralgia. Common adverse reactions are: retinal degeneration, vitreous disorder, uveitis, iris, iridocyclitis, cataract, cataract subcapsular, posterior capsule opacification, pericorneal keratitis, corneal abrasion, anterior chamber flare, lens blurred, injection site haemorrhage, conjunctivitis allergic, eye discharge, photophobia, ocular discomfort, eyelid edema, eyelid pain, conjunctival hyperemia, stripe, inflammation, anemia, anxiety, cough, nausea, allergic reactions ( rash, pruritus, urticaria, erythema). Uncommon adverse reactions are: blindness, endophthalmitis, hyphema, hypopyon, hyperviscosity, keratopathy, iris opacities, corneal deposits, corneal edema, corneal striae, injection site pain, injection site irritation, abnormal sensation in eye, eyelid irritation, face or body swelling, angioedema, injection site infection, rash, or pruritus. Rare but serious adverse reactions related to intravitreal injections included endophthalmitis, rhegmatogenous retinal detachment, retinal tear and istigmatic traumatic cataract. Packs: Pack of 1 vial. Note: Before prescribing, please consult full prescribing information available from Novartis Healthcare Private Limited, Sande House, 6th Floor Shivalik Estate Dr. Annie Besant Road, Worli, Mumbai - 400 018 India; tel: +9122 24076890 fax: +9122 24070382

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