7.12.5. Lacrimal System: Acquired Lacrimal Drainage Obstruction (II)

Acquired Nasolacrimal Duct Obstruction

Etiology

- **Involutional stenosis**
  - most common cause of NLDO in older persons
  - F:M=2:1
  - cause
    - inflammatory infiltrates and edema
      - unidentified infection
      - ? autoimmune disease
    - anatomical predisposition
  - treatment
    - DCR
- **Dacryolith (concretions)**
  - form within the lacrimal sac
  - pathogenesis
    - infection with Actinomyces israelii
    - infection with Candida species
    - long-term administration of topical medications
    - symptoms are unremitting
      - preexisting NLD obstruction
    - can form in patients with otherwise normal lacrimal drainage systems
  - histology
    - shed epithelial cells, lipids, and amorphous debris with or without calcium
  - acute impaction of dacryolith in NLD
    - intermittent symptoms
      - lacrimal sac distension and substantial pain
  - treatment
    - external DCR
  -
    Figure 13-13 (© 2020 American Academy of Ophthalmology)
- **Sinus disease**
  - may contribute to development of NLDO
  - previous sinus surgery
    - NLD is sometimes inadvertently damaged during sinus procedures
- **Trauma**
  - naso-orbital fractures
    - stenting of the entire lacrimal drainage system
    - early fracture reduction
    - late treatment of persistent epiphora usually requires DCR
  - rhinoplasty
  - endoscopic sinus surgery
- **Inflammatory disease**
  - granulomatous disease
    - sarcoidosis
    - granulomatosis with polyangiitis (formerly, Wegener granulomatosis)
    - lethal midline granuloma
  - performed at time of DCR
    - biopsy of lacrimal sac/NLD
- **Lacrimal plugs**
  - dislodged punctal and canalicular plugs
  - partially removed silicone stent
  - treatment consists of DCR
- **Radioactive iodine**
  - for treatment of thyroid cancer
    - may lead to closure of lacrimal apparatus, specifically sac and duct
    - not seen with lower dosages used for treatment of Graves hyperthyroidism
- **Neoplasm**
  - atypical presentation
    - younger age
    - male sex
    - bloody punctal discharge
    - lacrimal sac distension above medial canthal tendon
    - sinus or nasopharyngeal origin
      - history of malignancy
  - diagnostic workup
    - CT or MRI
    - preoperative endoscopy to evaluate for intranasal neoplasm
    - biopsy
      - if unexpected mass or other suggestive abnormality is encountered during surgery
  - treatment
    - benign tumors
      - DCR or CDCR
    - malignant tumors
      - initial treatment should focus on the neoplasm
      - surgical correction of nasolacrimal drainage system (DCR or CDCR) should be postponed until there is certainty of clear margins or freedom from recurrence

Management

- **intubation and stenting**
  - indication
    - partial stenosis of the NLD with symptomatic epiphora
      - only if the tubes can be passed easily
    - surgical intubation of entire lacrimal drainage system
    - a balloon catheter
      - DCR should be considered
    - intubation alone is not effective for complete NLDO
  - treatment of choice for most patients with acquired NLDO
  - indications
    - active infection should be treated, if possible, before DCR is performed
    - recurrent dacryocystitis
    - chronic mucoid reflux
    - painful distension of the lacrimal sac
    - bothersome epiphora
  - anesthesia
    - most commonly used
      - local anesthesia with intravenous sedation (monitored anesthesia care)
    - general anesthesia
  - intraoperative hemostasis
    - preoperative injection of lidocaine with epinephrine into medial canthal soft tissues
    - oxymetazoline hydrochloride
    - intranasally injected anesthetic and nasal packing with vasoconstrictive agents
      - phenylephrine
  - technique
    - creating an anastomosis between lacrimal sac and nasal cavity through a bony ostium
    - internal (intranasal) approach
      - advantages
        - lack of a visible scar
        - shorter recovery period
        - less discomfort
      - approach
        - endoscopic DCR
        - direct visualization
          - Internal DCRs through the nostril may also be performed under direct visualization
      - technique
        - removal of a nasal mucosal flap or en bloc resection
        - osteotomy
        - lacrimal sac is opened
        - medial wall of the sac is removed
          - preservation of the lacrimal and nasal mucosa may result in less scarring and a higher success rate
        - sac is marsupialized into nose
        - bicanalicular intubation
          - helps identify the thin lacrimal bone
        - a fiber-optic probe passed through a canaliculus to transilluminate the lacrimal sac
        - careful selection of patients with an adequate normal nasal cavity is crucial for success
        - surgeon should be prepared to modify the nasal anatomy
      -
        Figure 13-15 (© 2020 American Academy of Ophthalmology)
    - external (transcutaneous) approach
      - better exposure for management of
        - canalicular stenosis
        - unexpected neoplasm
        - dacryoliths
      - skin incision
        - avoid angular blood vessels
        - avoid wound contractures leading to epicanthal folds
      -
        Figure 13-14 (© 2020 American Academy of Ophthalmology)
      - osteotomy
        - adjacent to the medial wall of the lacrimal sac
          - hemostat
          - rongeur
          - trephine
          - drill
        - large osteotomy site facilitates the formation of posterior and anterior mucosal flaps from both lacrimal sac and nasal mucosa
        - suturing of corresponding posterior flaps and anterior flaps is common
        - sometimes only anterior flaps are anastomosed
        - a simultaneous stenting of the canaliculi with silicone tubes
          - especially in patients who have common canalicular stenosis
      - second attempts following failed DCR—no matter which approach was used—have a higher failure rate
        - if an internal DCR fails, the likelihood of a successful external DCR is somewhat decreased
      - biopsy with frozen section examination
        - if abnormal tissue is found
      - DCRs are successful in most patients
        - in the absence of a grossly visible abnormality or an indicative history, lacrimal sac biopsies are unlikely to reveal occult disease
      - failures are caused by
        - fibrosis
        - occlusion of the osteotomy
        - common canalicular obstruction
        - inappropriate placement or size of the bony ostium
        - patient's history of trauma
        - coexisting autoimmune inflammatory disease
        - active dacryocystitis
        - postoperative infection
        - hypersensitivity or foreign-body reactions to the stent
      - when an initial DCR fails
        - attempt a second DCR before resorting to CDCR
      - some surgeons apply topical mitomycin C
        - potent antiproliferative alkylating agent
        - to prevent fibrosis at the osteotomy site

Punctal Disorders

- **punctal stenosis and occlusion**
  - etiology
    - congenital
    - inflammatory
      - Stevens-Johnson syndrome
      - mucous membrane pemphigoid
      - infectious
        - herpes
    - iatrogenic
      - glaucoma medications
      - deliberate occlusion
    - punctal ectropion
  - treatment
    - dilation
      - benefits of dilation are short-lived
    - punctoplasty
      - snip procedure
      - small portion of the ampulla is excised
    - stenting
      - recurrent stenosis after punctoplasty
      - complete occlusion
      - surgical canalization + stenting
- **punctal enlargement**
  - prevent formation of adequate seal
    - lacrimal pump disruption
    - suctioning of tears does not occur
  - almost exclusively the result of iatrogenic injury
    - starting of lacrimal drainage system
      - "cheese-wiring" of puncta and adjacent canaliculi
      - patients with stents require periodic monitoring
      - stents should be removed if punctal deformation is detected
    - overly aggressive punctoplasty
    - excision of adjacent neoplasms
    - treatment
      - damage to puncta should be avoided because no consistently effective treatment is available
      - CDCR is the only reasonable alternative
- **punctal malposition**
  - medial ectropion repair
    - resection of a horizontal ellipse of conjunctival and subconjunctival connective tissue below the punctum, with reapposition of the edges
    - a horizontal eyelid tightening if laxity is present
    - + punctoplasty
- punctal obstruction/malposition by adjacent structures
  - hypertrophied caruncle
  - conjunctivochalasis

Canalicular Obstruction

Evaluation

- lacrimal system irrigation
  - partial obstruction
    - partial fluid flow into nose + partial reflux
      - what appears to be a partial obstruction may sometimes be a total functional occlusion
  - total obstruction
    - upper/lower canaliculus
      - cannula is advanced with difficulty, and irrigation fluid refluxes from the same canaliculus
    - common canaliculus
      - high-velocity reflux from the opposite punctum/canaliculus
- lacrimal system probing
  - upper/lower canalicular obstruction
    - reveals canalicular obstruction proximal to common canaliculus
  - total common canalicular obstruction
    - lacrimal probe advances ~8 mm from punctum before encountering a tactile soft stop

Etiology

- **Lacrimal plugs**
  - intracanalicular plugs
    - mold inversion
    - permanent intracanalicular plug is a poorly reviewed device that leads to partial canalicular obstruction and infection
  - small punctal plugs
    - may migrate into canaliculi and result in obstruction
  - even temporary or absorbable plugs can cause local inflammatory response and canalicular constriction
  - diagnostic workup
    - canalicular probing
    - high-frequency ultrasound
  - treatment
    - endoscopic plug is surgically excised
    - excision of a short segment of scarred canaliculus
      - nasolacrimostoma over a stent
  - references
- **Infection**
  - diffuse conjunctival infection
    - more common
      - bacterial virus
      - human adenovirus virus
  - localized canalicular infection
    - canaliculitis
- **Inflammatory disease**
  - mucous membrane pemphigoid
  - Stevens-Johnson syndrome
  - graft-vs-host disease
    - because of concurrent loss of tear secretion, patients often do not experience epiphora
- **Trauma**
- **Neoplasm**
  - Complete resection of neoplasms in the medial canthal area may include removal of the puncta and canaliculi
  - remaining portion of canaliculi may be manipulated to the conjunctival surface
    - a intubation
  - complete tumor excision must be confirmed by histologic examination before connection of lacrimal drainage system with the middle meatus is considered

Management

- canalicular stenting (intubation)
  - first-line therapy
  - punctum
    - symptomatic canalicular constriction
      - not complete occlusion
- **reconstruction**
  - successful when only a few millimeters are involved
  - near the punctum
    - occluded canaliculus is resected and cut ends are anastomosed over a stent
  - distally or within the common canaliculus
    - septination of scarred segment to establish a patent lumen
      - stenting to prevent contracture and to provide a scaffold for proper epithelialization
  - during removal of a punctal or canalicular plug, a small segment of scarred canaliculus is often excised
    - canaliculus is reconstructed over a stent
  - laser canaliculoplasty
    - Holmium laser
      - followed by stenting
- canalicular/dacryocystorhinostomy
  - common canaliculus is totally obstructed
    - canalicular/dacryocystorhinostomy
      - area of total common canalicular obstruction is removed
      - remaining patent canalicular system is directly anastomosed to the lacrimal sac mucosa
      - silicone stent
  - lacrimal sac is sclerotic
    - canalicular/rhinostomy
      - remaining patent canalicular system is directly anastomosed to lateral nasal wall mucosa
- conjunctivodacryocystorhinostomy (CDCR)
  - canalicular abnormality is so severe that canalicular system cannot be used or reconstructed
  - **techniques**
    - Anastomy
      - Jones tube is placed through an opening created at interior half of caruncle and then through osteotomy site into middle nasal meatus
        - a partial caruncular/ectomy
      - nasal dilators
        - to enlarge mucosal opening prior to insertion of Jones tube
      - desired tube length can be determined with a stent
        - have tubes of different lengths available at time of surgery
      - medial end of tube must be situated in lateral nasal
      - nasal end must clear the anterior end of middle turbinate
      - Partial resection of anterior middle turbinate may be necessary
    -
      Figure 13-12 (© 2020 American Academy of Ophthalmology)
  - **complications**
    - obstruction of the tube with mucus
      - forced inspiration, with mouth and nose manually closed, creates significant airflow through tube into nasal airway
        - patients should be instructed to perform this maneuver daily
    - migration of the tube
      - loss of the tube, even if only for a few days, may lead to closure of this soft-tissue tract
      - recurrent migration or loss of the tube
        - use rounded, angled, or modified Jones tube
        - polytetrafluoroethylene-coated tube
          - allows ingrowth of fibrous tissue into its outer covering
    - chronic foreign-body sensation
    - mucus production
    - pyogenic granuloma formation
    - periodic removal, cleaning, and replacement of the Jones tube in the office may be necessary

Ophthalmology Mind Maps/Arman Mashayekhi, MD