Congenital Nasolacrimal Duct Obstruction

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INITIAL PRESENTATION

Chief Complaint

Right eye tearing and mattering

History of Present Illness

A 12-month-old boy presented to the University of Iowa Department of Ophthalmology pediatrics service with mattering and watering of the right eye that had been ongoing since the first month of life. The degree of symptoms had remained unchanged since that time. The parents had not tried medication or Crigler massage. The parents denied fevers, recent illness, eye or periocular redness, swelling, or a history of eye infections. There were no symptoms in the left eye, and his parents had not noticed any eye crossing.

Past Ocular History

None

Medical History

Patient was meeting his developmental and growth milestones. He was born full term and did not have any other pertinent past medical history.

Systemic Medications

Ferrous sulfate

Ocular Medications

None

Allergies

None

Family and Social History

No family history of amblyopia or strabismus. He lives with his biological parents.

OCULAR EXAMINATION

Visual Acuity (tested by vertical induced tropia test)

- Distance:
  - Right eye (OD): Central, steady, maintained (CSM)
  - Left eye (OS): CSM
- Near:
  - OD: CSM
  - OS: CSM

Pupils

- OD: 5mm (dark) → 3mm (light), brisk, no relative afferent pupillary defect (RAPD)
- OS: 5mm (dark) → 3mm (light), brisk, no RAPD

Intraocular Pressure

- OD: 9 mmHg
- OS: 11 mmHg

Confrontation Visual Fields (using toys)

- OD: Full
- OS: Full

Strabismus Exam

- Orthotropic at distance and near with full motility

External

- OD: No palpable masses
- OS: Normal

Slit Lamp Exam

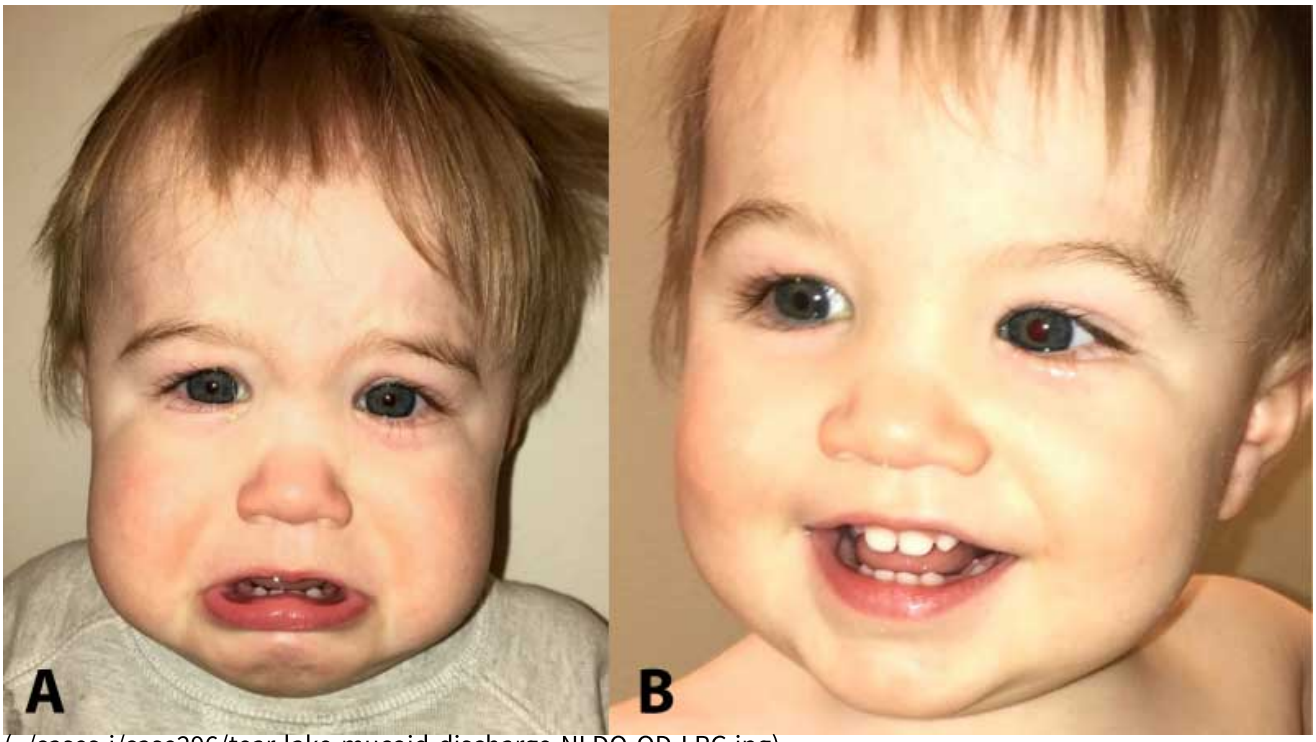
	OD	OS
Lids/Lashes	Normal	Normal
Conjunctiva/Sclera	Increased tear lake, mucoid discharge	Clear and quiet
Cornea	Clear	Clear
Anterior Chamber	Deep and quiet	Deep and quiet
Iris	Normal architecture	Normal architecture
Lens	Clear	Clear
Vitreous	Normal	Normal

Dilated Fundus Examination

	OD	OS
Disc	Normal	Normal
C/D Ratio	0.3	0.3
Macula	Normal	Normal
Vessels	Normal	Normal
Periphery	Normal	Normal

Cycloplegic Refraction (Retinoscopy)

	Sphere	Cylinder
OD	+2.25	Sphere
OS	+2.25	Sphere



(../cases-i/case296/tear-lake-mucoid-discharge-NLDO-OD-LRG.jpg)

> ***Figure 1.*** *Full face photographs demonstrating increased tear lake and mucoid discharge in the right eye consistent with nasolacrimal duct obstruction. Symptoms were exacerbated during periods of crying (photograph A). The tearing of the left eye in photograph B is secondary to recent crying.*

Additional Testing

Dye disappearance test: persistence of fluorescein was observed in the right eye at five minutes. The left eye demonstrated normal dye disappearance.

Differential Diagnosis

- Nasolacrimal duct obstruction
- Conjunctivitis
- Congenital glaucoma
- Dacryocystocele
- Dacryocystitis
- Corneal abrasion
- Retained foreign body

Diagnosis

Nasolacrimal duct obstruction, right eye

CLINICAL COURSE

The patient was diagnosed with a right nasolacrimal duct obstruction (NLDO). The parents were instructed to begin Crigler massage. His symptoms failed to improve with conservative measures. He then underwent right probing, irrigation, and balloon dacryoplasty under general anesthesia. The patient tolerated the procedure well and there were no complications. After a month, his mother reported resolution of the tearing, mattering, and discharge.

DISCUSSION

Etiology/Epidemiology

Nasolacrimal duct obstruction (NLDO) is a common cause of epiphora in infants and results from a blockage in the tear drainage system [1]. The lacrimal drainage system begins at the puncta found at the medial upper and lower eyelid margins. The tears then pass through canaliculi that run parallel to the eyelid margins. The canaliculi merge to form the common canaliculus, which passes through the valve of Rosenmuller, formed by tissue in-foldings, before emptying into the lacrimal sac [2]. In 10% of individuals, the common canaliculus is absent, and the upper and lower canaliculi enter the lacrimal sac independently [3]. The lacrimal sac empties into the nasolacrimal duct. The nasolacrimal duct opens into the inferior nasal meatus which is partially covered by another mucosal fold known as the valve of Hasner [4].

Congenital nasolacrimal duct obstruction is most commonly caused when there is incomplete canalization at the distal end of the duct, creating an imperforate membrane at the valve of Hasner [1]. It is estimated that 6% to 20% of newborns develop signs and symptoms of NLDO [5]. Infants have a higher incidence of symptoms as the amount of reflex tear production increases over the first weeks of life [6]. However, it is difficult to estimate the true prevalence of NLDO because approximately 90% of children have spontaneous resolution of the obstruction in the first six months of life [5]. NLDO is most commonly unilateral, although bilateral obstruction is observed in 20% of cases [7].

Signs and Symptoms

Infants with NLDO present with excess tearing or mattering [1]. If there is a distal obstruction near the valve of Hasner, there may be substantial mucopurulent discharge. On the other hand, if there is a proximal obstruction near the valve of Rosenmuller, excess tearing is more common leading to a more watery discharge [7]. Parents may note that the infants exhibit worse tearing in cold or windy weather, or when experiencing an upper respiratory infection.

Congenital NLDO must be differentiated from a functional NLDO that occurs due to obstruction of the outlet of the nasolacrimal duct due to swelling of the mucous membranes inside the nose due to upper respiratory tract infection [8]. The infant-sized anatomy of the turbinates allows only a small amount of such swelling before causing symptomatic tearing and mucoid discharge. At this institution (University of Iowa Department, Pediatric Ophthalmology), it is common practice to observe infants without intervention when tearing and discharge occur only in the setting of upper respiratory infection as these symptoms may resolve as the infant grows.

A careful examination can help differentiate NLDO from other entities involving the lacrimal drainage system. A congenital dacryocystocele (166-dacryocystocele.htm) can also present with epiphora but arises from a proximal obstruction (e.g., at the valve of Rosenmuller) in addition to a distal obstruction (e.g., at the valve of Hasner) [9]. The progressive secretion of mucous by lacrimal sac goblet cells results in distention of the lacrimal sac that may give rise to a bluish cystic mass, palpable below the medial canthal tendon [10]. The median age of presentation of dacryocystocele is 7 days, which is younger than the more common congenital NLDO [11]. Congenital dacryocystocele is considerably more rare than NLDO with one study reporting a prevalence of 1 case out of 3,884 live births [12]. Physicians should also assess patients with dacryocystocele for acute dacryocystitis, or infection of the lacrimal sac, which may occur as a complication of NLDO in 2-3% of symptomatic infants [13]. Infants with dacryocystitis may present with fever, erythema, swelling, warmth, and tenderness around the lacrimal sac [13].

Diagnosis

NLDO can generally be diagnosed by history and physical examination. Reflux of mucinous discharge following palpation of the lacrimal sac is a diagnostic indicator for an NLDO. A dye disappearance test can also be conducted to diagnose NLDO [5]. The test is performed by placing a drop of fluorescein-instilled saline in the inferior cul-de-sac of each eye. After five minutes, during which the infant does not rub or wipe his or her eyes, the disappearance of the dye is observed with a cobalt blue light. The test is positive if the dye persists in the lower cul-de-sac or runs down the patient's cheek.

Treatment

For an infant with NLDO, conservative measures typically begin with lacrimal sac massage, also known as Crigler massage [14]. This typically involves five consecutive strokes of moderate pressure applied over the lacrimal sac in a downward direction for 2-3 seconds, repeated three times daily. A meta-analysis of NLDO treatments illustrated that the success of conservative treatments can range from 14.2% to 96%, which was heavily influenced by compliance of the parents and the age of the child. The success of conservative treatments decreases with patient age. While 82.9% of one-month-old children ultimately had spontaneous resolution, this number fell to below 50% in children ten months of age [15].

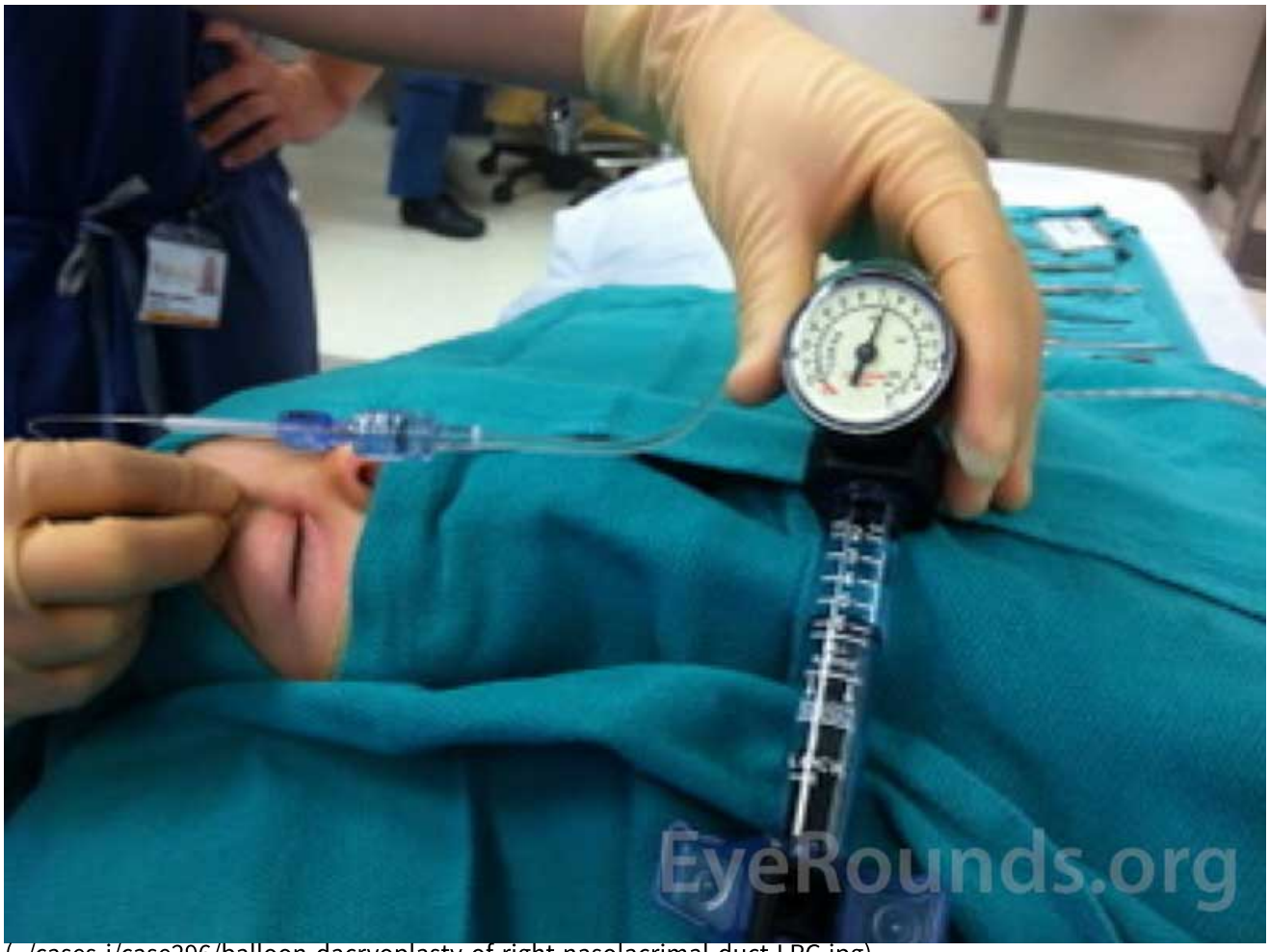
If conservative treatment of the NLDO is unsuccessful, clinicians typically proceed with nasolacrimal duct probing and irrigation [16]. There is debate about when to perform this procedure due to the high likelihood of eventual spontaneous resolution of NLDO among younger children. Some clinicians advocate for early intervention if the obstruction is severe or the child has bilateral NLDO [17]. They avocate performing in-office probing without general anesthesia, often at 3-4 months of age when infants can be bundled and awake during the procedure. Others will wait for possible spontaneous resolution until at least 12 months of age, at which time they proceed with probing and irrigation under general anesthesia. There is a 93% success rate with probing and a 52% success rate if probing is repeated after an initial failure [18]. Similar to spontaneous resolution, the success of probing decreases as the child's age increases. For instance, one study reported a success rate of probing of 90% for children under 6 months of age. This success rate fell progressively with age with only a 33% resolution rate in children 36-60 months of age [19].

In addition to probing, balloon dacryoplasty has been advocated following probing in an attempt to improve success rates (Figure 3). A fine catheter with an inflatable balloon at the tip is inserted through the lacrimal drainage system and inflated to dilate the obstruction. Through a series of inflations and deflation, resolution may be achieved in 75-100 % of children that undergo balloon dacryoplasty [20]. However, a study conducted by Gunton *et al.* showed no significant differences in rate of resolution of NLDO between probing and probing with balloon dacryoplasty [21].

Nasolacrimal stents can also be inserted at the time of probing or as a second procedure after a failed probing. Bicanalicular stents pass through the upper and lower puncta while monocanalicular stents only intubate one of the canaliculi. The Crawford stent, a commonly used bicanalicular stent, is a silicone tube that is attached to flexible metal probes and passed through the superior and inferior canaliculi to be retrieved in the nose, where the stent may or may not be sutured in place. Stents are typically left in place between two to four months. For a more detailed discussion on nasolacrimal stents, a guide can be found here (../tutorials/Stents/index.htm) [22]. The success rate of nasolacrimal duct stenting has been reported to be as high as 97% when conducted after a failed probing [23, 24]. However, in a study performed by the Pediatric Eye Disease Investigator Group, there was not a significant difference in the success rates for NLDO stenting compared to balloon dacryoplasty [24]. Many clinicians favor balloon dacryoplasty before stenting as it avoids the need for a removal procedure and has a lower risk of infection due to the potential of biofilm formation on the stent [25].

Should the above treatments prove unsuccessful, or in those patients with abnormal anatomy not amenable to the above approaches, more invasive surgeries can be pursued. Endoscopic intranasal surgery is a relatively new technique that involves endoscope-guided visualization of the valve of Hasner allowing for incision of the

imperforate membrane. One preliminary study has shown a success rate of 92.7% [26]. Dacryocystorhinostomy and conjunctivodacryocystorhinostomy are more invasive surgeries in which the lacrimal drainage systems are created by the surgeon and are typically reserved for those cases in which aforementioned procedures have been unsuccessful or cannot be performed [27, 28].



(../cases-i/case296/balloon-dacryoplasty-of-right-nasolacrimal-duct-LRG.jpg)

Figure 2. *Balloon dacryoplasty of the right nasolacrimal duct (courtesy Scott Larson, MD).*

EPIDEMIOLOGY OR ETIOLOGY	SIGNS
• NLDO is very common with a prevalence of 6-20% of all infants • 20% of NLDO are bilateral • 90% of children with NLDO experience spontaneous resolution	• Epiphora • Mucopurulent or watery discharge with reflux when pressure is applied over the lacrimal sac • Positive fluorescein dye disappearance test

SYMPTOMS	TREATMENT/MANAGEMENT
• Epiphora, worsens with crying • Possible inferior medial canthal swelling	• Crigler massage • Nasolacrimal duct probing • Balloon dacryoplasty • Nasolacrimal stent • Endoscopic intranasal surgery • Dacryocystohinostomy or Conjunctivodacryocystorhinostomy

References

1. Kushner BJ. Congenital nasolacrimal system obstruction. *Arch Ophthalmol* 1982; 100(4): 597-600. https://www.ncbi.nlm.nih.gov/pubmed/6896140/ (https://www.ncbi.nlm.nih.gov/pubmed/6896140/)
2. Ducker L, Rivera R. Anatomy, Head, and Neck, Eye Lacrimal Duct. StatPearls. Treatsure Island (FL): StatPearls Publishing; 2019.
3. Yazici B, Yazici Z. Frequency of the common canaliculus: a radiological study. *Arch Ophthalmol* 2000; 118(10): 1381-15.
4. Yedavalli V, Das Devsmita, Massoud TF. Eponymous "valves" of the nasolacrimal drainage apparatus. *Clinical Anatomy* 2018; 32(1): 35-40.
5. Perez Y, Patel BC, Mendez MD. Nasolacrimal Duct Obstruction. StatPearls.Treasure Island (FL): StatPearls Publishing 2019.
6. Toker E, Yenice O, Oguit MS, Akman I, Ozek E. Tear production during the neonatal period. *American Journal of Ophthalmology* 2002; 133(6): 746-749.
7. Vagge A, Desideri LF, Nucci P, Serafino M, Giannaccare G, Lembo A, Traverso CE. Congenital nasolacrimal duct obstruction (CNLDO): A Review. *Diseases* 2018; 6: 96.
8. Kim HC, Cho AR, and Lew H. Dacryoscintigraphic findings in the children with tearing. *Korean Journal of Ophthalmology* 2015; 29(1): 1-6.
9. EH, Longmuir SQ. Congenital dacryocystocele with spontaneous resolution. *Eye Rounds.org.* https://webeye.ophth.uiowa.edu/eyeforum/cases/166- dacryocystocele.htm (https://webeye.ophth.uiowa.edu/eyeforum/cases/166-%20dacryocystocele.htm)
10. 10. Davies R, Watkins WJ, Kotecha S, Watts P. The presentation, clinical features, complications, and treatment of congenital dacryocystocele. *Eye* 2018; 32: 522-526.
11. Wong RK, VanderVeen DK. Presentation and management of congenital dacryocystocele. *Pediatrics* 2008;122:e1108-12.
12. Shekunov J, Griepentrog GJ, Diehl NN, Mohney BG. Prevalence and clinical characteristics of congenital dacryocystocele. *J AAPOS* 2010; 14(5): 417-420.
13. Khatib L, Lebanon B, Katowitz WR. Managing Dacryoceles and Dacryocystitis. *Review of Ophthalmology* 2018.
14. Crigler LW. The treatment of congenital dacryocystitis. *JAMA* 1923; 81(1): 23-24.
15. Avram E. Insights in the treatment of congenital nasolacrimal duct obstruction. *Rom J Opthalmol* 2017; 6(12): 101-106.
16. Macewen CJ, Young JDH. Epiphora during the first year of life. *Eye* 1991; 5: 596-600.
17. Miller AM, et al. Office probing for treatment of nasolacrimal duct obstruction in infants. *J AAPOS* 2015; 18(1): 26-30.
18. Katowitz JA, Welsh MG. Timing of initial probing and irrigation in congenital nasolacrimal duct obstruction. *Ophthalmology* 1987; 94(6): 698-705.
19. Hung C, Chen Y, Lin S, Chen W. Nasolacrimal duct probing under topical anesthesia for congenital nasolacrimal duct obstruction in Taiwan. *Pediatrics & Neonatology* 2015; 56(6): 402-407.
20. Wladis EJ, Aakalu VK, Yen MT, Bilyk JR, Sobel RK, Mawn LA. Balloon dacryoplasty for congenital nasolacrimal duct obstruction: A report by the American Academy of Ophthalmology. *Opthalmology* 2018; 125(10): 1654-1657.

21. Gunton KB, Chung CW, Schnall BM, Prieto D, Wexler A, Koller HP. Comparison of balloon dacryocystoplasty to probing as the primary treatment of congenital nasolacrimal duct obstruction. *Journal of American Association for Pediatric Ophthalmology and Strabismus* 2001; 5(3): 139-142.
22. Ricca AM, Kim AK, Chahal HS, Shriver EM. Nasolacrimal Stents: An Introductory Guide. *Eye Rounds.org.* https://webeye.ophth.uiowa.edu/eyeforum/tutorials/Stents/index.htm (https://webeye.ophth.uiowa.edu/eyeforum/tutorials/Stents/index.htm)
23. Pe MR, Langford JD, Linberg JV, Schwartz TL, Sondhi N. Ritleng intubation system for treatment of congenital nasolacrimal duct obstruction. *Arch Ophthalmol* 1998; 116(3): 387-391.
24. Pediatric Eye Disease Investigator Group, Balloon catheter dilation and nasolacrimal intubation for treatment of nasolacrimal duct obstruction following a failed probing. *Arch Ophthalmol* 2010; 127(5): 633-639.
25. Samimi DB, Ediriwickrema LS, Bielory BP, Miller D, Lee W, Johnson TE. Microbiology and biofilm trends of silicone lacrimal implants: Comparing infected versus routinely removed stents. *Ophthalmic Plastic and Reconstructive Surgery* 2016; 32(6): 454-457.
26. Korkmaz H, Korkmaz M, Karakahya RH, Serhatli M. Endoscopic intranasal surgery for congenital nasolacrimal duct obstruction – A new approach. *Int J Pediatr Otorhinolaryngol* 2013; 77(6): 918-921.
27. McDonogh M, Meiring JH. Endoscopic transnasal dacryocystorhinostomy. *The Journal of Laryngology and Otology* 1989; 103(6): 585-587.
28. 28. Perry CB, Steele EA. Conjunctivodacryocystorhinostomy: Indications, tubes, and techniques. *Oculofacial, Orbital, and Lacrimal Surgery* 2019: 539-549.

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