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Incidence and Clinical Characteristics of Congenital Nasolacrimal Duct Obstruction

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Abstract

Background/Aims: The literature on the prevalence and demographics of congenital nasolacrimal duct obstruction (CNLDO) is 30 to 70 years old and largely comprised of small sample sizes. This study provides epidemiologic findings of this common disorder from the largest cohort reported to date.

Methods: The medical records of all children (< 5 years of age) residing in Olmsted County, Minnesota, when diagnosed with congenital nasolacrimal duct obstruction (CNLDO) from January 1, 1995, through December 31, 2004, were reviewed.

Results: Of 17,713 newborns born during the 10-year study period, 1998 were diagnosed with CNLDO, yielding a birth prevalence of 1 in 9 live births. The diagnosis was made in approximately 90% by a primary care physician, at a median age of 5 weeks, with no gender predilection. Compared to the reference population, CNLDO was associated with premature birth ($p=0.005$) and was more prevalent among Caucasians ($p<0.001$). Two thirds of patients initially presented with discharge alone, 18% with tearing alone, and 15% with both discharge and tearing.

Conclusions: In this large population-based cohort, CNLDO occurred in 1 in 9 live births with no gender predilection. Prematurity and Caucasian race were associated with the development of CNLDO. Mucopurulent discharge was a much more common feature than tearing at initial presentation.

Congenital nasolacrimal duct obstruction (CNLDO), reported to occur in 5-20% of newborns, [1–4] is generally characterized by persistent tearing and intermittent mucopurulent discharge from one or both eyes of an infant. The obstruction is due to the failure of nasolacrimal duct canalization from a variety of etiologies and most commonly occurs at the membrane of Hasner where the lacrimal duct empties into the nasal cavity.[5] Although there exists numerous publications on the management of CNLDO, published reports on the incidence and demographics of this disorder are uncommon, decades old, and typically limited by small sample sizes. The purpose of this study is to describe the incidence and

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clinical characteristics of CNLDO from among a large population-based cohort of children diagnosed over a 10-year period.

Methods:

The medical records of all patients less than five years of age diagnosed with congenital nasolacrimal duct obstruction, while residing in Olmsted County, Minnesota, from January 1, 1995 through December 31, 2004, were retrospectively reviewed. The population of Olmsted County is relatively isolated from other urban areas, and virtually all medical care is provided to its residents by Mayo Clinic, Olmsted Medical Group, and their affiliated hospitals. Effectively, all patient-physician encounters in the county are collected through the Rochester Epidemiology Project (REP), a computerized medical record linkage system.[6] Potential cases of CNLDO were ascertained by searching the REP linkage system for International Classification of Diseases 9 (ICD 9) codes for CNLDO using additional descriptors: dacryostenosis, tearing, plugged tear duct, stricture, stenosis, epiphora, and hypoplasia. The query identified 2331 potential cases from the two institutions. Patients were included if the documenting physician made a clinical diagnosis of nasolacrimal duct obstruction over the course of multiple well-child visits and correlating patient history. Patients were excluded if they were documented to have a diagnosis other than CNLDO, diagnosed outside the time period of the study, resided outside of Olmsted County, or refused research authorization. Residency and age verification was ascertained using REP-provided information at the time of record review. Each medical record was reviewed by the authors to confirm that a clinical diagnosis of CNLDO was made.

Annual age- and gender-adjusted incidence rates were estimated using the age- and gender-specific population figures for Olmsted County, Minnesota from the United States census. Differences in rates of premature births and C-section between the CNLDO cohort and the rest of babies born in Olmsted County during the study period were compared using chi-square tests. All statistical tests were two-sided and the threshold of significance was set at an alpha value of 0.05.

Results:

Of the 17,713 newborn births in Olmsted County, MN during the 10-year study period, 1,998 infants were diagnosed with CNLDO, yielding a birth prevalence of 11.3% (CI: 10.78-11.77) or 1 in 9 live births. The demographics and clinical characteristics of the study patients are summarized in Table 1. The median age at diagnosis was 5 weeks (range, birth to 57.6 months) and 959 (48%) were female. Approximately 90% of patients were diagnosed by a primary care physician. A history of premature birth (<37 weeks) was reported in 189 (9.5%) patients, higher ($p=0.002$) than the 7.5% observed in the study population without CNLDO. Similarly, 89% of the CNLDO cohort were Caucasian, higher ($p<0.001$) than the reference population of 80% Caucasians. Cesarean section delivery was not associated with the development of CNLDO ($p=0.258$). Thirty-eight percent of patients had CNLDO affecting the right eye, 32% the left eye, and 31% of patients had bilateral nasolacrimal duct obstructions ($p<0.001$). At the time of the initial diagnosis, 66% presented

with matting alone, 18% presented with tearing alone, and 15% presented with both matting and tearing.

Discussion:

There is considerable variability in the reported incidence of nasolacrimal duct obstruction.[1–4] Early studies of relatively small Western populations have reported an incidence of only 5%.[1,2] More recently, a rate of 12% was observed in Japan.[3] These studies, however, suffer from referral bias and small sample sizes. A more robust, population-based cohort of 4,792 infants studied by Young and MacEwen, reported the highest prevalence of 20%.[4] The authors theorized that, because CNLDO often resolves spontaneously soon after birth, the lower rates observed in prior studies were the result of ocular examinations occurring months after birth. However, Young and MacEwen themselves first examined their patients at 8 weeks of age. In contrast, the present study reviewed the medical records of all children diagnosed with CNLDO, from a cohort of 17,713 newborns, beginning at birth.

Premature birth has, in a single prior report,[7] been shown to be associated with the development of CNLDO. Lorena and coauthors reported this association in a cohort of 400 infants in which 39 had CNLDO. They reasoned that, because the nasolacrimal duct is not fully developed until the 8th month of gestation, children born prematurely are less likely to have fully patent ducts.[7] This association was based on a small sample size. However, prematurity was similarly shown to be associated with the development of CNLDO in this current cohort of 17,713 children. Likewise, primary cesarean section has been shown, in a single prior report from Germany,[8] to be associated with an increased risk of developing CNLDO. The authors reported primary scheduled cesarean section increased the risk of CNLDO by 1.7 fold compared to children delivered vaginally. We were unable, however, with a significantly larger sample size, to find any association between cesarean birth and CNLDO in this cohort.

Presenting features and laterality of CNLDO in this cohort appear to be at odds with prior investigations. Tearing, for example, is the most oft reported symptom in published studies of CNLDO, occurring in approximately 80% to 90% of patients.[9,10] In contrast, two-thirds of the cases in this study presented with discharge alone, while tearing, alone or in combination with discharge, was observed in only one-third of patients. This difference may be due, in part, to the younger age at presentation for the current cohort in which tear production is not fully developed. Moreover, the right eye was more commonly involved with CNLDO, compared to the left eye, in this study. An explanation for the significantly more common involvement of the right nasolacrimal system is unknown and is likely to be clinically irrelevant. Bilateral involvement occurred in approximately one-third of cases, consistent with prior reports.[9–11]

There are a number of limitations to the findings in this study. The retrospective design is limited by non-standardized and incomplete documentation. Second, although the vast majority of patients in Olmsted County are managed by the two medical systems within the community, some residents may have sought care outside of the county, thereby underestimating the true incidence in this population. Third, infants were included only if

they presented to a community physician. However, access to and quality of early infant care is excellent in Olmsted County as evidenced by the early median age at diagnosis (5 weeks) in this large cohort. Additionally, some infants with CNLDO may be asymptomatic in the early months, resolve sometime thereafter, and ultimately go unnoticed by the patient's caretaker or physician. Others may be asymptomatic and avoid detection for years. However, in an attempt to capture such patients, a diagnosis of CNLDO could occur as late as age 5 years in the current study. Finally, our ability to generalize these findings to other populations is limited by the demographics of Olmsted County, a relatively homogeneous semi-urban Caucasian population.

In this large population-based cohort of infants observed in the first several months of life, congenital nasolacrimal duct obstruction was diagnosed in 1 in 9 live births. The obstruction appears to be associated with premature birth, and not cesarean delivery, and may be disproportionately more common among Caucasians compared to other populations. Mucopurulent discharge, unaccompanied by tearing, was the most common presenting feature.

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REFERENCES

1. Kendig EL, Guerry D. Congenital impatency on the naso-lacrimal duct. Arch Ophthalmol. 1948;39:193–204.
2. Kendig EL, Guerry D. The incidence of congenital impatency of the nasolacrimal duct. J Pediatr. 1950;36:212. [PubMed: 15404617]
3. Noda S, Hayasaka S, Setogawa T. Congenital nasolacrimal duct obstruction in Japanese infants: its incidence and treatment with massage. J Pediatr Ophthalmol Strabismus. 1991;28:20–22. [PubMed: 2019953]
4. MacEwen CJ, Young JD. Epiphora during the first year of life. Eye (Lond). 1991; 5(pt 5):596–600. [PubMed: 1794426]
5. Cassady JV. Developmental anatomy of the nasolacrimal duct. Arch Ophthalmol. 1952;47:141–58
6. Melton LJ. History of the Rochester Epidemiology Project. Mayo Clin Proc. 1996;71:266–74. [PubMed: 8594285]
7. Lorena SH, Silva JA, Scarpi MJ. Congenital nasolacrimal duct obstruction in premature children. J Pediatr Ophthalmol Strabismus. 2013;50:239–244 [PubMed: 23614467]
8. Spaniol K, Stupp T, Melcher C, Beheiri N, Eter N, Prokosch V. Association between congenital nasolacrimal duct obstruction and delivery by cesarean section. Am J Perinatol. 2015;32:271–276 [PubMed: 24971571]
9. Pediatric Eye Disease Investigator Group. Primary treatment of nasolacrimal duct obstruction with probing in children younger than 4 years. Ophthalmology. 2008;115(3):577–84. [PubMed: 17996306]
10. Kashkouli MB, Beigi B, Parvaresh MM, Kassaee A, Tabatabaee Z. Late and very late initial probing for congenital nasolacrimal duct obstruction: what is the cause of failure? The British Journal of Ophthalmology. 2003;87(9):1151–1153. [PubMed: 12928286]

11. Takahashi Y, Kakizaki H, Chan WO, Selva D. Management of congenital nasolacrimal duct obstruction. Acta Ophthalmologica. 2010;88:506–513. [PubMed: 19681790]

Table.

Historical Characteristics of Children Born in Olmsted County, MN from 1995-2004 by CNLDO Diagnosis.

Characteristic	Without CNLDO N=15715	With CNLDO N=1998	p-value
Gender, Number (%)			0.48 †
Male	8040 (51.2)	1039 (52.0)	
Female	7675 (48.8)	959 (48.0)	
Race/Ethnicity, Number (%)			<0.001 †
Caucasian	9679 (80.1)	1626 (89.1)	
Other	957 (7.9)	29 (1.6)	
Black	744 (6.2)	89 (4.9)	
Asian	709 (5.9)	81 (4.4)	
Not Reported	3626	173	
Delivered by C-section, Number (%)			0.26 †
No	12704 (80.8)	1594 (79.8)	
Yes	3011 (19.2)	404 (20.2)	
Prematurity (<37 weeks), Number (%)			0.002 †
No	14542 (92.5)	1809 (90.5)	
Yes	1173 (7.5)	189 (9.5)	
Age at Diagnosis in Weeks			-
Median (Q1, Q3)	-	5.2 (1.7, 15.7)	
Range	-	0.0, 250.3	
Primary Diagnosis Provider, %			-
Pediatrician	-	1545 (77.4)	
Family Practitioner	-	224 (11.2)	
Ophthalmology	-	102 (5.1)	
Other	-	76 (3.8)	
Emergency Department	-	46 (2.3)	
Nurse Practitioner	-	4 (0.2)	
Unknown	-	1	
Laterality, %			<0.001 †
OD	-	739 (37.5)	
OS	-	629 (31.9)	
Both	-	605 (30.7)	
Unknown	-	25	
Symptoms, %			
Discharge only	-	1324 (66.3)	
Tearing only	-	351 (17.6)	
Both	-	298 (14.9)	
Neither	-	25 (1.3)	

† Chi-square Test across CNLDO Diagnosis