Research Article

Study from Punctum to Valve, An Audit of Probing in Children

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Abstract

Objectives : To assess the type of obstruction, age-related outcomes, and success rates of primary and repeat probing in children with congenital nasolacrimal duct obstruction (CNLDO).

Methods : A prospective study was conducted on 426 children (625 eyes) aged 6–60 months with watering/discharge. Patients were divided into Group A (6–18 months), Group B (19–36 months), and Group C (37–60 months). Obstruction type (membranous/firm) was determined during probing. Infants <18 months initially underwent lacrimal sac massage. Probing was performed as primary or repeat . Outcomes were defined by complete symptom resolution and assessed at 1, 3, and 6 months.

Results : Membranous obstruction was observed in 91% of eyes; firm obstruction in 4%. Lacrimal massage resolved symptoms in 77.9% of Group A eyes.Out of primary probing performed probing success rates were 76.2% (Group A), 76.8% (Group B), and 50.8% (Group C).Out of Repeat probing success decreased with age: 78.5% (Group A), 56.6% (Group B), and 40.4% (Group C). Third probing had limited benefit (overall 14.2% success). Unilateral cases (53.28%) slightly outnumbered bilateral (46.71%).

Conclusion : Membranous obstruction constituted the majority of cases, while firm obstruction was infrequent. Lacrimal massage was highly effective in infants, with nearly 78% achieving symptom resolution. Primary probing demonstrated comparable success in younger age groups but declined markedly in older children. The success of repeat probings decreased progressively with age, underscoring the limited efficacy of multiple attempts. Overall, early diagnosis and timely intervention yield the most favourable outcomes.

Keywords : Congenital nasolacrimal duct obstruction, probing, lacrimal massage, membranous obstruction.

Introduction

Congenital nasolacrimal duct obstruction (CNLDO) is a common pediatric condition resulting from blockage in the lacrimal drainage system (Figure 1), most frequently at the valve of Hasner, located distally in the nasolacrimal duct. It can occur unilaterally or bilaterally [1,2]and shows no sex or genetic predisposition. Although about 70% of newborns are born with an imperforate Hasner valve, only 6–20% develop symptoms such as epiphora (excessive tearing) and mucopurulent discharge, which typically resolve spontaneously within the first year of life.

CNLDO affects around 6–20% of infants, with over 90% experiencing spontaneous resolution by one year. Of those who remain symptomatic beyond 12 months, anatomical anomalies such as punctal agenesis, congenital fistulas, craniofacial deformities, or distal duct obstructions may be contributing factors. The most common cause is incomplete canalization at the valve of Hasner. Other causes include bony narrowing of the duct, proximal outflow dysgenesis, and dacryocele, a distinct subtype characterized by nasolacrimal sac distension[3]. The nasolacrimal system originates from ectodermal tissue by the fifth week of gestation and canalizes around the eighth week. Tears drain from the lacrimal gland through the puncta, canaliculi, sac, and ultimately into the nasal cavity. Dysfunction at any point, most commonly the valve of Hasner, disrupts this flow [4].

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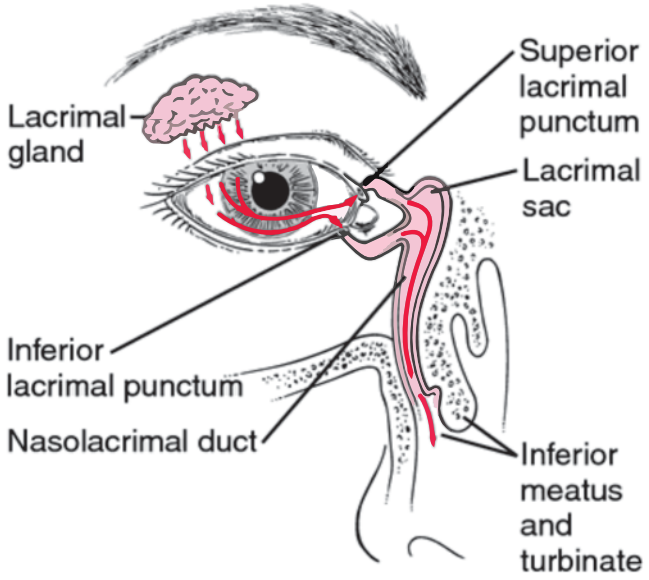

Figure 1 : Lacrimal Drainage System

Conservative Management

Observation remains the first-line approach for infants under 12 months, given high spontaneous resolution rates (32–95%). Studies show that resolution is most frequent in the first six months and that bilateral cases often resolve sequentially.[5,6,7] Lacrimal sac massage, particularly the Crigler maneuver, is widely used to expedite resolution. Regular caregiver education on proper massage technique significantly enhances outcomes.[8] Antibiotics are not routinely recommended and are reserved for cases with mucopurulent discharge or signs of infection. .High-pressure irrigation serves as an intermediate step between conservative treatment and surgery.[9,10] Success rates vary (33–100%) and are generally better in infants under 18 months. While it mimics massage by dislodging obstructions.[11] Probing (Figure 2) remains the gold standard for persistent CNLDO.[12] Early probing achieves success rates of 75–89%, with slightly lower rates for bilateral cases.[13] Delayed probing is also effective, especially in children aged 13–24 months. However, success rates decline beyond age two.

Repeated Probing and Additional Interventions

When initial probing fails, repeat probing is recommended after 1–2 months. Success declines with age.[14] Balloon catheter dilation (BCD)[15] offers another minimally invasive option with resolution rates around 77–90%. It's particularly useful for complex cases, although cost can be a limiting factor. Dacryocystorhinostomy (DCR)[16] is reserved for refractory cases or those with anatomical abnormalities such as bony obstructions or persistent dacryocystoceles. CNLDO is a common and typically benign condition in infancy, often resolving with conservative treatment. For persistent cases, massage, probing, intubation, or balloon dilation provide a stepwise, effective treatment strategy. Timely diagnosis, patient monitoring, and caregiver education are key to successful outcomes.

METHODS

This prospective study was conducted , from July 2023 to June 2024 in the out patient department of Upgraded department of Ophthalmolgy LLRM Medical college ,Meerut. Study was done to evaluate the type of obstruction and outcomes of probing in congenital nasolacrimal duct obstruction (CNLDO). A total of 426 children (625 eyes) aged 6–60 months presenting with watering and/or discharge were enrolled and divided into three groups: Group A (6–18 months), Group B (19–36 months), and Group C (37–60 months). Children with tearing due to facial malformations, eyelid malpositions, abnormal nasal bone structure, punctal agenesis/ectopia, congenital lacrimal sac fistulas, history of prior probing, no improvement after three probings, complex obstruction, or lack of consent were excluded. Detailed history and ocular examination, including discharge type, were recorded, and obstruction was classified as membranous or firm during probing. Primary probing was performed for untreated cases and repeat probing for persistent symptoms after previous probing. Success was defined as complete resolution of watering/discharge, while failure was persistent symptoms requiring further surgical intervention. Patients were followed up at 1, 3, and 6 months to assess outcomes and recurrence. Institutional Ethics Committee approval was obtained, and written informed consent was taken from parents/guardians with confidentiality maintained.

Results

LATERALITY	NUMBER OF PATIENTS	PECENTAGE
UNILATERAL	227	53.28
BILATERAL	199	46.71
TOTAL	426	100

Table I : Distribution of patients according to laterality

A total of 426 children (625 eyes) were included, with 221 males (51.87%) and 205 females (48.12%).The distribution of patients according to laterality and type of discharge are summarised in Table I and Table II respectively.

TYPE OF DISCHARGE	NUMBER OF EYES	PERCENTAGE %
MUCOPURULENT DISCHARGE	200	32
WATERY DISCHARGE	208	33.28
NO DISCHARGE	217	34.72
TOTAL	625	100

Table II : Types of discharge among patients

Children were divided into 3 groups according to their age in months(6-18 months,19-36 months and 37-60 months). Patients between 6 to 18 months old made up about 57.92% of the sample, those between 19 to 36 months made up about 24.16%, and 17.92% fell in the category of 37 to 60 months of age. The distribution illustrates a steady decrease in frequency as age advances, with fewer participants in the higher ages. The effectiveness of lacrimal massage for children is summarisedin Table III.

AGE (6-18months)	NUMBER OF EYES	PERCENTAGE %
IMPROVEMENT AFTER LACRIMAL MASSAGE	282	77.9
NO IMPROVEMENT AFTER LACRIMAL MASSAGE	80	22.09
TOTAL	362	100

Table III : Effect of lacrimal massage (age 6-18months)

The results of the initial probing for CNLDO were compared among three different age groups: 6–18 months, 19–36 months, and 37–60 months, totaling 343 eyes. The group 6–18 months had the highest success rate, reflecting that probing is better in young infants. As the patient's age increased, especially in the 37–60 months, the success ratio decreased,fact that proves the difficulty with the treatment of CNLDO in older kids. Results of a 2nd probing for CNLDO in three age groups: 6 to 18months, 19 to 36 months, and 37 to 60 months (with a total of 91 patients) shows that probing of the youngest group (6 to 18 months) was successful in 78.5% patients, and in 14.2 % it was unsuccessful. In age group (19 to 36 months) 56.6% was successful with 26.6% unsuccessful. Yet, the oldest group (37 to 60 months) had only 40.4% success, which indicated a drop in effectiveness by a considerable margin. Third probing results: in the youngest age group, two children we probed, with 50% success rate. In the middle age group, 8 children were probed, with 1 successful and six failed results, reflecting a low success rate.Additionally, there were follow-up difficulties, withlost to follow-up in both the middle and oldest groups. The findings of efficacy of repeat probing is tabulated in Table IV

AGE GROUP (months)	PRIMARY PROBING	REPEAT PROBING
6-18 months	80 (23.32%)	14(15.3%)
19-36 months	151(44.02%)	30(32.96%)
37-60 months	112 (32.65%)	47(51.64%)
TOTAL	343 (100%)	91(100%)

Table IV : Depicting the requirement of primary and repeat probing

Outcomes demonstrated a clear decrease in probing efficacy with increasing age and in cases with firm obstruction.Table V classifies the type of obstruction on the basis of findings of probing.

TYPES OF OBSTRUCTION	NUMBER OF EYES	PERCENTAGE (%)
MEMBRANOUS	569	91
FIRM	25	4
LOST TO FOLLOW UP	31	5
TOTAL	625	100

Table V : Distribution according to type of obstruction

Discussion

This prospective study evaluated the influence of age, obstruction type, and laterality on the outcomes of primary and repeat probing for congenital nasolacrimal duct obstruction (CNLDO) in a large cohort of 426 children (625 eyes). Our findings reaffirm the critical role of early intervention in optimizing outcomes, with both primary and repeat probing showing a marked decline in success rates with increasing age.

In our cohort, membranous obstruction accounted for 91% of cases, with firm obstruction observed in only 4%, consistent with previous reports indicating the predominance of membranous blocks in CNLDO and their higher responsiveness to probing which showed same results as Perveen et al., 2014[17]and Honavar et al. 2000.[18] Lacrimal sac massage alone resolved symptoms in 77.9% of eyes in the 6–18 month age group, aligning with prior studies that reported spontaneous or massage-induced resolution in 70–90% of infants within the first year same as Nelson et al.[19] and Kushner.[20]

Primary probing was most successful in Groups A and B (76.2% and 76.8%, respectively), but declined sharply to 50.8% in Group C. This downward trend mirrors the observations of Ulaş et al. (2023), who noted an 88.9% success rate in children under 24 months compared to 70% in older children. Repeat probing showed reduced efficacy, with success rates of 78.5%, 56.6%, and 40.4% across the three age groups, respectively. Our overall second probing success rate (51.6%) is comparable to the 52–56% reported by Katowitz et al,.[21] highlighting the diminishing returns of repeated interventions with age. Third probing was rarely effective, with only 14.2% success, supporting earlier findings that additional blind probing beyond the second attempt offers limited benefit and that alternative procedures such as silicone intubation or balloon dacryoplasty should be consideredas PEDIG.[22]

Laterality analysis revealed unilateral cases (53.28%) were slightly more common than bilateral (46.71%), with the latter potentially representing more complex anatomical variations and aligning with reports of lower success in bilateral diseaseas Świerczyńska et al.[23]. Notably, gender distribution

was nearly equal, with no significant differences in outcome, consistent with prior studies like Sathiamoorthi et al.[24]

Our results strengthen the argument for a stratified management approach: conservative treatment in infants <18 months, primary probing before two years in unresolved cases, and timely escalation to adjunctive procedures in older children or in firm obstructions. The high success rate in membranous cases underscores the importance of obstruction type as a prognostic factor.

This study has some limitations that must be considered when interpreting the findings : It was conducted at a single center, which may limit generalizability of the results to broader populations .

Variations in the surgical techniques employed by different surgeons could have introduced operator dependent bias .

Conclusion

Early diagnosis and timely management of CNLDO are crucial for achieving optimal outcomes. This study demonstrates that membranous obstructions, which constitute the majority of cases, respond well to conservative measures such as lacrimal sac massage in infants under 18 months and to probing before two years of age. Probing success declines significantly with increasing age and in firm or complex obstructions; however, repeat probing remains a valuable option in uncomplicated cases prior to considering more invasive interventions. These findings reinforce the need for prompt referral, age-stratified treatment protocols, and individualized management based on obstruction type to maximize success rates and minimize the need for surgical procedures.

CONFLICTS OF INTEREST

There is no conflicts of interest and financial support .

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