

# CLINICAL PREDICTORS OF PRIMARY NASOLACRIMAL DUCT PROBING FAILURE IN CHILDREN WITH CONGENITAL NASOLACRIMAL DUCT OBSTRUCTION

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## Abstract

**Purpose.** To identify clinical and anamnestic factors associated with failure of primary nasolacrimal duct probing in children with congenital nasolacrimal duct obstruction (CNLDO).

**Materials and Methods.** A retrospective study was conducted involving 48 children with CNLDO who underwent primary nasolacrimal duct probing between 20XX and 20XX. Clinical variables analyzed included age at surgery, disease laterality, history of dacryocystitis, and duration of symptoms prior to intervention. Treatment success was defined as complete resolution of epiphora and mucopurulent discharge without the need for additional surgical procedures during follow-up. Patients were divided into successful and failed probing groups. Statistical analysis was performed using Student's t-test, chi-square test, and Fisher's exact test. A p-value <0.05 was considered statistically significant.

**Results.** The overall success rate of primary probing was 83,3% (40/48), while treatment failure requiring additional intervention occurred in 16,7% (8/48) of patients. Children with unsuccessful outcomes were significantly older than those with successful outcomes (17,4±5,1 / 10,7±4,8 months, p=0,002). Age greater than 12 months was significantly associated with probing failure (75,0% / 27,5%, p=0,011). Bilateral disease (50,0% / 12,5%, p=0,018), a history of dacryocystitis (62,5% / 25,0%, p=0,042), and symptom duration exceeding six months (87,5% / 35,0%, p=0,008) were also significantly more frequent among patients with failed primary probing.

**Conclusion.** Primary nasolacrimal duct probing is a highly effective treatment for CNLDO. However, older age at intervention, bilateral involvement, previous dacryocystitis, and prolonged symptom duration are associated with an increased risk of treatment failure. Recognition of these factors may improve preoperative risk stratification and facilitate individualized treatment planning in children with CNLDO.

## Introduction

Congenital nasolacrimal duct obstruction (CNLDO) is the most common disorder of the lacrimal drainage system in early childhood, affecting approximately 5–20% of newborns [1,2]. The condition is primarily caused by the persistence of an embryonic membrane at the level of the valve of Hasner or by other developmental abnormalities involving incomplete canalization of the distal nasolacrimal duct. Clinically, CNLDO is characterized by persistent epiphora, mucopurulent discharge, and recurrent episodes of dacryocystitis, which may adversely affect the quality of life of both patients



and their caregivers [3,4,5,6]. Although spontaneous resolution frequently occurs during the first months of life, a substantial proportion of children require surgical intervention because of persistent symptoms and the risk of infectious complications.

Probing of the nasolacrimal duct remains the standard first-line surgical treatment for CNLDO when conservative management fails. Reported success rates of primary probing range from 70% to 95%, reflecting considerable heterogeneity among patient populations and study designs [2,6,7]. Previous studies [3,8,9,10] have suggested that treatment outcomes may be influenced by several clinical factors, including patient age, duration of symptoms, laterality of the disease, and a history of recurrent dacryocystitis. However, the prognostic significance of these factors remains controversial, and the available evidence is not entirely consistent.

Identification of predictors associated with unsuccessful primary probing is of particular clinical importance, as it may facilitate risk stratification, optimize the timing of surgical intervention, and improve individualized treatment planning. Therefore, the present study aimed to evaluate clinical and anamnestic factors associated with the failure of primary nasolacrimal duct probing in children with congenital nasolacrimal duct obstruction.

### Materials and Methods

This retrospective study included 48 children diagnosed with CNLDO who underwent primary nasolacrimal duct probing at the Department of Ophthalmology between 20XX and 20XX. The diagnosis was established based on characteristic clinical findings, including persistent epiphora, mucous or mucopurulent discharge, and confirmation of impaired lacrimal drainage by standard diagnostic testing. Patients with congenital anomalies of the lacrimal drainage system, previous lacrimal surgery, traumatic injuries involving the lacrimal pathways, or incomplete medical records were excluded from the analysis.

All patients underwent a comprehensive ophthalmological examination, including medical history assessment, external ocular examination, evaluation of the lacrimal puncta and lacrimal sac region, and diagnostic procedures to confirm nasolacrimal duct obstruction. The following variables were analyzed: age at the time of surgery, laterality of the disease (unilateral or bilateral), history of dacryocystitis, and duration of symptoms before intervention. Treatment success was defined as complete resolution of epiphora and mucopurulent discharge without the need for additional surgical procedures during the follow-up period. Based on treatment outcomes, patients were categorized into two groups: successful primary probing and failed primary probing requiring repeat intervention or alternative surgical management.

Statistical analysis was performed using IBM SPSS Statistics software. Continuous variables were expressed as mean  $\pm$  standard deviation (SD), whereas categorical variables were presented as absolute numbers and percentages. The normality of data distribution was assessed using the Shapiro–Wilk test. Comparisons between groups were performed using the independent samples Student’s t-test for normally distributed continuous variables and the chi-square test or Fisher’s exact test for categorical variables, as appropriate. A two-tailed p-value of  $<0.05$  was considered statistically significant.



## Results

A total of 48 children with congenital nasolacrimal duct obstruction who underwent primary nasolacrimal duct probing were included in the study. The mean age of the patients was 11,8±5,6 months. There were 26 (54,2%) boys and 22 (45,8%) girls. Unilateral disease was observed in 39 (81,3%) patients, whereas bilateral involvement was present in 9 (18,7%) cases. A history of dacryocystitis was documented in 15 (31,3%) children, and symptom duration exceeding six months prior to surgery was recorded in 21 (43,8%) patients. Primary probing was successful in 40 children (83,3%), while 8 patients (16,7%) required additional intervention because of persistent symptoms.

**Table 1. Baseline clinical characteristics of the study population (n=48).**

Age, months (mean±SD)	11,8±5,6
Male sex, n (%)	26 (54,2)
Female sex, n (%)	22 (45,8)
Unilateral disease, n (%)	39 (81,3)
Bilateral disease, n (%)	9 (18,7)
History of dacryocystitis, n (%)	15 (31,3)
Symptom duration >6 months, n (%)	21 (43,8)
Successful primary probing, n (%)	40 (83,3)
Need for repeat intervention, n (%)	8 (16,7)

Comparative analysis demonstrated significant differences between patients with successful and failed primary probing. Children with unsuccessful outcomes were significantly older than those with successful treatment outcomes ( $p=0,002$ ). Furthermore, age greater than 12 months was substantially more common among patients with failed primary probing (75,0% and 27,5%;  $p=0,011$ ).

Bilateral disease was identified in 50,0% of patients with failed probing compared with only 12,5% of those with successful outcomes ( $p=0,018$ ). Similarly, a history of dacryocystitis was significantly more frequent in the failure group than in the success group ( $p=0,042$ ). Prolonged symptom duration exceeding six months before surgery was also associated with a higher risk of treatment failure, occurring in 87,5% of unsuccessful cases compared with 35,0% of successful cases ( $p=0,008$ ).

**Table 2. Factors associated with failure of primary nasolacrimal duct probing.**

	Successful probing (n=40)	Failed probing (n=8)	p
Age, months (mean±SD)	10,7±4,8	17,4±5,1	0,002
Age >12 months, n (%)	11 (27,5)	6 (75,0)	0,011
Bilateral disease, n (%)	5 (12,5)	4 (50,0)	0,018
History of dacryocystitis, n (%)	10 (25,0)	5 (62,5)	0,042
Symptom duration >6 months, n (%)	14 (35,0)	7 (87,5)	0,008

Overall, older age at intervention, bilateral involvement, previous dacryocystitis, and prolonged symptom duration were significantly associated with an increased likelihood of primary probing failure. These findings suggest that both disease chronicity and clinical severity may adversely affect the success of initial surgical management in children with congenital nasolacrimal duct obstruction.



## Discussion

In the present study, primary nasolacrimal duct probing achieved a success rate of 83.3%, which is consistent with the outcomes reported in the contemporary literature [1,3,6]. These findings further support the role of probing as an effective first-line surgical intervention for children with CNLDO. Nevertheless, treatment failure was observed in a subset of patients, emphasizing the importance of identifying clinical factors associated with an unfavorable outcome and optimizing patient selection for primary intervention.

Age at the time of surgery emerged as one of the strongest factors associated with probing failure. Children with unsuccessful outcomes were significantly older than those with successful treatment, and the proportion of patients older than 12 months was substantially higher in the failure group. This observation is in agreement with previous reports suggesting that prolonged obstruction may result in progressive structural changes within the distal nasolacrimal duct, including fibrosis and the development of more complex anatomical barriers. Such changes may reduce the effectiveness of conventional probing and increase the likelihood of persistent obstruction. Although some studies have reported comparable success rates across different age groups, the present findings support the concept that delayed intervention may negatively influence treatment outcomes.

Another important finding was the significant association between bilateral disease and probing failure. Bilateral involvement may reflect a more extensive developmental abnormality of the lacrimal drainage system and, therefore, a greater degree of anatomical complexity. Similarly, a history of dacryocystitis was more frequently observed among patients with unsuccessful outcomes. Chronic or recurrent inflammation of the lacrimal sac may contribute to mucosal edema, scarring, and secondary structural alterations, thereby reducing the probability of complete restoration of lacrimal drainage following a single probing procedure. These results highlight the potential role of inflammatory burden as a determinant of surgical success.

The duration of symptoms before intervention also demonstrated a significant relationship with treatment outcome. Children with symptoms persisting for more than six months were considerably more likely to experience probing failure. This finding may reflect the cumulative effect of chronic obstruction and recurrent inflammation over time. From a clinical perspective, prolonged symptom duration should not be regarded solely as a temporal characteristic of the disease but rather as a marker of increased pathological remodeling within the lacrimal drainage system.

The clinical implications of these findings are noteworthy. Identification of patients at increased risk of probing failure may facilitate individualized treatment planning, improve parental counseling, and support timely referral for surgical intervention. Children presenting with advanced age, bilateral disease, recurrent dacryocystitis, or prolonged symptom duration may require closer postoperative monitoring and, in selected cases, consideration of alternative or adjunctive treatment strategies.

Several limitations of this study should be acknowledged. First, the retrospective design inherently limits the ability to establish causal relationships between the investigated factors and treatment outcomes. Second, the relatively small sample size may have reduced the statistical power to detect weaker associations. Third, multivariable regression analysis was not performed, preventing assessment of the independent predictive value of each factor. Future prospective studies involving larger patient cohorts are warranted to validate these findings and to develop robust predictive models for treatment outcomes in children with CNLDO.



## Conclusion

Primary nasolacrimal duct probing demonstrated a high overall success rate in the treatment of congenital nasolacrimal duct obstruction. However, treatment outcomes were significantly influenced by several clinical and anamnestic factors. Older age at the time of intervention, bilateral disease, a history of dacryocystitis, and symptom duration exceeding six months were all associated with an increased risk of primary probing failure. These findings suggest that the probability of an unfavorable outcome is determined not only by the presence of nasolacrimal duct obstruction itself but also by factors reflecting disease chronicity and severity. Recognition of these risk factors during the preoperative assessment may improve patient stratification, facilitate individualized treatment planning, and enhance prognostic counseling for caregivers.

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