

Clinical Outcome and Factors Predictive of Outcome of Nasolacrimal Duct Probing for Congenital Nasolacrimal Duct Obstruction in Younger and Older Children Performed at a Regional Institute of Ophthalmology in Western India.

Garima Agrawal¹

¹Associate Professor in Ophthalmology, Department of Oculoplastics and Ocular Oncology. M&J Western Regional Institute of Ophthalmology, BJ Medical College, Medicity, Baliya Limbdi, Ahmedabad ,Gujarat. 380016.

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ABSTRACT

Background: 2-6 % of full term newborn children manifest symptoms of congenital nasolacrimal duct obstruction. The most frequent presentation is tearing associated with matting of the eyelashes and recurrent infection. We designed a study to compare the success rate of nasolacrimal duct probing for congenital nasolacrimal duct obstruction in younger and older children seen at our western regional institute of ophthalmology. Probing under general anaesthesia was done in a cohort of children presenting with congenital nasolacrimal duct obstruction . The demography ,clinical presentation, management and outcome of the cases were documented. Factors associated with success of the procedure were documented. Aim: The aim of the study was to document the clinical outcome and factors predictive of success of nasolacrimal duct probing for congenital nasolacrimal duct obstruction in younger and older children seen at our Western Regional Institute of Ophthalmology in India. **Methods:** The study was carried out at our Western Regional Institute of Ophthalmology. The study period was July 2018 to May 2019 . The study was a prospective interventional outcome study in an institutional cohort. Probing was reserved for patients with recurrent infection or acute dacryocystitis in children between 6 months to 9 months of age . Initial probing was the treatment of choice for children between one year and three years as well as older children above three years upto twelve years. Probing was performed under general anaesthesia. Patients were followed at 1 week, 3 weeks, 3 months and 6 months after the procedure. Outcome was defined as resolution of symptoms and signs of nasolacrimal duct obstruction as observed by the ophthalmologist as well as reported by the parents within 3 weeks of the procedure and continued remission for 6 months post procedure. Probing was done twice before the procedure was declared a failure. Statistical Analysis: Student t test and chi square test was used for statistical analysis . $p < 0.05$ was taken as significant. The Fischer exact test was used to calculate the chi square value. **Results:** 25 eyes of 18 children with congenital nasolacrimal duct obstruction were subjected to probing during the time of the study. The age range was six months to eleven years. The overall success rate was 16/25(64%). The success rate for children less than or equal to three years was 8/9 (89%).The success rate in the age group three years to less than or equal to seven years was 7/12 (58.3%) . The success rate dropped to 25% (1/4) for children more than seven years of age. The success rate of nasolacrimal duct probing was observed to reduce with increasing age of the child. Persistent dacryocystitis, firm obstruction on nasolacrimal duct probing and repeat probing were statistically significantly associated with the outcome of probing. The children with any of the above factors had a lower success rate of nasolacrimal duct probing. **Conclusion:** The results of our study are comparable to other studies reporting outcome and predictive factors of nasolacrimal duct probing in younger and older children with congenital nasolacrimal duct obstruction. Children less than or equal to three years of age with congenital nasolacrimal duct obstruction could be successfully managed with nasolacrimal duct probing with great outcomes. Older children too had a reasonable outcome and age did not appear to be a significant factor affecting outcome. A firm obstruction on probing, persistent dacryocystitis and repeat procedure are significantly associated with the outcome of nasolacrimal duct probing. **Conclusion:** Children less than or equal to three years of age with congenital nasolacrimal duct obstruction can be successfully managed with nasolacrimal duct probing with great outcomes. Older children too had a reasonable outcome and age did not appear to be a significant factor affecting outcome. Thus in the light of the fact that probing is a safe and effective procedure , it appears logical to give a trial of initial nasolacrimal duct probing even to children older than three years. A firm obstruction on probing, persistent dacryocystitis and repeat procedure are significantly associated with the outcome of nasolacrimal duct probing.

Keywords: Congenital nasolacrimal duct obstruction, Nasolacrimal duct probing, younger and older children, predictive factors.

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INTRODUCTION

Congenital nasolacrimal duct obstruction is a frequent presentation to the outpatient department of our western regional institute of ophthalmology. Our centre is an important tertiary referral centre for children born with this clinical malady and have not improved with treatment at other centres. 30% infants have an obstructed nasolacrimal duct at birth.^[1] Only 2-6% of full term newborn children manifest symptoms of congenital nasolacrimal duct obstruction. The most frequent presentation is tearing associated with matting of the eyelashes and recurrent infection. The most common cause of obstruction is incomplete canalization of the nasolacrimal duct with a vestigial membrane at its distal end (valve of Hasner).^[1] Conservative management of the child with massage and topical antibiotics is recommended. More definitive treatment in the form of probing may be required for cases that fail to canalize by nine months to one year of age or early in cases with recurrent infection, acute dacryocystitis or the presence of congenital dacryocystocele.^[1]

Nasolacrimal duct probing is carried out under general anaesthesia. Probing is a simple, safe and relatively atraumatic procedure. It is deemed as one of the safest paediatric procedures. The success of probing has been reported to decrease as the age of the child increases. The procedure has been reported to have high success rates for children less than 24 months of age (97% to 75%). A number of workers have reported initial probing in older children above 2 years of age with success rates varying from 80.9% to 54.7%.

We designed a study to compare the success rate of nasolacrimal duct probing for congenital nasolacrimal duct obstruction in younger and older children seen at our western regional institute of ophthalmology in India. Probing under general anaesthesia was done in a cohort of children presenting with congenital nasolacrimal duct obstruction. The demography, clinical presentation, management and outcome of the cases were documented. Factors associated with success of the procedure were documented.

Aim:

The aim of the study was to document the clinical outcome and factors predictive of success of nasolacrimal duct probing for congenital nasolacrimal duct obstruction in younger and older children seen at our Western Regional Institute of Ophthalmology in India.

Name & Address of Corresponding Author

Dr. Garima Agrawal
Associate Professor in Ophthalmology,
Department of Oculoplastics and Ocular Oncology,
M&J Western Regional Institute of Ophthalmology,
BJ Medical College, Medicity, Baliya Limbdi,
Ahmedabad,
Gujarat. 380016.

MATERIALS AND METHODS

The study was carried out at our Western Regional Institute of Ophthalmology. The study period was July 2018 to May 2019. The study was a prospective interventional outcome study in an institutional cohort. Ethical approval was taken from the institutional review board. The diagnosis of congenital nasolacrimal duct obstruction was made on the basis of a history of constant watering from the eye since birth. The other associated signs include matting of eyelashes, regurgitation of clear, mucoid or mucopurulent fluid on pressure over the lacrimal sac, presence of discharge, chronic or acute dacryocystitis. Other causes of epiphora pertaining to the eyelids, ocular surface and congenital glaucoma were ruled out. Cases of punctal, canalicular or common canalicular block on probing were excluded from our study. All patients were subjected to a thorough clinical examination. The patients of age less than 9 months were treated with massage four times a day and topical moxifloxacin 0.5% as and when discharge was seen. Probing was reserved for patients with recurrent infection or acute dacryocystitis in children between 6 months to 9 months of age. Initial probing was the treatment of choice for children between one year and three years as well as older children above three years upto twelve years. Informed consent was taken from the parents of the patient. Probing was performed under general anaesthesia. Patients were followed at 1 week, 3 weeks, 3 months and 6 months after the procedure. Outcome was defined as resolution of symptoms and signs of nasolacrimal duct obstruction as observed by the ophthalmologist as well as reported by the parents within 3 weeks of the procedure and continued remission for 6 months post procedure. Probing was done twice before the procedure was declared a failure.^[2]

Factors predictive of the outcome were identified.

Statistical Analysis

Student t test and chi square test was used for statistical analysis. $p < 0.05$ was taken as significant. The Fischer exact test was used to calculate the chi square value.

RESULTS

25 eyes of 18 children with congenital nasolacrimal duct obstruction were subjected to probing in the time of the study.

[Table 1] shows the demographic profile of the patients. We present data of consecutive 18 children with congenital nasolacrimal duct obstruction who underwent probing at our institute during the study period of July 2018 to May 2019. There were eight boys and ten girls. Seven children had bilateral involvement and an equal number had only the left eye involved. Four children had involvement of the

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right eye only. Five children were less than or equal to three years of age. Eight children were between three and seven years while four were older than seven years. The oldest child seen was eleven years of age. It is observed that a high number of patients were of preschool age (>3 years to 7 years). This may reflect the concern of the parents just before the child goes to school. Our Institute is a tertiary referral centre with many patients being referred to us for treatment in difficult cases. There appears to be an equivocal distribution in other age groups.

Table 1: Patient Demographics

Age	Number (Percentage)
< 9 months	1 (5)
9 months to <=1year	2 (11)
>1to<=3 years	3 (17)
>3to <=7years	8 (44)
>7 to <=12years	4 (22)
Gender	
Male	8 (44)
Female	10 (56)
Laterality	
OD only	4(22)
OS only	7 (39)
Bilateral	7 (39)

[Table 2] shows the clinical presentation of congenital nasolacrimal duct obstruction. Watering, regurgitation on pressure over the lacrimal sac, matting of the eyelashes and increased tear lake were seen in all patients. A six month old baby had a presentation of acute dacryocystitis. The child was treated with oral and topical antibiotics till the inflammation was reduced and then subjected to nasolacrimal duct probing. Discharge at the time of presentation was seen in fourteen patients. The discharge was mucoid in eleven patients and mucopurulent in three. Chronic persistent dacryocystitis was seen in eight patients. Recurrent conjunctivitis was seen in seven patients. We did not come across a case of congenital dacryocystocele.

Table 2: Clinical presentation of Congenital Nasolacrimal duct Obstruction

Presentation	Number(percentage)
Watering	25 (100)
Regurgitation on pressure over lacrimal sac	25 (100)
Mattering of the eyelids	25 (100)
Increased tear lake	25 (100)
Mucoid Discharge	11 (44)
Mucopurulent discharge	3 (12)
Acute dacryocystitis	1 (4)
Persistent dacryocystitis	8(32)
Pyo-mucocele	1 (4)
Recurrent conjunctivitis	7 (28)
Congenital dacryocystocele	None

[Table 3] shows the outcome of probing in twenty five eyes of eighteen children as per the age group. Four eyes of three children who were six months, nine months and one year of age who underwent probing had a successful outcome. Five eyes of three

children aged two years were probed. Probing was successful in four eyes and one eye of a child with bilateral presentation had a failed outcome. Twelve eyes of eight children in the age group of more than three and equal to or less than seven years were subjected to initial probing. The procedure was successful in seven out of twelve eyes probed. Four eyes of four children of ages eight years, nine years, ten years and eleven years were probed initially for congenital nasolacrimal duct obstruction. The procedure was successful in one child. A firm obstruction was seen in the three eyes that failed the procedure.

Table 3: Outcome of Nasolacrimal Duct Probing as per age group

Age Group for Probing	Outcome [Successful cases/all cases (percentage)]
Age	
< 9 months	1 /1 (100)
9 months to <=1year	3 /3 (100)
>1to<=3 years	4 /5 (80)
>3 to <=7years	7 /12 (58.3)
>7 to <=12years	1 /4 (25)

Table 4: Success of probing in younger versus older children

Age Group	Successful Probing	Failed Probing
0 to <= 3years	8	1
>3years to <= 7 years	7	5
>7years to <= 12 years	1	3
Total	16	9

Chi square statistic is 5.2276. The p value is 0.073255. The result is not significant at $p < 0.05$.

Table 5: Factors predictive of the outcome of Nasolacrimal Duct Probing

Factor	Successful Probing	Failed Probing	Total	P value
Age				
<=3years	8	1	9	$p = 0.08$
>3 years	8	8	16	
Age				
<= 7 years	15	6	21	$p = 0.11$
>7 years	1	3	4	
Laterality				
Unilateral	9	2	11	$p = 0.20$
Bilateral	7	7	14	
Procedure				
Initial	14	11	25	$p = 0.0354$
Repeat	2	9	11	
Type of Obstruction on Probing				
Membranous	15	1	16	$p = 0.0001$
Firm	1	8	9	
Persistent Dacryocystitis				
None	14	3	17	$p = 0.0099$
Present	2	6	8	

[Table 4] shows the statistical analysis of the success of nasolacrimal duct probing in younger versus older children using the chi square test for a 3*2 contingency table to know the statistical significance

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of the outcome. The chi square value was 5.22 and the p value was 0.07. Notwithstanding that the success percentage of nasolacrimal duct probing reduced with age, the result was statistically not significant at a p value of 0.07.

[Table 5] shows the factors predictive of the outcome of nasolacrimal duct probing. Notwithstanding that the success percentage of nasolacrimal duct probing decreases with increasing age [Figure 1], we could not find a statistically significant association between the two. The p value for data comparing the success of nasolacrimal duct probing in children ≤ 3 years and children above 3 years was 0.08. The p value for data comparing the success of nasolacrimal duct probing in children ≤ 7 years and above 7 years was 0.11. These values were statistically not significant at $p < 0.05$.

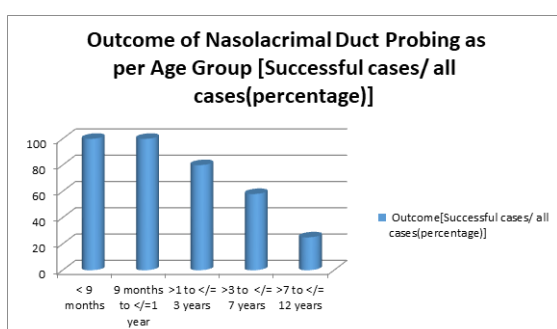


Figure 1: Graphical Representation of Success of Nasolacrimal Duct Probing as per Age Group.



Figure 2: A eight year old child with bilateral congenital nasolacrimal duct obstruction.

Congenital nasolacrimal duct obstruction in the right eye of a eight year old child. Note the discharge at the medial canthus in the right eye. There is an increased tear lake in both eyes.

Presence of bilateral nasolacrimal duct obstruction was seen in seven children and a unilateral presentation was seen in eleven cases. Nine out of eleven eyes with unilateral presentation were successfully probed. Seven eyes of children with bilateral nasolacrimal duct obstruction were successfully probed. Two and seven eyes in the unilateral and bilateral group respectively failed probing. p value at 0.20 was statistically not significant.

Twenty five cases were subjected to initial probing. Fourteen cases were successful in the first attempt. Eleven cases were subjected to a repeat probing. Two cases of repeat probing were successful and nine cases failed a repeat attempt at probing. The p value was statistically significant at 0.0354. While doing this analysis we have taken initial procedure as the one done at our institute at the time of presentation of the patient. A history of a previous procedure elsewhere was not taken as the initial procedure.



Figure 3: Probing of the Nasolacrimal Duct.

Probing of the nasolacrimal duct. Note the probe inserted in the nasolacrimal duct.



Figure 4: Postoperative patient after Nasolacrimal Duct Probing.

Resolution of discharge and wetting in the right eye in early postoperative period.

Nasolacrimal duct probing was successful in sixteen out of twenty five cases. Fifteen of these cases had a membranous type of congenital nasolacrimal duct obstruction. Only one case had a firm type of congenital nasolacrimal duct obstruction that could be successfully probed in two attempts. Eight of the nine cases that failed probing had a firm type of nasolacrimal duct obstruction. Only one patient with failed probing had a membranous type of congenital nasolacrimal duct probing. The p value comparing the successful outcome of probing of membranous versus firm obstruction was 0.0001. This value was statistically significant at $p < 0.05$.

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Persistent dacryocystitis was seen in eight eyes. Two of these were probed successfully. Six eyes in this group failed probing. Fourteen eyes without persistent dacryocystitis could be probed successfully. Three eyes without persistent dacryocystitis failed probing. The p value comparing the two groups was 0.0099. This was statistically significant.

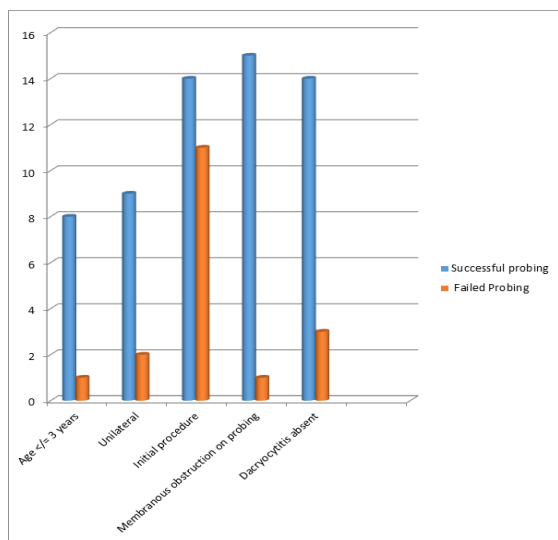


Figure 5: Graphical representation of factors associated with successful outcome of nasolacrimal duct probing.

DISCUSSION

25 eyes of 18 children with congenital nasolacrimal duct obstruction were subjected to probing during the time of the study. The age range was six months to eleven years. The overall success rate was 16/25(64%). The success rate for children less than or equal to three years was 8/9 (89%).The success rate in the age group three years to less than or equal to seven years was 7/12 (58.3%). The success rate dropped to 25% (1/4) for children more than seven years of age. The success rate of nasolacrimal duct probing was observed to reduce with increasing age of the child.

Persistent dacryocystitis, firm obstruction on nasolacrimal duct probing and repeat probing were statistically significantly associated with the outcome of probing. The children with any of the above factors had a lower success rate of nasolacrimal duct probing.

In our previous study on the clinical presentation, management and outcome of hundred consecutive cases of congenital nasolacrimal duct obstruction seen at a regional institute of ophthalmology ,massage with topical antibiotics were given to all patients. Probing was done in 37 children. The age group for probing was 6 months to four years. Older children were subjected to an initial dacryocystorhinostomy. Repeat probing was

required in nine children. Two out of these nine children required probing with silicone intubation with inferior turbinate infraction. Four children were managed with dacryocystorhinostomy. The success rate of various procedures were 60% for conservative management, 70.3% for probing, 77.8% for repeat probing, 50% for probing with silicone intubation with inferior turbinate infraction and 75% for dacryocystorhinostomy.^[2]

Hanover SG et al reported the outcome of probing for congenital nasolacrimal duct obstruction for children 2 years and older. 73.3% patients (44 of 60) had resolution after one attempt of probing. 16 patients needed a repeat procedure. Overall success rate was 80% (48 of 60). Factors predictive of poor prognosis were identified.^[3]

Kashkouli MB et al reported a cure rate of 90.2% in the membranous and 33.3% in the complex congenital nasolacrimal duct obstruction in both late and very late probing($p < 0.0001$). Complex congenital nasolacrimal duct obstruction was defined as a firm bony resistance that prevented the probe from reaching the nasal cavity.^[4]

Maheshwari R reported the results of probing in children aged 13 months and above. The success rate in group one (13-24 months) was 88.1% and in group two (> 24 months) was 80.9%.^[5]

Deok Sun Cha et al reported that the success rate of initial probing in patients aged 6 – 71 months was 80%. The success rate of second probing was 61% for all patients.^[6]

The Paediatric Eye Disease Investigator Group concluded that probing is a successful primary treatment of nasolacrimal duct obstruction in about three/forth cases in children aged 6 to < 36 months old.^[7]

Kushner BJ reported the results of simple probing in children aged 18 months to 4 years. 70% children had a good outcome. 100% children with simple membrane at valve of Hasner had a good outcome. Only 36% of those with complicated obstruction had a good outcome.^[8]

Katowitz JA et al reported 97% success rate of initial probing in children under 13 months of age. Only 54.7 % success rate is reported in children over 13 months of age .They concluded that initial probing should be done prior to 13 months of age depending on severity of symptoms and parent compliance with medical management.^[9]

Eshragi B reported the role of probing in children two years and older and to establish factors predictive of outcome. They reported a total of 82 children with a mean age of 34.5 months (range 24 months to 60 months). Complete response rate was 54% . Bilateral association was associated with failure ($p < 0.0001$). age more than thirty six months was not associated with failure. They concluded that nasolacrimal duct probing can be a useful initial procedure for patients with congenital nasolacrimal

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duct probing even for children more than two years to five years of age.^[10]

Maheshwari R et al reported a success rate of 80.95% for probing for simple congenital nasolacrimal duct obstruction in 2 to 7 years old children.^[11]

Maheshwari R et al reported 49 eyes of 42 children in age group of 2 to 7 years. Probing was successful in 39 eyes (79.6 %). Success rate was 85% in children less than 5 years and 55.55% in those older than 5 years. All cases with failed probing had complex type congenital nasolacrimal duct obstruction. They concluded that initial probing is a viable option for older children with congenital nasolacrimal duct obstruction.^[12]

Koushan K et al reported 170 eyes of 130 children of mean age 31.7 +/- 1.8 months. Overall success rate of probing was 71.2% (121/170). The success rate of group one of age group 18.3 +/- 0.3 months was 76%. The success rate of group two of age group 39.8 +/- 11.8 months was 73%. The success rate of group three of age group 96.3 +/- 4.8 months was 42.9 %. Group three had an increased risk of failure. They concluded that the success rate of probing is not significantly reduced if performed between 24 and 60 months.^[13]

CONCLUSION

Children less than or equal to three years of age with congenital nasolacrimal duct obstruction can be successfully managed with nasolacrimal duct probing with great outcomes. Older children too had a reasonable outcome and age did not appear to be a significant factor affecting outcome. Thus in the light of the fact that probing is a safe and effective procedure, it appears logical to give a trial of initial nasolacrimal duct probing even to children older than three years. A firm obstruction on probing, persistent dacryocystitis and repeat procedure are significantly associated with the outcome of nasolacrimal duct probing.

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