

## Success Rate Comparison of Nasolacrimal Duct Probing with and without Assistance of Nasal Endoscope in Congenital Nasolacrimal Duct Obstruction

Irshad Hussain, Shafaq Pervez Khan\*, Masood Alam\*\*, Asim Abbas, Faisal Aziz Khan

Combined Military Hospital Malir Cantt, Karachi/National University of Medical Sciences (NUMS) Pakistan, \*Life Care Hospital, Karachi Pakistan, \*\*Pakistan Air Force Base Hospital Faisal, Karachi Pakistan

### ABSTRACT

**Objective:** To compare the success rate of nasal endoscopic assisted probing and simple probing in congenital nasolacrimal duct obstruction.

**Study Design:** Quasi-experimental study.

**Place and Duration of Study:** Eye department, Combined Military Hospital, Malir Cantt, Karachi, from Feb 2018 to Jun 2019.

**Methodology:** A total of 100 children were randomly divided into two groups. Each child in both groups underwent probing of the nasolacrimal duct. In one group, simple probing was performed, and patency was confirmed with metal on metal touch. In the second group, a nasal endoscope was employed to visualize probe passage through the opening of the nasolacrimal duct in the inferior meatus. In fracture of the inferior turbinate was performed in every case when a nasal endoscope was utilized. In the simple probing group, in fracture was performed if the inferior meatus was narrow. The rate of epiphora resolution was recorded in both groups at 1-month postoperatively.

**Results:** The success rate of epiphora resolution was 96% (48 out of 50) in the nasal endoscopic assisted probing-group and 82% (41 out of 50) in the simple probing-group ( $p=0.02$ ). The simple probing-group had a 40% (20 out of 50) significant nasal bleed, and in the nasal endoscopic-group, the significant nasal bleed was 20% (10 out of 50) ( $p=0.02$ ).

**Conclusion:** Nasal endoscopic assisted probing of the nasolacrimal duct has a higher success rate than simple probing in congenital nasolacrimal duct obstruction.

**Keywords:** Congenital nasolacrimal duct obstruction, Nasal endoscopy, Probing.

**How to Cite This Article:** Hussain I, Khan SP, Alam M, Abbas A, Khan FA. Success Rate Comparison of Nasolacrimal Duct Probing with and without Assistance of Nasal Endoscope in Congenital Nasolacrimal Duct Obstruction. *Pak Armed Forces Med J* 2022; 72(2): 608-612. DOI: <https://doi.org/10.51253/pafmj.v72i2.4116>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

### INTRODUCTION

Nasolacrimal duct obstruction (NLDO) is one of the most common problems faced in paediatric ophthalmology. 6-20% of full-term newborns have symptomatic NLDO.<sup>1-3</sup> The most common cause is the simple membrane obstruction at the end of the NLD.<sup>4</sup> The success rate of probing testicles varies from 77 to 97% among patients under the age of 18.<sup>5</sup> A significant risk factor identified as a cause of probing failure is the occurrence of complex obstruction, also called nonmembranous, firm or complicated.<sup>6</sup>

Internationally nasal endoscopy has been a valuable adjunct to lacrimal surgery for over two decades.<sup>7-9</sup> In Pakistan, there is limited research work to date about the use of nasal endoscopy in probing and sac syringing in the children of our population with CNLDO. Therefore the objective of this study was to compare the success rate of nasal endoscopic assisted

probing and simple probing in congenital nasolacrimal duct obstruction in the Pakistani population.

### METHODOLOGY

This quasi-experimental study was conducted at the Department of Eye Combined Military Hospital Malir Cantt Karachi. The study duration was 17 months, from Feb 2018 to June 2019. The study was approved by the Institutional Review Board (Ref No. 1400/2019/Trg/Adm).

**Inclusion Criteria:** Children between the ages of 10 and 24 months who presented with a history suggestive of unilateral or bilateral CNLDO or were previously diagnosed with CNLDO and their treatment with lacrimal sac massage had failed were included in the study. Children whose acute dacryocystitis had resolved with systemic antibiotics and those with non-resolved congenital dacryocoele were also included in the study.

**Exclusion Criteria:** Children with punctual agenesis, ectopic puncta, multiple puncta and canalicular stenosis /obstruction were excluded from the study.

**Correspondence:** Dr Irshad Hussain, Department of Ophthalmology, Combined Military Hospital CMH Murree, Pakistan  
Received: 14 Apr 2020; revision received: 07 Jul 2020; accepted: 09 Jul 2020

One hundred children were selected from the Eye OPD and divided randomly into two equal groups (Group-A and Group-B), based on a computer-generated random numbers table. The calculated sample size was 50 using success rates of previously published data of 76.9% for simple probing 10 (P1= success rate in simple probing) and 97.2% for nasal endoscopic assisted probing 11 (P2=success rate in endoscopically assisted probing). However we took 100 patients. In group-A, patients' simple probing was performed, i.e. without the assistance of nasal endoscope and in group B, a nasal endoscope was employed during probing of the nasolacrimal duct. All the probings were performed by one surgeon only.

Written informed consent was taken. All the procedures were performed under general anaesthesia. Topical decongestant nasal drops (Xylometazoline Hydrochloride, 0.05% w/v) were instilled in the nasal cavity each child, before the child entered the operating room and soon after induction of general anaesthesia, a nasal pack with gauze soaked in 0.05% w/v Xylometazoline hydrochloride or 1:100,000 Epinephrine was precisely inserted under the inferior turbinate and between the inferior turbinate and the nasal septum for 10 minutes and then removed. After 10 minutes, the nasal cavity was inspected. In group-A patients, if the inferior turbinate (IT) was found hypertrophied or impacted against the lateral wall of the nose or inferior meatus was shallow. The IT was fractured by clamping the anterior half of the IT with a straight hemostat and turning it 90 towards the nasal septum. In contrast, this procedure was performed under direct visualization with the nasal endoscope in every patient in group-B, irrespective of any anatomic variability in IT position. Significant bleeding after IT fracture was controlled with the nasal pack for 05 minutes.

The punctae were examined under the operating microscope. Both punctae were dilated with a punctum dilator. A Hard stop was confirmed through canaliculi with a bowman size 0000 probe. Syringing was then performed with normal saline through one of the punctae. In both groups, Bowman probe no 0 or 1 was used for probing the nasolacrimal duct. The probe was marked at 12 and 20 mm from the tip and was passed horizontally and then vertically posterolaterally through the NLD. If a bony obstruction was felt soon, then further forcing the probe through the nasolacrimal duct was not done, and the procedure was aborted. Passage of probe was continued through the NLD if

little resistance, rubbery resistance, feeling of a sudden pop or give in was felt at the distal end of NLD till the 20 mm mark on the probe and until a hard stop was felt at the floor of the nose.

In group-A patients, patency of the NLD was confirmed by obtaining a metal on metal touch by using another bowman probe inserted through the na-res followed by recovery of saline through the external nares on syringing. In group-B patients, patency of the NLD was confirmed by directly visualizing the probe tip in the inferior meatus. A 2.7mm 30 rigid nasal endoscope was employed and after adjusting for white balance and applying the antifog solution, it was passed along the floor of the nose into the already widened inferior meatus up to a distance of 20-22 mm from the external nares till the anticipated site of NLD opening at the valve of Hasner, identified as a small dimple in the lateral wall of the nasal mucosa. An attempt to directly visualize the tip of the probe was made. If the probe tip was visualized in the inferior meatus lying freely, then the patency of the NLD was confirmed. If the probe tip protruded through a thin obstructing membrane or stenotic valve, the opening was widened by moving the probe from side to side and augmented by a sickle knife cut on the probe to increase the size of the opening.

Similarly, if the probe failed to perforate the nasal mucosa because of a thick membrane or stretchable valve, a sickle knife was used to perforate the mucosa over the tip of probe. If the probe went through a sub-mucosal plane down to the nasal floor without the perforation of the mucosa into the nasal cavity or went medially perforating the inferior turbinate mucosa, an anatomical variant of CNLDO or a false passage was expected. The probe was slightly withdrawn and redirected until the distal end of the NLD was seen to have been passed. Postoperatively topical Tobramycin eye drops four times/day and Xylometazoline Hydrochloride 0.05% nasal drops were prescribed for two weeks.

Patients were reviewed at one-week and one-month periods after the procedure. Success was defined as the complete absence of watering and stickiness and a normal fluorescein dye disappearance test at one month postoperatively. Patients were followed up for three months.

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 20.0. Descriptive statistics and normality tests were computed. Mann-Whitney U test was used to compare the age of

the two groups. The success rate of epiphora resolution was described as frequency and percentage. Pearson chi-square test was selected to compare the success rate of epiphora resolution and frequency of significant bleeding among the groups. The *p*-value of  $\leq 0.05$  was considered to be statistically significant.

**RESULTS**

One hundred children were included in the study. The primary outcomes were the success rate of resolution of epiphora and frequency of nasal bleed in simple probing and endoscopic assisted probing groups. Of 100 children, 58(58%) were males, and 42 (42%) were females. The median (IQR) age of the children in the endoscopic group and the simple probing group was shown in Table-I.

**Table-I: Comparison of the ages of the children in simple probing group and endoscopic group.**

	Simple Probing (n=50)	Endoscopic Assisted Probing (n=50)	<i>p</i> -value
	Median (IQR)	Median (IQR)	0.001
Age in Months	12 (3)	19 (5)	

Children in the endoscopic group were significantly older than children in the simple probing group. There was a higher success rate of epiphora resolution in the endoscopic group as compared to the simple probing group, and this difference was statistically significant (Table-II).

**Table-II: Comparison of success rate of epiphora resolution between endoscopic and simple probing group.**

	Endoscopic Assisted Probing (n=50)		Simple Probing (n=50)		<i>p</i> -value
	Frequency	Percentage	Frequency	Percentage	
Suc Rate	48/50	96%	41/50	82%	0.02

With a nasal endoscope, various kinds of obstructions were detected in the endoscopically assisted group. Table-III showed these obstructions encountered in the endoscopic group with their corresponding success rates.

Inferior turbinate was fractured in every case (50/50) in the endoscopic group, and in the simple probing group, 20 out of 50 (40%) cases required an infraction of the inferior turbinate.

Among the complications of probing and sac syringing, it was detected that fewer children developed a persistent nasal bleed in the endoscopic group, necessitating the placement of a nasal pack, whereas, in the simple probing group, a statistically significant

number of children had a nasal pack placement after extubation (Table-IV).

**Table-III: Success rates of resolution of epiphora according to various types of obstruction in endoscopic group (n=50).**

Type of Obstruction (n=50)	Frequency	Success Rate
Membranous	43 (86%)	100%
False Passage	3 (6%)	100%
Elastic Membrane	2 (4%)	100%
Atresia of Lower end of	2 (4%)	0%

*Nasolacrimal duct.*

**Table-IV: Comparison of frequency of nasal bleed in simple and endoscopic assisted probing groups**

	Endoscopic Assisted Probing (n=50)		Simple Probing (n=50)		<i>p</i> -value
	Frequency	Percentage	Frequency	Percentage	
Nasal Bleed	10/50	20%	20/50	40%	0.02

**DISCUSSION**

The appropriate age for probing has always been a controversial topic.<sup>12,13</sup> In our study, the median age of probing without the use of endoscope was 12 months. The higher success percentage reported in our study in advanced age results from direct visualization and detection around the opening of NLD and inferior meatus. Simple probing combined with infraction of the inferior turbinate during the first attempt has not improved the success rate compared with probing alone. Although we achieved a higher percentage of epiphora resolution in the endoscopic group, we believe this was not mainly due to infraction of the IT.

Direct visualization of anomalies at the distal end of NLD is the most significant advantage of the nasal endoscope.<sup>14,15</sup> The commonest anomaly that we detected in our study was a membrane at the distal end of NLD, preventing the passage of the probe tip. Similarly utilizing nasal endoscope, Ghafar recorded membranous obstruction in 82.36% 16 and McEwen *et al*,<sup>17</sup> detected a membrane in 65% cases. With the membranous obstruction, McEwen *et al*, reported a success rate of 96% with the first probing.<sup>17</sup> In our study, 100% cases with a membrane achieved complete resolution of epiphora after probing.

The second most common anomaly at the distal end of the NLD in our endoscopic group was detecting or creating a false passage. We found that in 6% cases, the probe passed submucosally either towards the inferior turbinate or nasal floor along the lateral wall of the nose. Hidenori *et al*,<sup>18</sup> reported an incidence of 20% of false passage while Miguel *et al*,<sup>11</sup> found an 11.1% rate of false passage creation. The creation of false

passage in our cases was the continuation of NLD beyond the opening of the valve of Hasner and a short NLD that was opening in the apex of the inferior meatus. After the relocation of the probe, the success rate was 100%. In our two cases of false submucosal passage, the probe could not be passed from the bony nasolacrimal canal into the nose, and the procedure was aborted, and these patients were planned for dacryocystorhinostomy.

There are a couple of uncommon causes of lower end NLD obstruction seen on endoscopy that has been mentioned in previously published data.<sup>19</sup> These are the presence of an NLD cyst at the distal end and enlarged, edematous nasal mucosa.<sup>20</sup> In our study, none of these rare causes was seen because NLD cysts are nearly universal in mucoceles, which is a condition of neonates.

The bleeding in our blind probing group was significantly higher than in the endoscopic group. This was attributable to the blind manipulation of instruments in the inferior meatus to obtain a metal on metal touch as well as injuring mucosa in blindly tackling complex anatomical variations of NLD and pushing the probe in false submucosal passages, especially towards the inferior turbinate, whereas direct endoscopic visualization reduces mucosal trauma.<sup>21,22</sup>

The higher success rate in our endoscopic group was purely due to the direct visualization of the anomalies at the distal end of the NLD and the area of the inferior meatus. Wallace *et al*, achieved a 100% success rate in all the cases with NLD anomaly, whether it was atresia, stenosis or false passage with the help of endoscope.<sup>23</sup> Similarly, Kouri *et al*, mentioned that 23% cases had nasal anomalies that would have been missed with blind probing. Even bony obstruction variants of NLDO can be managed successfully with nasal endoscope.<sup>24</sup>

Further studies need to be conducted wherein the success rate of probing with the use of the nasal endoscope in failed/second attempt cases must be determined. To conclude, using a nasal endoscope is justified in every case of congenital nasolacrimal duct obstruction during probing, whether it is a primary procedure or in failed cases, irrespective of any age.

### STUDY LIMITATIONS

There are certain limitations of the use of the nasal endoscope. Our study was conducted in a multidisciplinary hospital where high tech endoscopic equipment was readily available, and the cost was not an issue. An otolaryngologist familiar with the use of endoscope assisted us. The otolaryngologist

performed rhinology surgical procedures in two cases when an elastic membrane needed to be excised. These limitations become substantial when this procedure is performed in an isolated setup. Despite these limitations, several authors have suggested the nasal endoscope is a must-have armamentarium and a viable option as a primary and standard treatment modality in CNLDO. Another limitation of our study was that we did not investigate the causes of the failure of resolution of epiphora in the blind probing group cases by using a nasal endoscope. This would have helped us statistically estimate the number of cases that would have benefitted from an endoscope and hence determine the additional success rate that would have been achieved with an endoscope.

### CONCLUSION

Nasal endoscopic assisted probing of the nasolacrimal duct has a higher success rate than simple probing in congenital nasolacrimal duct obstruction.

**Conflict of Interest:** None.

### Authors' Contribution

IH: Conception and design of the work, SPK: drafting the work and literature review, MA: Critical revision of intellectual content and final approval of the manuscript, AA: data analysis and ENT cover, FAK: Acquisition interpretation of data for the work.

### REFERENCES

1. Saha BC, Kumari R, Sinha BP. Clinical Outcome of Probing in Infants with Acute Dacryocystitis-A Prospective Study. *J Clin Diagn Res* 2017; 11(8): NC01-NC03
2. Kato K, Matsunaga K, Takashima Y, Kondo M. Probing of congenital nasolacrimal duct obstruction with dacryoendoscope. *Clin Ophthalmol* 2014; 2014(8): 977-980.
3. Ranganathan KS. A study of congenital dacryocystitis. *J Evid Based Med Healthc* 2017; 4(64): 3826-3829.
4. Rashid W, Shaheen N, Zargar S, Ganie MR, Kounsar H. Outcome of probing and sac syringing in congenital nasolacrimal duct obstruction in children above two years of age : a prospective study. *Ann Int Med Den Res* 2017; 3(5): OT01-OT03.
5. Théra JP, Hughes D, Tinley C, Bamani S, Traore L, Traore J. Results of probing in the management of children suffering from Nasolacrimal duct obstruction. *Sch Acad J Biosci* 2016; 4(3B): 277-279.
6. Maheshwari R. Results of Probing for Congenital Nasolacrimal Duct Obstruction in Children Older than 13 Months of Age. *Indian J Ophthalmol* 2005; 53(1): 49-51.
7. Perveen S, Sufi AR, Rashid S, Khan A. Success Rate of Probing for Congenital Nasolacrimal Duct Obstruction at Various Ages. *J Ophthalmic Vis Res* 2014; 9(1): 60-69.
8. Grover AK . Management of nasolacrimal duct obstruction in children: How is it changing? *Indian J Ophthalmol* 2017; 65(10): 910-911.
9. Lueder GT. The association of neonatal dacryocystoceles and infantile dacryocystitis with nasolacrimal duct cysts( An American ophthalmological society thesis). *Trans Am Ophthalmol Soc* 2012 ;110(1): 74-93.
10. Casady DR, Meyer DR, Simon JW, Stasiar GO, Zobal-Ratner JL. Stepwise treatment paradigm for congenital nasolacrimal

## Nasolacrimal Duct Probing

- duct obstruction. *Ophthalmic Plast Reconstr Surg* 2006; 22(4): 243-247.
11. Miguel AA, Félix JA, Asunción MF, Maria del MG, Bernado C, Ignacio LM, et al. Comparative study of primary intention lacrimal probing with and without nasal endoscopy. *Acta Otorrinolaringol Esp* 2014; 65(5): 297-301.
  12. Takahashi Y, Kakizaki H, Chan WO, Selva D. Management of congenital nasolacrimal duct obstruction. *Acta Ophthalmol* 2010; 88(5): 506-513.
  13. Petersen DB. Resolution of Congenital Nasolacrimal Duct Obstruction with Nonsurgical Management. *Arch Ophthalmol* 2012; 130(6): 730-734.
  14. Kouri AS, Tsakanikos M, Linardos E, Nikolaidou G, Psarommatis I. Results of endoscopic assisted probing for congenital nasolacrimal duct obstruction in older children. *Int J Pediatr Otorhinolaryngol* 2008; 72(6): 891-896.
  15. Attarzadeh A, Sajjadi M, Owji N, Talebnejad MR, Farvardin M. Inferior Turbinate Fracture and Congenital Nasolacrimal Duct Obstruction. *Eur J Ophthalmol* 2006; 16(4): 520-524.
  16. Abd El Ghafar AE. Endoscopic-guided probing for the management of congenital nasolacrimal duct obstruction. *Delta J Ophthalmol* 2015; 16(2): 93-96.
  17. MacEwen CJ, Young JD, Barras CW, Ram B, White PS. Value of nasal endoscopy and probing in the diagnosis and management of children with congenital epiphora. *Br J Ophthalmol* 2001; 85(3): 314-318.
  18. Hidenori S, Toshiyuki T, Akira M. Direct endoscopic probing for congenital lacrimal duct obstruction. *Clin Exp Ophthalmol* 2013; 41(8): 729-734.
  19. Al-Faky YH. Nasal endoscopy in the management of congenital nasolacrimal duct obstruction. *Saudi J Ophthalmol* 2014; 28(1): 6-11.
  20. Lueder GT. Paediatric Lacrimal disorders. In: Wilson ME, Saunders RA, Trivedi RH, editors. *Pediatric Ophthalmology Current thought and Practical Guide*. Springer-Verlag Berlin Heidelberg; 2009. p. 279. [internet] Available at: [https://catalog.library.vanderbilt.edu/discovery/fulldisplay/alma991043684618703276/01VAN\\_INST:vanui](https://catalog.library.vanderbilt.edu/discovery/fulldisplay/alma991043684618703276/01VAN_INST:vanui)
  21. Okumuş S, Öner V, Durucu C, Coşkun E, Aksoy U, Durucu E, et al. Nasolacrimal duct intubation in the treatment of congenital nasolacrimal duct obstruction in older children. *Eye (Lond)*. 2016; 30(1): 85-88.
  22. Elmorsy S, Shabana YK, Fayek HM. Endoscopic assisted probing for symptomatic congenital nasolacrimal duct obstruction after one year of age. *Rhinology* 2010; 48(1): 100-103.
  23. Wallace EJ, Cox A, White P, Macewen CJ. Endoscopic-assisted probing for congenital nasolacrimal duct obstruction. *Eye (Lond)* 2006; 20(9): 998-1003.
  24. Choi WC, Kim KS, Park TK, Chung CS. Intranasal endoscopic diagnosis and treatment in congenital nasolacrimal duct obstruction. *Ophthalmic Surg Lasers* 2002; 33(4): 288-292.
- .....