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Nasolacrimal probing vs endoscopic assisted nasolacrimal probing with inferior turbinate medialization in congenital nasolacrimal duct obstruction

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Running Title: Probing vs assisted inferior turbinate medialization in CNLO

Abstract:

Purpose: This study aimed to evaluate the outcomes and success rates of nasolacrimal probing alone compared with endoscopic assisted nasolacrimal probing with inferior turbinate medialization in congenital nasolacrimal duct obstruction.

Patients and methods: This prospective comparative nonrandomized interventional study included 74 eyes of 59 patients (15 were bilateral and 44 were unilateral) with epiphora due to congenital nasolacrimal duct obstruction. 35 eyes were treated by nasolacrimal probing alone (group1) and 39 eyes were treated by endoscopic assisted nasolacrimal probing with inferior turbinate medialization (group2). They were admitted to the ophthalmology department at Al Azhar University Hospital Damietta branch during the period from March 2019 to September 2021. The main outcome of success is absence of epiphora and follow up period was 6 monthes.

Results: There were insignificant differences between both groups as regard age, gender, and laterality of nasolacrimal duct obstruction. As regards the success of the procedure, the success rate was 91.4% in group 1 and 89.7% in group 2 with no significant difference between both groups (P-value = 0.80). As regards factors affecting the success of the procedure, success rates were higher in younger patients in both groups (P-value <0.001).

Conclusion: There was no significant difference between both groups regarding the success of the procedure. Success was higher in younger patients in both groups so early probing is recommended in congenital nasolacrimal duct obstruction whatever the procedure.

Keywords: Epiphora; Probing and endoscopic.

INTRODUCTION

Epiphora or tearing is known as excessive watering of the eye which is a common problem among referrals to oculoplastic clinics. The process of tearing includes several steps including formation in the lacrimal gland, spreading through eye blinking, vaporization from the ocular surface, and draining through the nasolacrimal duct. Abnormalities in any of these steps can cause epiphora[1]. Nasolacrimal duct obstruction (NLDO) is considered the most common abnormality of the lacrimal system in infancy. It is commonly caused by membranous obstruction of the lower end of the nasolacrimal duct. Congenital nasolacrimal duct obstruction (CNLDO) occurs in up to 70% of neonates at delivery. However, only 6%–20% of all neonates presented with watery eyes[2].

The first-choice management of NLDO is usually conservative methods, such as prescribing antibiotics and massaging the lacrimal sac[3]. If NLD canalization fails to occur and the epiphora persists. The timing of probing for CNLDO is still an issue of debate but if the condition persists beyond 6 months, early probing gives good results. An equally effective approach is conservative management until 9-12 months of age waiting for spontaneous resolutions followed by probing for persistent obstruction[4]. Lacrimal intubation has become a very common surgical procedure for congenital nasolacrimal duct

obstruction that does not respond to conservative medical treatment or with failed probing[5].

Traditional options include office probing with topical anesthesia at the age of 4 to 6 months or observation and medical management followed by probing under general anesthesia at approximately 12 months of age. It has been reported that delay in probing beyond 6 months is associated with a lower rate of success and this worsens as the child gets older[6]. Another alternative approach for failed probing is balloon dilatation of the distal nasolacrimal duct. In this technique, inflation of a balloon at the end of a probe can be effective in diffusely dilating the lacrimal system and opening adhesions or constrictions due to chronic infection with a reported success rate of 76% to 83%[7].

Few studies have investigated the utility of Mitomycin C (MMC) for lacrimal probing to treat NLDO. Mitomycin C (MMC) is considered an alkylating antibiotic used to reduce fibroblast collagen synthesis by inhibiting DNA-dependent RNA synthesis and can suppress cellular proliferation in any period of the cell cycle. To prevent excessive fibrous tissue formation, Mitomycin C has been used as adjunctive therapy to reduce subsequent fibroblasts proliferation. Mitomycin C (MMC) is a chemotherapeutic antibiotic that has been used as an adjunct to prevent recurrence after pterygium surgery and glaucoma surgery[8].

Finally, if all the aforementioned measures failed to cure NLDO, dacryocystorhinostomy (DCR) through external or nasal endoscopic approach may be needed to create a new path for tears from the lacrimal sac to the nasal cavity. After which, a silicon tube is passed through the puncti, lacrimal sac, and finally into the upper lateral part of the nasal cavity[9].

This study aimed to evaluate the outcomes and success rates of nasolacrimal probing alone compared with nasolacrimal probing with endoscopic assisted inferior turbinate medialization in congenital nasolacrimal duct obstruction in children.

PATIENTS AND METHODS

This prospective comparative nonrandomized interventional study included 74 eyes of 59 patients (15 were bilateral and 44 were unilateral) with epiphora due to congenital nasolacrimal duct obstruction. 35 eyes were treated by nasolacrimal probing alone (group 1) and 39 eyes were treated by endoscopic assisted nasolacrimal probing with inferior turbinate medialization (group 2). The children were admitted to the ophthalmology department at Al Azhar University Hospital Damietta branch for external nasolacrimal probing during the period from March 2019 to September 2021.

Informed consent was obtained from all guardians, Preoperative workup included obtaining the patient medical and ocular history, and a thorough slit-lamp examination of the conjunctiva and cornea to rule out possible ocular surface disorders

Congenital nasolacrimal duct obstruction (CNLDO) was diagnosed clinically by the presence of epiphora beginning during the first few weeks of life and presence of at least one sign of CNLDO (epiphora, increased tear lake, and/ or mucopurulent discharge or reflux of contents of the lacrimal sac with pressure in the absence of upper respiratory tract infection, congenital glaucoma or ocular surface irritation). Demographic data were gathered from each case, and the associated ophthalmic and systemic diseases were noted.

Exclusion criteria:

Patients with a history of prior nasolacrimal surgery, craniofacial anomalies, history of trauma, punctum agenesis, congenital dacryocystocele, associated ocular disease, when parents refuse to participate in the study and lack of adequate follow-up.

Procedures:

All surgeries were performed under General Anesthesia (GA) by a single surgeon under general anesthesia. Adrenaline 1/200,000 was inserted in the ipsilateral nares at the level of the inferior turbinate. Dilatations of both puncti by using Nettleship dilator then Bowman's probes of increasing diameters were used for dilatation of the lacrimal passage; a Bowman's probe was introduced vertically into the punctum and ampulla and then rotated horizontally 90° in the same plane to enter the canaliculus, with lateral tension placed on the lid.

The probe was then advanced until it touched a region of bony firmness; this indicated that it had reached the lacrimal sac.

Then, the probe was rotated upward 90° and advanced down to the nasolacrimal meatus until it gave way through the membranous resistance into the nasal cavity. At this stage, the metal-to-metal sensation is used to ensure proper passage of the probe through the NLD in group 1 but in group 2, we used an endoscope to visualize the lacrimal probe from below the inferior turbinate (fig: 1). As well as the patency of the nasolacrimal system was evaluated by irrigation of saline through the superior punctum, flow of saline into the nose was confirmed by a pediatric size suction catheter that was placed below the inferior meatus.

A periosteal elevator was used to medialize the inferior turbinate guided by the endoscope in group 2 (fig: 2). Nasal tampon soaked with vasoconstrictor-antihistaminic gel was inserted in the ipsilateral nares to be taken out after 2 days postoperatively.

Figure: 1: Visualization of the lacrimal probe guided by endoscope in group 2.

Figure: 2: Medialization of the inferior turbinate guided by endoscope in group 2

Post-operative assessment:

After surgery, patients received betamethasone eye drops 6 h, and chloramphenicol eye drops 4 h, which were tapered off after 1 week. Patients also received oral cephalexin for 1 week. Follow-up visits were scheduled at 1 week, 1, 3, and 6 months postoperatively.

The success of probing was the main outcome measure and was defined as complete remission of watering, discharge, and reflux of the lacrimal sac on pressure at one week of the procedure.

Statistical tests used are mean, standard deviation, chi-square test, and P-value. P-value was considered significant if <0.05. Statistical analysis was performed using a commercially available statistical software package (SPSS for Windows, version 24, IBM SPSS Inc., and Chicago, Illinois, USA).

RESULTS

This prospective comparative nonrandomized interventional study included 74 eyes of 59 patients with epiphora due to congenital nasolacrimal duct obstruction.35 eyes were treated by endoscopic assisted nasolacrimal probing alone (group 1) and 39 eyes were treated by endoscopic assisted nasolacrimal probing with inferior turbinate medialization (group 2).

There were insignificant differences between both groups as regard age, gender, and laterality of nasolacrimal duct obstruction. As regards the success of the procedure, the success

rate was 91.4% in group 1 and 89.7% in group 2 with no significant difference between both groups (P-value = 0.80) (table: 1). As regards factors affecting the success of the procedure, success rates were higher in younger patients in both groups (P-value <0.001) (table: 2).

Table (1): Comparison between both groups regarding sex, age, laterality and outcome of the procedure

Variable		Group 1 (n=29)	Group 2 (n=30)	Total (n=59)	Test	P value
Sex (n, %)	Male	15(51.7%)	16(53.3%)	31(52.5%)	0.015#	0.90
	Female	14(48.3%)	14(46.7%)	28(47.5%)		
Age (months)	Mean±SD	16.21±3.93	16.07±3.99	16.13±3.92	0.13$	0.89
	Min.-Max.	12.0-25.0	12.0-28.0	12.0-28.0		
Laterality (n,%)	Unilateral	23(79.3%)	21(70.0%)	44(74.6%)	0.67#	0.41
	Bilateral	6(20.7%)	9(30.0%)	15(25.4%)		
Outcome (n,%)	Success	32(91.4%)	35(89.7%)	67(90.5%)	FE	0.80
	Failure	3 (8.6%)	4(10.3%)	7(9.5%)		

FE: Fisher exact test; # Chi square test; $: student "*t*" test.

Table (2): Factors affecting outcome

Variable		Success (n=29	Failure (n=30)	Test	P value
Sex (n, %)	Male	27(50.9%)	4(66.7%)	FE	0.46
	Female	26(49.1%)	2(33.3%)		
Age (months; Mean±SD)	All patients	15.30±2.98	23.50±3.72	6.22#	<0.001*
	Group 1	15.34±3.11	23.67±1.52	4.51#	<0.001*
	Group 2	15.25±2.91	23.33±5.68	4.15#	<0.001*
Laterality (n,%)	Unilateral	39(73.6%)	5(83.3%)	FE	0.60
	Bilateral	14(26.4%)	1(16.7%)		

FE: Fisher exact test; $: student "*t*" test.

DISCUSSION

Congenital NLDO is considered a common lacrimal system disorder in children and the conservative therapy is sufficient in most cases during the first 12 months, but if the condition persists the probing has been proposed as the most effective procedure in cases aged between 12 and 18 months[10].

In the present study, there were insignificant differences between both groups as regard age, gender, and laterality. As regards the success of the procedure, the success rate was 91.4% in group 1 and 89.7% in group 2 with no significant difference between both groups (P-value = 0.80).

In agreement with the present study, a study conducted by Khataminia1 et al, in which primary probing only was done on 50 eyes that 41 eyes were completely successful, 6 eyes were partially successful and 3 eyes were not cured, which shows the high success rate of primary probing. The group with fracturing inferior turbinate showed the same high success rate[2].

Another study was conducted by Ragabi et al demonstrated that a total success rate was 91.2% for patients with turbinate fracture and 86.4% for patients without turbinate fracture. The difference between success rates was not statistically significant (p = 0.269). The authors did not find significant differences between cases and controls in age subgroups[11].

Although Zilelioglu G and Hosal B showed that the use of nasal endoscopy during probing improved the results of probing compared with blind probing. Moreover, it allows proper

readjustment of the position of the probe during surgery if a false passage occurred[12]. Also, Hidenori et al. reported that even with experienced hands, a false passage may occur during primary probing and will have a negative impact factor on the results. They mentioned that bleeding during probing that meant a false passage occurred in up to 20% of blind probing[13].

Although metal-to-metal sensation is used by most surgeons to ensure proper passage of the probe through the NLD, a false passage may still occur and different varieties of anomalies cannot be detected except by direct visualization using nasal endoscopy[14].

Al-Faky reported that during endoscopically guided probing, the following variants were detected impaction of the inferior turbinate that concealed the NLD opening, the probe may pass through a stenotic valve, bony obstruction, and perforation of the membrane may be difficult because of a thick or elastic membrane[15].

Atarzadeh et al conducted a study on children with congenital NLDO and showed that in case group (probing + Infracture of the inferior turbinate) results were good in 22 (66.7%) patients, fair in 8 (24.2%), and poor in 3 (9.1%). In control group (simple probing) results were good in 20 (71.4%) patients, fair in 3 (10.7%) and poor in 5 (17.9%) (P=0.9). Success rates were 91% and 82% in case and control groups respectively (P=0.4)[16].

Another prospective interventional case series included 10 female children (38.46%) and 16 male children (61.54%), with a mean age of 15.6 ± 2.1 months. Endoscopic-guided probing achieved a success rate of 94.12%. Endoscopy indicated a stenotic valve and membrane in 82.36%, elastic membrane in 5.88%, submucosal false passage in 5.88%, bony obstruction in 2.94%, and tight inferior turbinate in 2.94% of the patients. This study demonstrated that Endoscopic-guided probing transfers probing from a blind procedure to a visualized one, diagnoses the cause of obstruction and false passage, and enables intraoperative readjustment of false passage; this, in turn, increases the success rate[17].

As regards factors affecting the outcome in this present study, the success rate was higher in younger patients in both groups but compared with older children (P-value <0.001). This present study was supported by another study that reported success rate in combined case and control groups in patients younger than 24 months (success rate: 91.7%) was significantly higher than those older than 24 months (success rate: 71.9%; p = 0.001)[11].

Some reports suggest that early intervention avoids months of morbidity due to epiphora and its subsequent complications. They also suggest that postponement of the procedure may result in a reduction of the success rate with simple probing because of chronic inflammation and secondary fibrosis[18].

However, another prospective study showed no decline in success rates up to the age of 36 months[19]. Also, Robb et al found no profound effect of age on the success rate of probing, reporting that in children older than 2 years who underwent probing, the success rate was 94%[20].

Limitations of this study: The study was limited by the short period of follow up.

CONCLUSION

There was no significant difference between both groups regarding the success of the procedure. But the success was higher in younger patients in both groups so early probing is recommended in congenital nasolacrimal duct obstruction whatever the procedure.

Disclosures

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DATA AVAILABILITY

All data are included in this article.

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Ethics declarations

Conflict of interest

Ezzeldin R. Ezzeldin. Author have no conflicts of interest that are directly relevant to the content of this review.

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