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Our Approach and Results for Congenital Nasolacrimal Duct Obstruction in a Tertiary Hospital

Üçüncü Basamak Bir Hastanede Konjenital Nazolakrimal Kanal Tıkanıklığına Yaklaşımımız ve Sonuçlarımız

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ABSTRACT

Background: To evaluate the effectiveness of probing and nasolacrimal duct intubation in patients with congenital nasolacrimal duct obstruction (CNLDO).

Materials and Methods: CNLDO data collected between June 1, 2014, and June 1, 2023, were retrospectively reviewed. canalicular Crawford intubation was performed in all patients after two failed probing procedures.

Results: A total of 121 eyes of 93 patients (45 male and 48 female) were included in the study. The first probing procedure was successful in 94 (80.3%) eyes and the second probing procedure in 15 (75%). Among the four eyes in the silicone intubation group, the first procedure was successful in two (50%) and partially successful in the remaining two (50%). Silicone intubation was successful in all five eyes (100%) for which the second probing failed.

Conclusion: Nasolacrimal duct intubation with silicone tubes appears to be a less invasive and successful treatment option for CNLDO after failed probing.

Keywords: Congenital nasolacrimal duct obstruction, epiphora, fluorescein disappearance test, probing, silicone intubation

ÖZ

Amaç: Konjenital nazolakrimal kanal tıkanıklığı (KNLKT) olan hastalarda sondalama ve nazolakrimal kanal entübasyon işlemlerinin etkinliğini değerlendirmeyi amaçladık.

Gereç ve Yöntemler: 1 Haziran 2014 ile 1 Haziran 2023 tarihleri arasında takip edilen KNLKT geriye dönük olarak incelendi. İki başarısız sondalama prosedüründen sonra bikanaliküler Crawford entübasyonu tüm olgularda uygulandı.

Bulgular: Çalışmaya 93 hastanın (45 erkek ve 48 kadın) toplam 121 gözü dahil edildi. İlk sondalama işlemi 94 (%80,3) gözde, ikinci sondalama işlemi 15 (%75) gözde başarılı oldu. Silikon entübasyon grubundaki dört gözün ikisinde (%50) ilk işlem başarılı, kalan ikisinde (%50) kısmen başarılı oldu. İkinci sondalamanın başarısız olduğu beş gözün hepsinde (%100) silikon entübasyon başarılı oldu.

Sonuç: Silikon tüplerle nazolakrimal kanal entübasyonu, başarısız problamadan sonra KNLKT için daha az invaziv ve başarılı bir tedavi seçeneği gibi görünmektedir.

Anahtar Kelimeler: Konjenital nazolakrimal kanal tıkanıklığı, epifora, floresan kaybolma testi, sondalama, silikon entübasyon

Introduction

The incidence of congenital nasolacrimal duct obstruction (CNLDO) in the general population has been previously reported to be 20% of all infants in the first year of life (1). According to another source, it is seen in one out of every nine infants (2). In the majority of newborns (73.3%), there is a membranous barrier between the nasolacrimal duct and inferior meatus; i.e., the lumen of the nasolacrimal duct does not open into the nose at birth (3). 95% of cases with CNLDO become symptomatic in the first month of life. Spontaneous remission has been observed before the age of 1 year in 96% of symptomatic patients (1). The diagnostic criteria for CNLDO are the presence and appearance of epiphora and the formation of mucopurulent discharge

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following pressure on the affected lacrimal sac. It has been suggested that most such cases are resolved under conservative treatment (topical antibiotic and massage on the lacrimal sac) (4). In cases where conservative treatment fails, probing is successfully used to treat CNLDO in most children aged six to <15 months of age. The success rate is lower in older age, in the presence of bilateral disease, or when there is more than one clinical manifestation of CNLDO (5,6). Balloon catheter dilatation of the nasolacrimal duct and nasolacrimal duct intubation been similarly successful in the surgical treatment of permanent CNLDO (7). However, the appropriate timing of surgery remains a long-debated issue. While some researchers recommend early probing, some ophthalmologists prefer to perform this procedure after the first year (5,6).

The aim of this study was to evaluate the effectiveness of probing and silicone intubation procedures in treating patients with CNLDO.

Materials and Methods

The records of all patients with a diagnosis of CNLDO who were followed up in the oculoplasty unit of our clinic between June 1, 2014, and June 1, 2023, were retrospectively reviewed. The study was approved by the Ümraniye Training and Research Hospital Clinical Research Ethics Committee (approval number: 2020-01/237, date: 11.06.2020) and was consistent with the tenets of the Declaration of Helsinki. Patients diagnosed with CNLDO on the basis of typical signs and symptoms, such as epiphora, increased tear meniscus, recurrent or persistent mucopurulent discharge, and an abnormal fluorescein disappearance test (FDT) result, were included in the study. All patients received conservative medical treatment, including nasolacrimal sac massage until spontaneous resolution or interventional procedures were performed. FDT was performed by an ophthalmologist without topical anesthesia. Five minutes after fluorescein application to the eye surface, the result was classified as normal, abnormal, or indeterminate. The presence of no or a very thin fluorescein-colored tear meniscus was considered a normal result, whereas a thick fluorescein-colored tear meniscus was considered abnormal. The presence of minimally increased tear film or residual fluorescein in the tear was evaluated as an indeterminate result (8). Surgical success in probing was defined as the complete resolution of previous signs and symptoms and a normal or indeterminate FDT result. Partial success was defined as reduced symptoms accompanied by intermittent watering depending on environmental conditions. The failed probing criteria were recurrent epiphora, mucoid discharge, lacrimation, and an abnormal FDT result. Canalicular Crawford intubation was performed on all patients whose findings did not regress after two fail probing procedures. The success of treatment was defined as the absence of epiphora, mucoid discharge, and lacrimation in the examination undertaken 1 month after tube removal.

Observation and Follow-up

After both surgical procedures, the patients were administered topical moxifloxacin four times a day for 7 days. Follow-up examinations were performed on the seventh day and at the fourth week during the procedure. Treatment was considered successful or partially successful if CNLDO symptoms (epiphora, increased tear meniscus, and mucopurulent discharge) were reduced and the FDT result was normal or indeterminate. If the first probing was not successful, a second procedure was planned to be performed 4 weeks later. If symptoms and signs still did not improve after the second probing, nasolacrimal duct intubation was planned. In patients whose age was not suitable for probing, nasolacrimal duct intubation was performed as the primary procedure.

Surgical Procedures

Probing

The procedure was performed using the patients under general anesthesia by the same surgeon. The upper and lower canaliculi were enlarged using a punctal dilator. To confirm the diagnosis of occlusion, the nasolacrimal duct was irrigated using a syringe and a lacrimal cannula attached to its tip. The flow of fluid from the other canaliculi during irrigation confirmed the diagnosis of occlusion. A Bowman probe suitable for the patient was first advanced 2 mm vertically, and then horizontally toward the medial until reaching bone sensation; then, the probe was verticalize. It slowly advanced along the nasolacrimal duct until it passed the occluded part. Patency was confirmed by allowing a second probe to touch the probe in the nasopharynx, visualizing the probe under the inferior turbinate, or aspirating the fluorescein-colored solution from the nasopharynx after irrigation through the nasolacrimal system.

Nasolacrimal Duct Intubation

The surgical procedure was performed under general anesthesia. All procedures were performed by the same surgeon. Both upper and lower canaliculi were enlarged using a punctal dilator. To confirm the diagnosis of occlusion, the nasolacrimal duct was irrigated using a syringe and a lacrimal cannula attached to its tip. The flow of fluid from the other canaliculi during irrigation confirmed the diagnosis of occlusion. Probing was performed using an appropriate Bowman probe selected by the surgeon.

Canalicular Crawford intubation was performed. The ends of the tube were seen and removed through the nose, cut and knotted outside the nose, and the knot was inserted back into the nose. The tube was planned to remain in place for at least 3 months. When it was time to remove the tube, the knot was cut and the tube was removed from the nose by an otolaryngologist while the child was awake or under conscious sedation.

Statistical Analysis

The Statistical Package for the Social Sciences v. 21 (SPSS, Inc., Chicago, IL, USA) was used for statistical analyses. Quantitative variables were defined as mean and standard deviation and qualitative variables as percentages. The mean values were standardized to within 1.0 standard deviation for all determined values. Statistically significant differences were determined using the chi-square test. Values were considered statistically significant if $p<0.05$.

Results

A total of 121 eyes of 93 patients (45 male and 48 female) who underwent probing and/or silicone intubation were included in the study. Probing and/or silicone intubation were performed bilaterally in 28 patients and unilaterally in 65 patients. Of the operated eyes, 63 were right eyes and 58 were left eyes (Table 1).

As the primary procedure, probing was performed in 117 eyes (96.7%) at a mean age of 18 months (3-64 months) and silicone intubation in four eyes (3.3%) at a mean age of 50 months (47-60 months) (Table 2).

Table 1. Distribution of sex and affected eyes for the primary procedure

		n	%
Gender	Male	45	48.4
	Female	48	51.6
	Total	93	100.0
Affected side	Right	63	52.1
	Left	58	47.9
	Total	121	100.0

In cases where probing was performed as the primary method, the first procedure was successful in 94 (80.3%) eyes and unsuccessful in 23 eyes (19.7%) (Table 3). The decision for silicone intubation as the primary procedure was made on the basis of the age of the patients at the time of diagnosis. Among the four eyes that underwent silicone intubation as the primary method, the first procedure was successful in two (50%) and partially successful in the remaining two (50%).

In one eye in which the first probing failed, the canalicular system was incomplete; therefore, probing was not repeated. In two further eyes with failed probing, silicone intubation was applied as the second procedure at the 35th month (26-43 months), taking into account the age of the patients. Success was achieved in both eyes (100%). In the remaining 20 eyes in which the first probing procedure had failed, second probing was performed at a mean age of 23 months (12-32 months). The second probing was successful in 15 eyes (75%) and failed in five (25%) (Tables 4, 5).

According to the age evaluation, the first probing procedure was successful in 44 eyes (77.2%) and failed in 13 eyes (22.8%) among patients younger than 18 months. In the ⩾18 months group, the first probing was successful in 50 eyes (83.3%) and unsuccessful in 10 eyes (16.7%). There was no statistically significant difference between the patients aged <18 months and ⩾18 months in terms of probing results ($p>0.05$) (Table 6).

In five eyes in which the second probing failed, silicone intubation was performed at an average of 27 months (21-36 months), and success was achieved in all these cases (100%). In two eyes, the tube was removed at the second week and one month following intubation, respectively, because the patient pulled the tube out of the punctum,

Table 2. Distribution of age at the time of probing or silicone intubation as the primary procedure

			Age (months)		
	n	%	Median	Minimum	Maximum
Probing	117	96.7	18	3	64
Silicone intubation	4	3.3	50	47	60

Table 3. Success rates of probing and silicone intubation performed as primary procedures

	Outcome							
	Success		Failure		Partial success	Total		
	n	%	n	%	n	%	n	%
Probing	94	80.3	23	19.7	0	0.0	117	100.0
Silicone intubation	2	50.0	0	0.0	2	50.0	4	100.0

Table 4. Distribution of age at the time of probing or silicone intubation performed as the second procedure

			Age (months)		
	n	%	Median	Minimum	Maximum
Probing	20	90.9	23	12	32
Silicone intubation	2	9.1	35	26	43

Table 5. Success rates of probing and silicone intubation performed as the second procedure

	Outcome					
	Success		Failure		Total	
	n	%	n	%	n	%
Probing	15	75.0%	5	25.0	20	100.0
Silicone intubation	2	100.0%	0	0.0	2	100.0

Table 6. Distribution of procedure success according to age group

		Outcome					
		Success		Failure			
		n	%	n	%	χ^2	p
Age group	<18 months	44	46.8	13	56.5	0.698	0.404
	≥18 months	50	53.2	10	43.5		

and we were not able to insert it back into its place. For the remaining three cases, the tube was removed at an average of 3 months. No complications related to silicone intubation were observed.

Discussion

This study included 121 eyes from 93 patients. We retrospectively determined the probing success rate of CNLDO cases diagnosed at our clinic. We evaluated the effect of age at the time of probing on the success of the procedure. At the same time, we shared our results of nasolacrimal duct intubation in patients who did not benefit from repeated probing.

The timing of probing, the standard therapeutic procedure used for treating CNLDO, remains a matter of debate (9). In a previous study, it was shown that postponing probing and irrigation for CNLDO after 1 year did not cause an increase in failure or complication rates (10). Zor et al. (11) found the success rate of probing to be 93.7% in patients aged 12 to 84 months. Considering the high spontaneous resolution rates observed in the first 12 months, the authors suggested that probing should not be performed unless complications such as dacryocystitis and canaliculitis develop during this period. Another study concluded that the ideal probing time was between 6 and 12 months (12). We choose to perform conservative approaches and wait for up to 12 months for spontaneous recovery.

Consistent with the literature, we found that the first probing procedure was completely successful in 80.3% of the eyes and unsuccessful in 19.7%. In a recently published study with a large series, it was shown that spontaneous recovery slowed down and plateaued after 9 months in the follow-up of CNLDO (13). Recent reports have shown that age at probing is an important risk factor for failure of the procedure (6,9,14). In a large-series study, it was concluded that probing between 9 and 15 months might be reasonable, considering that the success of the first probing decreases after the 15th month. This timeframe includes both an earlier and narrower age range for intervention compared with probing after 1 year of age (13). Gul et al. (14) reported 100% success in probing performed at 4-12 months, 88.5% success at 7-12 months, and 82.5% success at 13-24 months. In our study, when we grouped the probing patients according to their ages at the time of the procedure, we observed that age did not have a significant effect on the success of the procedure. In one eye in which the first probing failed, probing was not repeated because the canalicular system was incomplete. Among the remaining eyes that underwent the second probing procedure, success was achieved in 15 eyes (75%), whereas the procedure failed in five (25%). Similar to the literature, our results concerning the second probing were not as successful as those of the first probing (15).

Silicone intubation has been frequently used for many years for treating many conditions such as congenital nasolacrimal duct occlusion, canalicular lacerations, primary canalicular disease, and complicated Dacryocystorhinostomy (16). Some researchers apply intubation, primarily as canalicular or monocanalicular for treating CNLDO in older children or in cases where the duct is narrow during probing (17). In our study, due to the age of the patients at the time of the procedure, probing was not performed in four eyes, and silicone intubation was undertaken as the primary procedure. Silicon intubation was also performed in two eyes in which the first probing had failed, and the second probing was not considered appropriate because of the age of the patients. Silicone intubation was performed in five additional eyes because the second probing procedure was unsuccessful. In addition, all intubations were performed canalicularly.

Many studies have demonstrated the success of silicone intubation for treating CNLDO. In the literature, the success rate of silicone intubation in pediatric eye diseases has been reported as 90.9% by Pashby and Rathbun (15),86% by

Yazıcı et al. (17), and 84% by Repka et al. (7). In the current study, according to the first-month follow-up results, there was partial improvement in two eyes that underwent silicone intubation as the primary procedure, whereas all the other eyes on which silicone intubation was performed as the second procedure had complete recovery.

The recommended time for tube removal varies between 6 weeks and 18 months after surgery (19). In our study, the tubes were removed after an average of 2.5 months. Although the initial plan was to remove the tubes at the third month, we had to remove them at the second week after the procedure in one patient and at one month in another patient because the tubes had been pulled out of the punctum. In both of these cases in which the tubes were removed early, the symptoms disappeared completely. Complications such as pyogenic granuloma formation, punctal or canalicular damage, crusting, runny nose, and corneal abrasion were not observed.

Conclusion

Our results show that probing is a very safe and effective procedure, and it has very successful results when applied after 12 months of age. Considering its less invasive nature, nasolacrimal duct intubation with silicone tubes appears to be a successful treatment option for CNLDO after failed probing. In the future, we plan to share our nasolacrimal duct intubation with silicone tubes results from our increasing number of cases to further contribute to the literature.

Ethics

Ethics Committee Approval: The study was approved by the Ümraniye Training and Research Hospital Clinical Research Ethics Committee (approval number: 2020-01/237, date: 11.06.2020)

Informed Consent: Patient inform consent is not required for this study.

Authorship Contributions

Surgical and Medical Practices: G.K.H., Concept: A.K., Design: A.K., B.İ.S.A., Data Collection or Processing: G.K.H., Analysis or Interpretation: M.S.K., B.İ.S.A., Literature Search: A.K., Writing: G.K.H., A.K.

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