

Monocanalicular Intubation in Children with Incomplete Complex Congenital Nasolacrimal Duct Obstruction Older Than Five Years of Age

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Abstract

Purpose: To evaluate the role of monocanalicular intubation (MCI) in congenital nasolacrimal duct obstruction (CNLDO) in children older than 5 years of age.

Methods: A retrospective case series study was done on children over 5 years of age diagnosed with CNLDO who underwent MCI. Success rates were evaluated subjectively by asking their parents about persistent symptoms and objectively using the dye disappearance test in clinical examination.

Results: A total of 43 eyes of 37 patients with a mean age of 7.42 ± 2.33 (range, 5–15 years of age) were included. The success rate was 60.46%, and the rate of secondary surgical intervention was 25% of all cases (61.11% of failed cases).

Conclusion: Primary MCI maintains a reasonable success rate in incomplete complicated CNLDO regardless of age.

Keywords: Age over 5 years old, Congenital nasolacrimal duct obstruction, Crawford intubation, Monocanalicular intubation

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INTRODUCTION

One of the most common orbital problems in children is congenital nasolacrimal duct obstruction (CNLDO).^{1,2} Approximately 20%–30% of all newborn infants present with CNLDO symptoms. The rate of spontaneous resolution in infants up to 1-year-old age is about 96%.³ Management of CNLDO in the 1st year of life is usually conservative with hydrostatic massage and topical antibiotics.^{4,5} In cases of unresolved epiphora beyond the age of 1-year, probing is the procedure of choice with high success rates.⁶⁻⁹ In a small minority of children with failed probing or older children as a primary intervention, silicon tube intubation is preferred by many ophthalmologists.¹⁰⁻¹² One of the most popular

techniques for silicone tube intubation is monocanalicular intubation (MCI) which is simple and less traumatic than bicanalicular intubation.¹³

Indeed, many surgeons believe that probing alone does not have an acceptable success rate in children older than 2 years of age¹⁴⁻¹⁶ because fibrosis and inflammation persist in these cases. Furthermore, in another hypothesis, more complex obstructions accumulate with time.⁴ However, some researchers claim that there is no decrease in the probing success rate in older children.¹⁷ Probing is a safe procedure that is easy to perform and more convenient for both the surgeon and the child in comparison to more invasive approaches like

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balloon dacryoplasty and dacryocystorhinostomy. Besides that, in our literature review, there has been no age limit for performing dacryocystorhinostomy in children till now.

Hence, the management of CNLDO in older children is controversial, and there is a lack of consensus on the approach for first intervention, especially in ages older than 5 years, which is the target age group in this study.

METHODS

This is a retrospective case series study done in Farabi Eye Hospital of Tehran and a private eye hospital in Isfahan on patients diagnosed with CNLDO with ages of 5–15 years old, between 2009 and 2017, who underwent probing and MCI. Tehran University of Medical Sciences' Ethical Board Committee approved the protocol (Ethics approval code: 9511257014) and informed consents were obtained. Tenets of the Declaration of Helsinki were followed. Medical records were reviewed. Under general anesthesia, all patients underwent irrigation tests, and CNLDO was approved. Then inferior punctum was dilated, and Bowman's probe (number 0 or 00) was used for probing, and patency was confirmed with metal on metal touching, using a Crawford hook. According to the surgeon's diagnosis based on probing at the time of surgery, patients with an incomplete complex type of obstruction were included. It was considered when the probe could reach the nasal cavity with some effort, and there were multiple sites of nasolacrimal obstructions (tactile sensation) without any bony resistance or very narrow nasolacrimal duct in which smaller size of the probe and/or more force was needed to pass through. A medium collarette Monoka tube attached to a Fayet-Bernard metal probe (FCI, Paris, France) was inserted in the lower canalicular system and fixed in the punctum in 37 patients, and Masterka tube (FCI-Ophthalmics, Marshfield Hills, MA) was used in 6 patients by pushing the tube into the nasolacrimal duct. Then the introducer was removed, and the tube was anchored in place at the punctum by a plug-like fixation head. Topical fluorometholone 0.1% (FML) and chloramphenicol 0.5% were instilled every 6 h for the first 10 postoperative days. The tube was removed after 2 months. Two oculoplastic surgeons did all surgeries.

Patients with histories of previous trauma to the lacrimal system, surgical procedures on the lacrimal drainage system, punctal or canalicular abnormalities, complete complex nasolacrimal duct obstruction, craniofacial anomalies, and nasal pathology were excluded.

We visited the patients after 1 week, and 3, and 12 months. The dye disappearance test was done as an objective test for evaluating the procedure's success. It was considered negative (dye disappearance test grade 0–1) if it disappeared or there was faint dye in the tear film after 3 min.¹⁸ We also asked about persistent epiphora or purulent discharge as a subjective symptom of failed cases or any other secondary surgical interventions needed for treating these cases.

The resolution was defined as not having epiphora or purulent discharge for 12 months following surgery, and a negative dye disappearance test and MUNK score of 0 or 1.¹⁹ Descriptive statistics is used in the dataset. The chart of demographic information, including age, sex, success, and the failure rate of surgical intervention, and the need for secondary intervention were reviewed.

RESULTS

In this study, we included 43 eyes of 37 patients diagnosed with CNLDO. The mean age of patients was 7.42 ± 2.33 (ranging from 5 to 15 years of age). Twenty-four patients (64.86%) were male. No patient had a previous history of probing. Fourteen eyes (31.81%) were correct, and 17 eyes (39.53%) were left eyes, and six patients (13.63%) had bilateral involvement. The demographic data of each subgroup (successful and failed cases) are mentioned in Table 1.

Six eyes underwent Masterka intubation, and the rest (37 eyes) underwent Monoka Crawford intubation. The mean follow-up time was 12.4 ± 0.6 months.

In 26 eyes (60.46%), there was no tearing and purulent discharge up to 12 months after tube removal, and a successful dye disappearance test, which is defined as a success rate.

Eleven (25%) of all eyes (61.11% of failed cases) underwent secondary surgical intervention. Other failed cases did not come to follow-up exams. Finally, dacryocystorhinostomy was done for four eyes, and balloon dacryoplasty for five eyes and two eyes underwent reintubation according to the surgeon's decision. The final success rate for initially failed cases who underwent additional surgery was 63.63%.

DISCUSSION

This study reports success rates of probing monocanalicular silicone intubation in CNLDO in children over the age of

Table 1: Demographic data of successful and failed intubation subgroups

Variable	Succeed	Failed	P	Total
Age	7 ± 2.08	8.14 ± 2.62	0.22	7.42 ± 2.33
Gender				
Male	16	8	0.92	24
Female	7	6		13
Laterality				
OD	9	11	0.04	20
OS	17	6		23
Postoperative munk score				
0	24 eyes	0	-	0.00
1	2 eyes	1	-	
2	-	2	-	
3	-	3	12 eyes	
4	-	4	5 eyes	
Treatment				
Masterka	2	4	0.06	6
Monoka	24	13		37

5 years as the first line of surgical intervention. CNLDO is divided into two subgroups. Simple forms are defined as a single distal membranous block at the Hasner valve that can be overcome in the absence of resistance or without much resistance.^{20,21} Complex forms consist of any nasolacrimal duct variations, a firm bony obstruction, impacted inferior turbinate, nondevelopment of nasolacrimal duct, or those associated with craniofacial abnormalities or syndromes.²² These complex types are also in the forms of complete (firm bony resistance preventing the probe from reaching the nasal cavity and repeated probing did not alter the condition) and incomplete (included narrow bone canal and multiple mucosal stenosis).^{6,21}

MCI is a simple treatment done by many ophthalmologists in children older than 1 year who did not respond to conservative management. As children grow up, simple obstructions tend to cure, and more complex ones remain, and it is why the success rate of treatment options decreases by increasing age.⁴ Dacryocystorhinostomy is reserved as the last option in persistent nasolacrimal duct obstruction in children.^{23,24} However, in our literature review, there was no cut-off for age to perform dacryocystorhinostomy in CNLDO cases.

In a study by Kashkouli *et al.*, initial nasolacrimal duct probing is advised for up to 5 years.²⁵ Andalib *et al.* reported the same result for bicanalicular versus MCI in children with CNLDO (89% vs. 86.2%, respectively).²⁶ Eshraghi *et al.*, in another study, found that bicanalicular intubation in incomplete complex CNLDO had a higher success rate in comparison to MCI, although the difference was not significant (74.4% vs. 59.6%).¹⁰ In many previous types of research, age is considered a risk factor of probing success rate^{4,27,28} although the others did not have such results.^{17,29-31}

In a study by Eshraghi *et al.*, 53.3% of children older than 18 months with incomplete complex NLDO resolved thoroughly after Masterka intubation.⁶ In a study by Okumuş *et al.*, 73.3% of children ranging from 7 to 15 years complete resolved during the follow-up period (8.8 ± 3.4 months).³² In a systematic review, Tai *et al.* mentioned that age is not predictive of intubation failure up to approximately 10 years old, which agrees with our results.³³

In this study, we included children over 5 years of age who were all in the incomplete complex type according to probing at the time of surgery, and Crawford intubation was done for them with a success rate of 60.46%, which is a similar rate of success in comparison to the previously mentioned study. As mentioned previously, MCI is easier to perform and less traumatic to the lacrimal system and has a lower rate of complications in comparison to bicanalicular intubation. Another advantage of MCI is that removal is simply done in the office.

Indeed, we think that as the pathophysiology of CNLDO is known and the same in all different age groups, our approach is also the same regardless of age and includes the following: Probing is first done. If the obstruction is simple (the probe

reaches nasal cavity with ease after popping sensation), it is sufficient. However, if it is incomplete complex, we can insert a Monoka Crawford tube, and in incomplete complex cases, dacryocystorhinostomy should be done. Hence, it is crucial to identify the type of obstruction while we are doing probing, and it is better to complete the procedure in one session according to the kind of obstruction.

The effectiveness of probing reduces with age because more severe obstructions remain after the initial high rates of spontaneous opening, and age is not supposed to have the central role in deciding about which surgical procedure should be done in CNLDO cases with attention to the similar pathophysiology. Clinicians must consider the type of obstruction (simple, incomplete complex, complete complex) to choose the best surgical intervention modality for each child regardless of his/her age.

This study has several limitations. The sample size was small, and the follow-up time was relatively short.

According to our study, ophthalmologists should keep probing and intubation in mind as an initial surgical option for treating children with CNLDO regardless of age before performing more complicated procedures such as early dacryocystorhinostomy. Nevertheless, to find the actual effect of age, we need to research comparing simple CNLDO of different age groups who underwent probing and also incomplete complex forms of various ages who underwent Crawford intubation.

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Conflicts of interest

There are no conflicts of interest.

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