Bicanalicular Intubation versus Monocanalicular Intubation in Management of Congenital Nasolacrimal Duct Obstruction

Prof. Dr. Abd-El Moez Haddad Ahmed, Prof. Dr. Ahmed Ismail M. Kamel, Prof. Dr. Abdallah Elhosainy Shaleel, Hala Salim Hagag

Ophthalmology Department, Faculty of Medicine Al-Azhar University, Egypt
haythamabdou@yahoo.com

Abstract: Congenital nasolacrimal duct obstruction occurs in approximately 5% of normal newborn infants. However, not all the neonates have symptoms because the obstruction usually resolves spontaneously before lacrimal secretion begins. The characteristic presentation of CNLDO obstruction is watering (epiphora) and mucopurulent discharge observed from the first month of life. This usually affects only one eye, although both eyes may be affected in up to 20% of cases. There is an extensive literature advocating treatments for CNLDO, Opinions have diverged as to the appropriate treatment regarding nature and timing. Probing has traditionally been advocated as a first-line management of CNLDO. Recently, however, some authors prefer to stent all patients at initial probing, regardless of complexity as it is thought to be associated with a high success and a low complication rate. In the present study assessment of the role of the newly designed monocanalicular intubation (Monoka) versus bicanalicular intubation in treatment of congenital nasolacrimal obstruction was evaluated. The study included 60 eyes of 54 patients with CNLDO their age was between 1.2-4.4 years, 30 eyes had monocanalicular intubation with Monoka tube and 30 eyes hadbicanalicular intubation. The overall success rate in monocanalicular intubation (Monoka) group was 76.7% while in bicanalicular intubation group was 80.0%. However the difference in the success rates between the two groups was not statistically significant (P value of 0.936). Monocanalicular intubation proved to be a simple method for nasolacrimal intubation with a fast learning curve and few complication. Both types of intubation are effective in primary management of congenital nasolacrimal duct obstruction. Our results raise the question of whether this ease and effectiveness of the tube could be weighed against the extra higher cost compared to bicanalicular intubation as there was no statistical difference between the two procedures.

[Abd-El Moez Haddad Ahmed, Ahmed Ismail Kamel, Abdallah Elhosainy Shaleel, Hala Salim Hagag. **Bicanalicular Intubation versus Monocanalicular Intubation in Management of Congenital Nasolacrimal Duct Obstruction.** *Nat Sci* 2019;17(3):1-9]. ISSN 1545-0740 (print); ISSN 2375-7167 (online). http://www.sciencepub.net/nature. 1. doi:10.7537/marsnsj170319.01.

Keywords: Bicanalicular Intubation versus Monocanalicular Intubation, Management of Congenital Nasolacrimal Duct Obstruction

1. 1. Introduction

Nasolacrimal duct obstruction (NLDO) is a blockage of the lacrimal drainage system. It may be congenital or acquired. Congenital obstructions tend to produce symptoms during the neonatal period, while acquired obstructions may be primary or secondary [(1)].

The primary acquired nasolacrimal duct obstruction (PANLDO) describes an entity of nasolacrimal duct obstruction caused by inflammation or fibrosis without any precipitating cause [(2)], while the secondary acquired lacrimal drainage obstruction (SANLDO) may result from a wide varity of infectious, inflammatory, neoplastic, traumatic or mechanical causes [(3)].

Congenital nasolacrimal duct obstruction (CNLDO) occurs in approximately 5% of normal newborn infants. Canalization of the nasolacrimal duct system is usually complete by the eighths' month of gestation [(4)].

There is no sex predilection and no genetic predisposition. The blockage can be unilateral or bilateral. The rate of spontaneous resolution is estimated to be 90% within the first year of life [(5)].

The congenital problems that can affect the nasolacrimal system could be imperforate Hasner valve; which is the most common cause of CNLDO, dacryostenosis; a common condition which may produce clinical symptoms in 2-4% of newborns, anomalies of the sac, anomalies of the puncta or anomalies of the canaliculi [(6)].

The characteristic presentation of CNLDO is epiphora, periocular crusting and discharge due to infection of the lacrimal system [(7)].

There is considerable controversy surrounding the management – both conservative and surgical – of childhood epiphora. The most common outcome of infantile epiphora is spontaneous resolution [(8)].

Treatment of CNLDO consists of initial observation followed by probing. While in case of probing failures, more aggressive surgical procedures may be indicated, such as; nasolacrimal duct

intubation, balloon dacryoplasty and Endoscopic dacryocystorhinostomy [9].

Aim of the Work

Comparison of monocanalicular tube with bicanalicular tube in management of congenital nasolacrimal duct obstruction.

1. 2. Patients and Methods

Study design

A randomized interventional case-controlled study that included 60 eyes of 52 patients, to compare the success rate of bicanalicular intubation versus monocanalicular silicone intubations in the treatment of children with CNLDO. The study was carried out from May 2015 to March 2017.

The patients were selected from the outpatient Ophthalmology Clinic of Al-Azhar hospitals and Memorial institute of ophthalmic research. The protocol was revised and approved by Al-Azhar University Ophthalmology Ethical Committee; informed written consent was obtained from all parents/guardians before the initiation of the procedure.

2. Patient selection:

Inclusion criteria:

Children aged between 1-5 years with primary CNLDO symptoms with simple mucosal obstruction with failure of probing procedure were included in the study.

Exclusion criteria:

- Children younger than 1 year because of known high probability of self-resolution during maturation of the nasolacrimal duct and older than 5 years.
- Patients who did previous lacrimal intervention other than probing or previous eyelid surgery.
- Punctal obstruction.
- Canalicular causes eg:
  - Canalicular obstruction.
  - Canalicular atresia with or without lacrimal duct agenesia.
  - Acquired pathologies of the canaliculi.
- Eyelid mal-positioning.
- Other causes of congenital Nasolacrimal Duct Obstruction eg:
  - Congenital lacrimal sac mucocele.
  - Dacrocystocele.
  - Neonatal dacrocystitis.
- Other causes of epiphora eg:
  - Acute conjunctivitis.
  - Glaucoma.
  - Entropion and trichiasis.
- Cases which didn't complete follow up were also excluded from the study.

Treatment groups:

Patients were randomly assigned to one of 2 groups.

Group A: 30 eyes underwent monocanalicular intubation of the nasolacrimal ducts.

Group B: 30 eyes underwent bicanalicular intubation of the nasolacrimal ducts.

Statistical Analysis

Data were collected, revised, coded and entered to the Statistical Package for Social Science (IBM SPSS) version 23. The quantitative data were presented as mean, standard deviations and ranges when their distribution found parametric while qualitative data were presented as number and percentages.

The comparison between two independent groups with qualitative data was done by using **Chi-square test** and/or **Fisher exact test** only when the expected count in any cell found less than 5.

The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following:

P > 0.05: Non significant,

P < 0.05: Significant.

P < 0.01: Highly significant.

3. Results

During the period of time covered by this study, surgery was performed on sixty eyes of 52 patients with CNLDO.

Monocanalicular intubation was performed in 30 eyes (27 children; group I) and bicanalicular in 30 eyes (27 children; group II). The youngest patient was 1.2 year old and the oldest was 4.4 years old. 28 were female patients, 26 were male patients. The right eye was involved in 27 cases. 2 patients lost in follow up one of them was bilateral intubation the other was bicanalicuar intubation.

Table (1): Demographic data of the studied patients

		No. = 54
Gender	Females Males	28 (51.9%) 26 (48.1%)
Age in years	Mean ± SD Range	2.65 ± 0.89 1.2 – 4.4
Laterality	Unilateral Bilateral	48 (88.9%) 6 (11.1%)
Previous probing number **(per eye)**	One Two	37 (61.6%) 23 (28.4%)

Patient's age:

From 1.2 to 4.4 years in both groups.

Laterality:

Total number of patients was 54, 6 patients had bilateral symptoms and 48 unilateral.

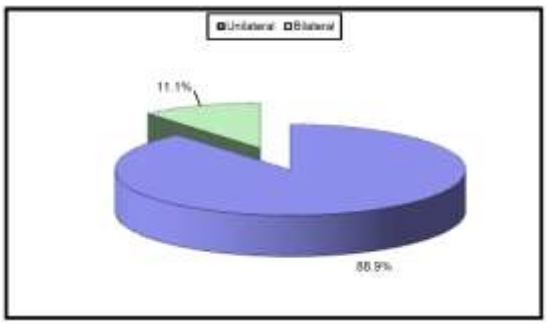

Figure (1): Laterality of the studied patients

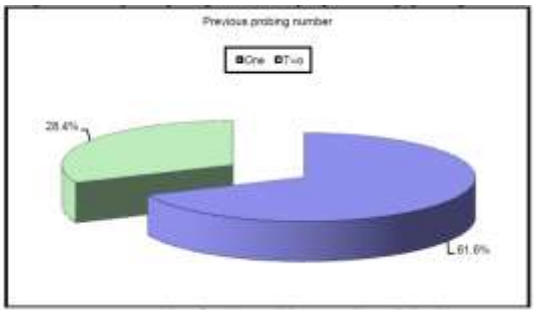

Figure (2): Number of previous probing among the studied patients

Preoperative data:

History taking which include: for how long did lacrimation occur, onset of lacrimation, history of previous probing and how many times probing is done, history of previous surgery or drug intake and massage.

Operative data:

During operation:

Slitting of the lower punctum was accidentally occurred in one patient with monocanalicular intubation but the injury was small and did not need repair for the punctum and its size was less than the diameter of the collarette.

Torn tube during grasping from the nose occurred in two monoka tubes.

Table (2): Comparison between group A and group B regarding torn tube and slitting during surgery

Operation		Group A		Group B		Test value*	P-value	Sig.
		No.	%	No.	%			
Torn tube	Negative	28	93.3%	30	100.0%	2.069	0.150	NS
	Positive	2	6.7%	0	0.0%			
Slitting of the punctum during surgery	Negative	29	96.7%	30	100.0%	1.017	0.313	NS
	Positive	1	3.3%	0	0.0%			

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant
*: Chi-square test

The previous table shows that there was no statistically significant difference found between group A and group B regarding torn tube and slitting during surgery with p-value = 0.150 and 0.313 respectively.

Post-operative data:

Follow up of the patients was done at 1st day, 1 week, 1 month and 2 month's post-operative.

In the first postoperative day

All patients came for examination, 1 patient of group A complained of postoperative epistaxis that continued till second day compared to 3 patients of group B. while lid edema occurs in 8 patients in group A and 13 patients in group B.

Table (3): Comparison between group A and group B regarding epistaxis and lid edema in the first day postoperative

First day		Group A		Group B		Test value*	P-value	Sig.
		No.	%	No.	%			
Epistaxis	Negative	29	96.7%	27	90.0%	1.071	0.301	NS
	Positive	1	3.3%	3	10.0%			
Lid edema	Negative	22	73.3%	17	56.7%	1.832	0.176	NS
	Positive	8	26.7%	13	43.3%			

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant
*: Chi-square test

The previous table shows that there was no statistically significant difference found between group A and group B regarding epistaxis and lid edema in the first day postoperative with p-value = 0.301 and 0.176 respectively.

Complications during first week:

Corneal erosion in the inferior medial quadrant was observed in one eye treated with monocanalicular intubation**,** and resolved within a few days after local treatment; it was not necessary to remove the tube prematurely.

Extrusion of the tube was found in 3 cases of group B. 2 of tubes were successfully repositioned in the operating room and one was removed.

Mucopurulent conjunctivitisoccurred in 4 cases and improved by antibiotics drops and ointment after three days.

Nasal obstruction occur in 15 cases 4 of them where in group A while 11 in group B and they were referred to an ENT consultant.

Slitting of the punctum occurs in one patient in group B.

Table (4): Comparison between group A and group B regarding corneal erosion, extrusion and mucopurulent conjunctivitis during the first week postoperatively

First week		Group A		Group B		Test value*	P-value	Sig.
		No.	%	No.	%			
Corneal erosion	Negative Positive	29 1	96.7% 3.3%	30 0	100.0% 0.0%	1.017	0.313	NS
Extrusion	Negative Positive	30 0	100.0% 0.0%	28 2	93.3% 6.7%	2.069	0.150	NS
Mucopurulent conjunctivitis	Negative Positive	28 2	93.3% 6.7%	28 2	93.3% 6.7%	0.000	1.000	NS

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant
*: Chi-square test

The previous table shows that there was no statistically significant difference found between group A and group B regarding corneal erosion, extrusion and mucopurulent conjunctivitis with p-value 0.313, 0.150 and 1.000 respectively.

Complications during the first month:

Slitting of the punctum (cheese wiring) and canaliculi were observed in one eye with BCI (group B) and none with MCI (group A).

Dislodging of the tube was found in 2 patients in group B and early removal was done with improvement of the symptoms in consecutive follow up.

Lacrimation of the healthy eye occurs in one patient of group B because of running nose.

Table (5): Comparison between group A and group B regarding slitting (cheese wiring of the punctum), dislodgement, nasal obstruction mucopurulent conjunctivitis during the first month postoperative

Complications during first month postoperative		Group A		Group B		Test value*	P-value	Sig.
		No.	%	No.	%			
Slitting (cheese wiring of the punctum)	Negative Positive	30 0	100.0% 0.0%	29 1	96.7% 3.3%	1.017	0.313	NS
Dislodgement	Negative Positive	30 0	100.0% 0.0%	28 2	93.3% 6.7%	2.069	0.150	NS
Nasal obstruction	Negative Positive	28 2	93.3% 6.7%	27 3	90.0% 10.0%	0.218	0.640	NS
Mucopurulent conjunctivitis	Negative Positive	28 2	93.3% 6.7%	29 1	96.7% 3.3%	0.351	0.554	NS

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant
*: Chi-square test

The previous table shows that there was no statistically significant difference found between group A and group B regarding slitting, dislodgement, nasal obstruction and mucopurulent conjunctivitis with p-value 0.313, 0.150, 0.640 and 0.554 respectively.

Outcome of the procedure:

At two months post procedure removal of both tubes in outpatient clinic 6 patients only need general anesthesia for the removal of the tube.

Table (6): Comparison between group A and group B regarding general anesthesia for removal of tube at 2 months

Two months follow up (remval of tube)		Group A		Group B		Test value*	P-value	Sig.
		No.	%	No.	%			
General anesthesia for removal at 2 months	Negative Positive	25 5	83.3% 16.7%	29 1	96.7% 3.3%	2.963	0.085	NS

The previous table shows that there was no statistically significant difference found between group A and group B regarding general anesthesia for removal of tube at 2 months with p-value = 0.085.

After two months from removal (four months after surgery) of tube by history taking and fluorescein disappearance test we found that:

In group A, complete resolution of symptoms was observed in 22/29 eyes (one patient didn't come in follow up) and failure in 5 eyes.

In group B, the complete resolution of symptoms was observed in 23/28 eyes (two patients didn't come in follow up) and failure in 4 eyes.

The success rate in group A (MCI) wasn't significantly higher than that of group B (BCI). There was no sex predominance.

Table (7): Comparison between group A and group B regarding follow up at 4 months (2 months after tube removal)

		Group A		Group B		Test value*	P-value	Sig.
		No.	%	No.	%			
Follow up at 4 months	Not failed	23	76.7%	24	80.0%	0.132	0.936	NS
	Failed	5	16.7%	4	13.3%			
	Unknown	2	6.7%	2	6.7%			

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant
*: Chi-square test

The previous table shows that there was no statistically significant difference found between group A and group B regarding follow up at 4 months (2 months after tube removal) with p-value = 0.428.

Relation of failure cases to age:

9 failed cases 6 of them were above 3 years while 3 of them are below 3 years of age.

4. Discussion

There are several techniques in management of CNLDO as irrigation, probing, silicone tube intubation, inferior turbinate fracture, balloon dacryocystoplasty, endoscopic intranasal surgery or dacryocystorhinostomy. So it's important that the chosen technique to be in correlation with the etiology of the disease and the complexity of the case [(13)].

Lacrimal pathways prosthesis with silicone tubes is indicated in ineffective conservative treatment, failed probing, or presence of strictures [(14)].

The technique of tube placement in children requires general anesthesia, and normal anatomy of the lacrimal system. The success rates ranged from 80% to 100 %[(15)].

Silicone intubation was first described by Quickert and Dryden in 1970 and the procedure has become part of the standard management of CNLDO. Among the factors that affect the treatment success of CNLDO are age, severity of symptoms, the history of previous interventions, time of the interventions, and compliance with treatment. However, there are no generally accepted and defined rules concerning age, length of intubation, and/or different variations in intubation systems [(15)].

Some authors had said that monocanalicular intubation could offer a chance to achieve a high success rates as it requires only a single pass through the nasolacrimal system [(16)].

While other authors use bicanalicular intubation more frequently, not only for treatment of CNLDO, but also for dacryocystorhinostomy, and canalicular stenosis [(15)].

Bicanalicular intubation was first introduced by Guibor [(19)] and Crawford [(18)] to augment the effect of sole probing with providing a pathway for epithelial cells to migrate and form a lumen around the tube in long term. The success rate of this procedure has been declared to be from 83% to 100% in various studies [(19)].

The French firm FCI introduced Monoka in 1992 and the first study on the clinical outcomes and complications of Monoka intubation method was done by Kaufman and Guay-Bhatia [(20)] in 1998. In this monocanalicular intubation method, the difficulty of passing the tube through the two puncti and canaliculi is simplified and abbreviated to a briefer technique.

The most commonly used are the Masterka and the Monoka tubes. In comparison of Monoka versus Masterka intubation for the treatment of CNLDO, there is little data in the literature. In 2014, Andalib and Mansoori[(21)] obtained higher success rate of intubation of Monoka (90%) compared to Masterka intubation (50%) in a prospective study.

Rajabi et al. [22], work on 90 eyes where they found that the overall success rate was 71.15% in Monoka group and 47.3% in Masterka group with statistically significant difference [22].

Besides the one time pass through the nasolacrimal system in Masterka intubation, this technique also does not have the stage of probe retrieval when reached to the nasal floor [22]. In spite that it seems very quicker to perform, however, meanwhile the metal guide is removed, the silicone tube has the opportunity to bunch up and come into the lacrimal sac, and the efficacy drops to a large extent, to a level similar to sole probing [23].

In present study the Monoka tube not the Masterka was used as the previous studies suggested that the success rate of Monoka is better than Masterka and one of the greatest disadvantages of masterka is that it may be punched up in the lacrimal sac so it will not be effective in management of congenital nasolacrimal duct obstruction.

In present study monocanalicular intubation (Monoka) and bicanalicular intubation for management of congenital nasolacrimal obstruction were used and compared.

Few reports compared the success rates of MCI with BCI. The success rates of BCIs for the treatment of CNLDO ranged from 83% to 100%.

In 1998 Kaufman and Guay-Bhatia [20] reported a 68% overall success rate in bicanalicular intubation group and 79% in Monoka group in a retrospective study of 73 patients.

Feyet et al. [24] observed complete resolution of epiphora in 67.7% with Monoka and 62.4% with BCI in their study of 120 cases [24].

On other hand study comparing MCI and BCI in 48 eyes, Kashkouli et al. [11] achieved nearly the same complete success rate (MCI 61.5%, BCI 59.0%); moreover, higher partial success and lower failure rate was achieved than in the group with BCI [11].

Rajabi et al. [22] found that the overall success rate was 96.4% in bicanalicular intubation and 71.5% in Monoka group. Actually there is no definite explanation to demonstrate the reason of this finding; they suppose that in bicanalicular intubation technique, as two parallel tubes are located beside each other, the diameter of the epithelial lumen that forms around the tubes is larger in this technique. The external diameter of the Crawford silicone tube is 0.8 mm and it returns to the nasal cavity after a U-turn in the punctal region compared to one-way pass of Monoka intubation with the external diameter of 0.64 mm.

Similar to the previous reports [25,26,27] their data showed lower success rate with increased age in BCI group; although age had no effect on the success rate in MCI group comparable to previous studies [26,28]. Compared to other studies that showed different rates of success from 86%-100% in MCI method [99,101], their study showed lower success rate in this technique with both methods, Monoka & Masterka.

On the other hand in the prospective randomized study of Andalib et al. [29], and another study by Kominek et al. [28], no statistically significant difference was found between bicanalicular and MCI techniques.

The present study included 60 eyes of 54 patients with CNLDO between the ages of 1.2-4.4 years, 30 eyes had monocanalicular intubation and 30 eyes had bicanalicular intubation. The overall success rate in the monocanalicular intubation group was 76.7% while in the bicanalicular intubation group was 80.0%. However the difference in the success rates between the 2 groups was not statistically significant.

(P value of 0.936). This could be due to limitation to our study that included a small number of cases and the relatively short follow up period.

In the present study, there were three cases of bleeding intraoperatively which corresponds to 5% of the cases. Repka et al. [23] reported in their study done on 180 eye, only one case of nasal bleed due to torn inferior turbinate which required packing and this corresponds to 0.5% of the cases [23]. While Rajabi et al. [22] had six cases of nasal bleeding from 347 eyes which corresponds to 1.7% of the cases [22].

In present study two cases of torn monoka tube after intubation and during grasping the tube from the nose and were replaced. This corresponds to 6.7% of the cases of group A. On the other hand this complication did not occur in group B. This complication is not reported in previous studies, the company did not give us an explanation for this industrial defect.

One case from group A (3.3%) had slitting of the punctum due to excessive traction from the nose but the tear was small and did not need repair for the punctum. This complication was not reported in previous studies too.

One of the factors that may determine whether or not to use BCI or MCI is the number of complications. One of the main advantages of BCI is that BCI is generally very well-tolerated by the cornea because it is significantly smoother than MCI. If MCI is used, corneal abrasions or ulcers can be caused by the ocular end of the MCI. The abrasions usually occur in the inferior nasal quadrant (if the tube is fixed in the inferior canaliculus), and usually heal in a few days after local treatment [30].

Fayet et al. [30] observed only three (1.5%) corneal ulcers in 223 eyes with MCI, whereas no corneal ulcers were observed in 1, 620 BCI placements. They assumed that the placement of the MCI in the superior canaliculus is a predisposing

factor for corneal irritation, especially if the size and length of the collarette is larger [30].

On the other hand, Engel et al. [16] recommend performing MCI through the superior canaliculus, found only 2% risk of conjunctival or corneal abrasions in their series of 635 eyes [16].

Ragib et al. [23] had corneal abrasion only in one eye of 338 cases using Monocanalicular intubation through the lower punctum.

Pashby and Hurwitz [31] found the diameter of the collarette to be unimportant and without influence on the rate of corneal erosions [31].

In present study, in which monocanalicular tubes were inserted into the inferior Canaliculus, corneal abrasion was observed in only one child (3.3%) P-value > 0.05 one week after the surgery. The abrasion healed within 3 days without premature removal of the tube. Our experience confirms that it is necessary to use tubes of appropriate size with a small flange (collarette) that does not exceed the eyelid margin and does not irritate the cornea, so that corneal abrasion and ulceration will be avoided.

Kominek et al. [23] found that the manipulation in only one canaliculus is also advantageous because the risk of possible iatrogenic traumatization of the lacrimal system is lower and the tube is fixated in the punctum without the need of anchoring sutures, there is no risk of cheese wiring of the puncta due to excessive tension as in cases of bicanalicular intubation. Removal of the tube is simple and done under light sedation as an office procedure [23].

Cervenka et al. [32] found that the manipulation in only one canaliculus may be advantageous because the risk of possible iatrogenic traumatization of the lacrimal system is lower. [32]

In present study only one eye in group B (bicanalicular intubation) 3.3%had cheese wiring of the lower punctum at one month follow up and there was no need to remove the tube as the punctal laceration was less than 3 mm. Close follow up was done and the patient was instructed not to rub the eyelids and the tube was removed after one month.

In order to prevent damage to the punctum by fibrous meatal ring while inserting the MCI, an appropriate technique should be used [33]. That is why performing an excessively aggressive dilation of the punctum is not recommended. Fayet et al [30] who developed the Monoka system (FCI, France), recommended only gentle traction on the distal end at the time of insertion and gentle dilation of the punctum. A special dilator for inserting the tube can help to avoid inadvertent damage to the punctum and canalicular systems [30,133]. Although in the present study we did not use this dilator, no difficulties during the time of intubation were observed. On the other hand, excessive dilation might increase the incidence of some complications, especially spontaneous loss of the tubing. [33]

Ragib et al. [32] reported premature tube removal because of tube dislodging [32]. Lower unplanned tube removal rates in Monoka group in their study is probably due to the tie made to the nasal wall. The Monoka was tied in the nasal cavity and so that the rate of extrusion was small in our series.

In the study by Kaufman et al. [24] of 48 eyes with MCI, 21 cases of premature tube removal occurred (43.7%) [24].

In present study dislodging of the tube was found in 2 cases after one week with BCI. One of them was repositioned in the operating room and one was early removed and this child came in follow up with symptoms of failure (lacrimation and positive dye disappearance test) and after one month was reintubated with monocanalicular tube. One month postoperatively we had another 2 cases of dislodgement of the tube one from group A and one from B where early removal was done with improvement of the symptoms during the follow up.

Huang et al. [12] found two granulomas in children who had MCI. Though those resolved few weeks after removal of the tube, they seemed to be related to the ocular end of MCI [12] while in present study no granuloma pyogenicum was observed in either groups.

In the study done by Ragabi et al. [22] all stents were removed three month after intubation and patients were examined three months after tube removal for clinical outcome evaluation [22].

Komínek et al. [28] had said that the tubes were removed 2 to 4 months after the surgery, and the children were followed up for 6 months [28].

Repka et al. [24] planned tube retention for 2 to 5 months in a prospective study [24].

Peterson et al. [77] found that removal of the silicone tube at 2 months is less likely to affect the final result in children with simple nasolacrimal duct obstruction but removal of the tube after 2 months is recommended for children with complex obstruction [10].

Fayet et al. [30] recommended not leaving a tube in for longer than 3 months to decrease the likelihood of complications [30].

Welsh et al. [34] say that removal of the tube remains controversial but the recommended time range from 6 weeks to 18 month [34].

Migliori and Putterman [35] found that retention for only 6 weeks was sufficient for a satisfactory outcome [35].

Lim and colleagues [35] found that there was a significant decrease in success with retention of the tubes beyond twelve months [36]. Conversely, other

authors have found that retention for 6 months or more is preferable for an improved chance of success [20,34].

In our study the tube was removed after two months and the patients were followed up for one month after removal of the tube.

The question of whether or not the number of complications would increase with longer tube placement is unclear [16].

Relation of failure according to age

Welsh & Katowitz [34] reported success rates for intubation stratified by patient age. The success rate for intubation in children aged 12-24 month was 91.3% which decreased to 85.5% in those aged 24-36 months and to 79.6% in those aged 36-48 months [34].

In our study9 failed cases where 6 of them were above 3 years.

Finally the question is bicanalicualr intubation or monocanalicuar intubation

Engel et al. [35] found patients with MCI had less recurrence and reoperations, and is an appropriate alternative in the treatment of CNLDO [35] and this comes in agreement with our study that MCI reduce reoperation as the BCI can be extruded by the patient while rubbing his eyebut don't reduce the recurrence.

Our results raise the question of whether or not it would be better to prefer MCI over BCI in the treatment of CNLDO, further prospective, randomized studies would better determine the advantages and disadvantages of the two intubation methods.

References

1. Weiss AH, Baran F & Kelly J. Congenital nasolacrimal duct obstruction. Arch Ophthalmol 2012; 130: 842–848.
2. Linberg JV, McCormick SA. Primary acquired nasolacrimal duct obstruction. A clinicopathologic report and biopsy technique. Ophthalmology 1986; 93(8):1055-1063.
3. Bartley GB. Acquired lacrimal drainage obstruction: an etiologic classification system, case reports, and a review of the literature. Part 3. Ophthal Plast Reconstr Surg. 1993. 9(1):11-26.
4. Moscato EE, Kelly JP & Weiss A. Developmental anatomy of the nasolacrimal duct: Implications for congenital obstruction. Ophthalmology 2010; 117: 2430–2434.
5. Nelson LB, Calhoun JH, Menduke H. Medical management of congenital nasolacrimal duct obstruction. Ophthalmology. 1985; 92:1187-1190.
6. Sevel D. Developmental and congenital abnormalities of the nasolacrimal apparatus. J Pediatr Ophthalmol Strab 1981; 18(5):13-19.
7. MacEwen CJ & Young JD. The fluorescein disappearance test (FDT): an evaluation of its use in infants. J Pediatr Ophthalmol Strabismus 1991b 28: 302–305.
8. MacEwen CJ & Young JD. Epiphora during the first year of life. Eye 1991 a 5: 596–600.
9. Takahashi T, Kakizaki H, Chan W. management of congenital nasolacrimal obstruction. Actaophthalmol, 2010; 88:506-513.
10. Peterson NJ, Weaver RG & Yeatts RP. Effect of short-duration silicone intubation in congenital nasolacrimal duct obstruction. Ophthal Plast Reconstr Surg 2008; 24: 167–171.
11. Kashkouli MB, Kempster RC, Galloway GD, et al. Monocanalicular versus bicanalicular silicone intubation for nasolacrimal duct stenosis in adults. Ophthal Plast Reconstr Surg 2005; 21:142–147.
12. Huang YH, Liao SL, Lin LLK. Balloon dacryocystoplasty and monocanalicular intubation with Monoka tubes in the treatment of congenital nasolacrimal duct obstruction. Graefes Arch Clin Exp Ophthalmol 2009; 247:795–799.
13. Kakizaki H, Takahashi T, Kinoshita S, et al. The rate of symptomatic improvement of congenital nasolacrimal duct obstruction in Japanese infants treated with conservative management during the first year of age. Clin Ophthalmol 2008; 2:291–294.
14. Memon MN, Siddiqui SN, Arshad M, et al. Nasolacrimal duct obstruction in children: outcome of primary intubation. J. Pak. Med. Assoc. 2012; 62(12):1329–1332.
15. Yu G, Hu M, Wu Q, e al. Factors affected therapeutic results in treatment of children congenital nasolacrimal duct obstruction by Ritleng lacrimal intubation. Zhonghua Yan Ke Za Zhi. 2012; 48(5):423–427.
16. Fayet B, Katowitz W, Racy E, et al. Pushed monocanalicular intubation: An alternative stenting system for the management of congenital nasolacrimal obstructions. J AAPOS, 2012; 1-5.
17. Guibor P. Canaliculus intubation set. Trans Sect Ophthalmol Am Acad Ophthalmol Otolaryngol. 1975; 79(2): OP419–420.
18. Crawford JS. Intubation of obstructions in the lacrimal system. Can J Ophthalmol. 1977; 12(4):289–292.
19. Dortzbach RK, France TD, Kushner BJ, et al. Silicone intubation for obstruction of the nasolacrimal duct in children. Am J Ophthalmol. 1982; 94(5):585–590.
20. Kaufman LM, Guay-Bhatia LAG. Monocanalicular intubation with Monoka tubes for the treatment of congenital nasolacrimal duct obstruction. Ophthalmology 1998; 105:336–341.

21. Andalib D, Mansoori H. A comparison between monocanalicular and pushed monocanalicular silicone intubation in the treatment of congenital nasolacrimal duct obstruction. Int J Ophthalmol. 2014; 7(6):1039–1042.
22. Rajabi MT, Najmeh Z, Alireza M. Bicanalicular versus monocanalicular intubation after failed probing in congenital nasolacrimal duct obstruction Int J Ophthalmol. 2016; 9(10): 1466–1470.
23. Repka MX, Melia BM, Beck RW. Primary treatment of nasolacrimal duct obstruction with nasolacrimal duct intubation in children younger than 4 years of age. J AAPOS 2008; 12:445–450.
24. Fayet B, Bernard JA, Assouline M. Bicanalicular versus monocanalicular silicone intubation for nasolacrimal duct impatency in children: a comparative study. Orbit 1993; 12:149–156.
25. Goldstein SM, Goldstein JB, Katowitz JA. Comparison of monocanalicular stenting and balloon dacryoplasty in secondary treatment of congenital nasolacrimal duct obstruction after failed primary probing. Ophthal Plast Reconstr Surg. 2004;20(5):352–357.
26. Freitag SK, Woog JJ. Congenital nasolacrimal obstruction. Ophthalmol Clin North Am 2000; 13:705–718.
27. Lee H, Ahn J, Lee JM, et al. Clinicaleffectiveness of monocanalicular and bicanalicular silicone intubation for congenital nasolacrimal duct obstruction. J Craniofac Surg. 2012; 23(4):1010–1014.
28. Kominek P, Cervenka S, Pniak T, et al. Monocanalicular versus bicanalicular intubation in the treatment of congenital nasolacrimal duct obstruction. Graefes Arch Clinical Exp Ophthalmol. 2011; 249(11):1729–1733.
29. Andalib D, Gharabaghi D, Nabai R, et al. Monocanalicular versus bicanalicular silicone intubation for congenital nasolacrimal duct obstruction. J AAPOS. 2010; 14(5):421–424.
30. Fayet B, Hurbli T, Renard G, et al. Suggested precautions when using a monocanalicular stent. Ophthal Plast Reconstr Surg 2001; 17:76–77.
31. Pashby RC, Hurwitz JJ. Pediatric lacrimal diseases. In: Hurwitz JJ (ed) The lacrimal system, 1st edn. Lippincott Raven, Philadelphia, 1996; pp 237–244.
32. Červenka S, Komínek P, Novák V. Intubation of the lacrimal pathways under endoscopic control. Ophthalmologica 2000; 214:381–384.
33. Fayet B, Assouline M, Bernard JA. Letter to editor (Monocanalicular intubation with Monoka tubes for the treatment of congenital nasolacrimal duct obstruction). Ophthalmology 1998; 106:1795–1796.
34. Welsh MG, Katowitz JA. Timing of Silastic tubing removal after intubation for congenital nasolacrimal duct obstruction. Ophthal Plast Reconstr Surg. 1989; 5(1):43–48.
35. Migliori ME, Putterman AM. Silicone intubation for the treatment of congenital lacrimal duct obstruction: successful results removing the tubes after six weeks. Ophthalmology. 1988; 95(6):792–795.
36. Lim CS, Martin F, Beckenham T, Cumming RG. Nasolacrimal duct obstruction in children: outcome of intubation. J. AAPOS. 2004; 8:466–472.
37. Engel JM, Hicuje-Schmidt C, Khammar A, et al. Monocanalicular silastic intubation bor the initial correction of congenital nasolacrimal duct obstruction. J AAPOS 2007; 11:183–186.

12/19/2018