·Clinical Research·

# A comparison between monocanalicular and pushed monocanalicular silicone intubation in the treatment of congenital nasolacrimal duct obstruction

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Received: 2013-07-05 Accepted: 2014-09-09

## Abstract

**•AIM: To compare the success rate of monocanalicular versus pushed monocanalicular silicone intubation (PMCI) of the nasolacrimal duct for congenital nasolacrimal duct obstruction (CNLDO).**

**•METHODS: In a prospective randomized clinical trial 53 eyes of 49 patients with CNLDO underwent either monocanalicular silicone intubation (MCI) (*n*=28 eyes) or PMCI (*n*=25 eyes). All procedures were performed by 1 oculoplastic surgeon. Treatment success was defined as the complete resolution of epiphora at 3mo after tube removal.**

**•RESULTS: The surgical outcome was assessed in 20 eyes with MCI and 20 eyes with PMCI. The mean age of treatment was 26.25±10.08mo (range, 13-49mo) for MCI and 26.85±12.25mo (range, 16-68mo) for PMCI. Treatment success was achieved in 18 of 20 eyes (90.0%) in the MCI group compared with 10 of 20 eyes (50%) in the PMCI group (*P*=0.01). In the PMCI group, the tube loss (30%) was greater than the MCI group (5%), however the differences between the 2 groups proved to be not significant (*P*=0.91).**

**•CONCLUSION: Our results indicate that MCI has higher success rate in CNLDO treatment compared with PMCI in this small series of patients.**

**•KEYWORDS:** lacrimal drainage system; congenital nasolacrimal duct obstruction; silicone intubation

**DOI:10.3980/j.issn.2222-3959.2014.06.24**

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

## INTRODUCTION

Congenital nasolacrimal duct obstruction (CNLDO) is thought to be a prenatal developmental failure to cannulate the nasolacrimal system [1]. CNLDO is a common condition in early childhood which is reported to occur in 3.5% of mature children [2]. Most cases will resolve spontaneously early in life [3]. For those children whose obstruction does not spontaneously resolve, probing is an initial procedure [4]. Nasolacrimal silicone intubation is a treatment for CNLDO after failed probing and irrigation[5,6]. It has been recommended as the primary procedure in patients older than 24mo because of the reduced success rate of probing with age [7]. Intubation was more successful than probing in patients with Down syndrome[8].

Many intubation techniques and types of intubation sets have been described. In monocanalicular silicone intubation (MCI), the stent was retrieved in the nasal cavity with a special hook [9,10]. More recently, pushed MCI (PMCI) has been introduced as another potential treatment option in CNLDO. In PMCI, the metallic guide is located inside a silicone tube. Therefore, there is no intranasal retrieval of the stent required with this technique [11,12]. It seems that the latter technique is less traumatic to nasal cavity than MCI. The aim of this study was to compare the outcomes of MCI and PMCI as a treatment for CNLDO.

## SUBJECTS AND METHODS

**Subjects** Children with CNLDO were prospectively randomized into 2 groups for either MCI or PMCI from December 2011 to February 2013. The diagnosis of NLDO was based on symptoms of epiphora or recurrent mucopurulant discharge from birth and/or reflux from the lacrimal sac with pressure. Children with CNLDO and a history of failed probing (secondary treatment) or age of at

**Table 1 Baseline characteristics of study patients**

| Variables | MCI | PMCI | *P* |
|---|---|---|---|
| Mean age at operation time (mo) | 26.25 ±10.08 (13-49) | 26.85 ±12.25 (16-68) | 0.98[a] |
| Probing history | | | |
| N | 7/20 (35%) | 12/20 (60%) | 0.20[b] |
| Y | 13/20 (65%) | 8/20 (40%) | |

MCI: Monocanalicular silicone intubation; PMCI: Pushed monocanalicular silicone intubation. [a]Mann-Whitney *U* test; [b]Chi-square test.

least 24mo old at presentation (primary treatment) were included in this study. Children with Down syndrome, punctal or canalicular anomaly, previous nasolacrimal duct intubation or dacryocystorhinostomy, history of trauma to the nasolacrimal system, craniofacial abnormality, or less than 6wk of follow-up after tube removal were excluded. The study was approved by the Tabriz University of Medical Sciences Ethics Committee. Different surgical options were explained to parents, and informed consent was obtained.

**Methods** All nasolacrimal intubations were performed under general anesthesia with laryngeal mask by a single oculoplastic surgeon (Andalib D).

After standard probing through the lower punctum, patency was confirmed by touching the probe under the inferior meatus in the nasal cavity with a Crawford hook (metal on metal).

In the monocanalicular technique, we placed a medium collaret Monoka Fayet tube (Guide of Crawford, FCI, Paris, France; Figure 1) through the lower punctum; the tube was retrieved in the nasal cavity with Crawford hook. The head was then fixed in the inferior punctal ampulla with a plug inserter.

In the pushed monocanalicular technique, probe with marking (Figure 2) was used for initial probing and measuring the proper length of the stent (30 mm, 35 mm, 40 mm). Once the proper stent length was selected, the Masterka (FCI, Paris, France; Figure 2) was inserted into the lower canaliculus. Once the Masterka was advanced completely into nasolacrimal duct and the plug came in contact with punctum, the metal guide was removed by holding the plug firmly in contact the punctum. The head was then fixed in the inferior punctal ampulla with a plug inserter. Following the surgery, antibiotic and corticosteroid drops were prescribed 4 times daily for 1wk in all patients. The children were examined for tube loss and corneal complication within 1wk and then again after the first and third months of surgery. Tube removal was scheduled for 3mo after surgery. Tube removal was performed in the office. Treatment success was defined as the complete resolution of epiphora at 3mo after tube removal.

**Statistical Analysis** The data were analyzed with the SPSS statistical package (Version 17; SPSS, Inc, Chicago, IL, USA). Descriptive statistics, including the mean and standard deviation were calculated for all variables. Study groups were compared using Chi-square, Fishers exact and Mann-Whitney *U* test. The *P* value of less than 0.05 was considered to be statistically significant.

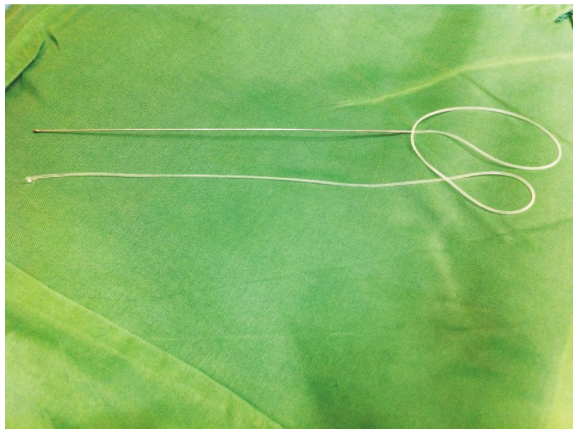

**Figure 1 Monoka Fayet tube (Guide of Crawford).**

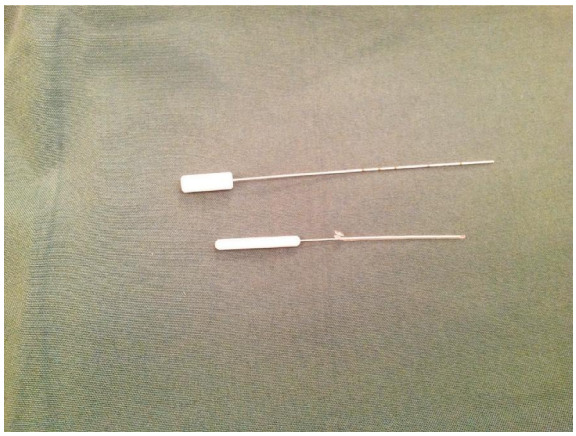

**Figure 2 Probe with marking and Masterka.**

## RESULTS

A total of 53 eyes of 49 children with CNLDO were included, in 2 groups: MCI (*n*=28 eyes) and PMCI (*n*=25 eyes). In the MCI group, 8 patients were unavailable for follow-up after tube removal. In the PMCI group, 5 patients were unavailable for follow-up after tube removal. Thus, we successfully evaluated the clinical results of 20 eyes of 19 patients in the MCI group and 20 eyes of 17 patients in the PMCI group. Baseline characteristics by treatment group are given in Table 1.

Treatment success was achieved in 18 of 20 eyes (90.0%) in the MCI group compared with 10 of 20 eyes (50%) in the PMCI group ($P$=0.01).

Treatment success was achieved in 7 of 12 eyes (58.3%) after PMCI as a primary treatment.

In 1 of 20 eyes in MCI, the tube was lost after 1mo. A successful result was achieved in this eye at 3mo after tube loss. In 6 of 20 eyes in PMCI, the tube spontaneously fell out before 1mo. A successful result was achieved only in 3 eyes at 3mo after tube loss. In the PMCI group, the tube loss (30%) was greater than the MCI group (5%), however the differences between the 2 groups proved to be not significant ($P$=0.91).

Slit punctum occurred in 4 eyes in PMCI. The tube was lost only in 1 of 4 eyes. No punctal complications occurred in MCI. No other complications (corneal abrasion, tube-related keratopathy, canaliculitis and punctal plug migration to canaliculus) were seen in either group.

## DISCUSSION

In this study, there was a statistically significant increase in the success rate of intubation in MCI (90%) compared with PMCI (50%; $P$=0.01). We could not find any study that compared these procedures in the literature.

In our study, the success rate for MCI (90%) compares favorably with the previously reported success rates, which have ranged from 86.2% to 100% for MCI in treatment of CNLDO[13-16].

We achieved a lower success rate with PMCI (50%). Also, we achieved a lower success rate with PMCI as a primary treatment (58.3%). However, in a retrospective study by Fayet and colleagues, 110 eyes were treated as a primary procedure with PMCI, with an overall success rate of 85%[11].

In our study, tube loss was 30% in the PMCI. However, tube loss after PMCI was 15% in study by Fayet *et al* [11] suggested that length of intubation for the PMCI may play some role in treatment success. El-essawy [17] found that the reoperation rate was increased if the tubes were removed prior to 6wk. Also, Peterson *et al* [18] found that early tube removal increased the reoperation rate in children older than 24mo. It seems that the tube loss may increase failure rate in PMCI, although the small number of patients in our study was the important limitation to make any accurate determination in this regard. Furthermore, the bunching of stent within lacrimal sac during the removal of metal guide may a risk factor for intubation failure.

Monocanalicular tubes can be pulled out easily with eye rubbing, and we provided caregivers with instructions to prevent eye manipulation to minimize this complication. In our study, tube loss was uncommon in the MCI (only 1 eye) compared with tube loss after MCI of 3.4% to 22.8% reported in other studies [13-15]. However, there was a statistically insignificant increase in the tube loss in PMCI (6 of 20 eyes; $P$=0.9). Also, the tube loss after PMCI was 15% in study by Fayet *et al* [11]. They found that an unnecessarily long stent will contact the floor of the nasal space and may blend. This could act as a spring, placing an upward force to unstent the Masterka[11].

In our study, slit punctum occurred in 4 of 20 eyes with PMCI and the tube was lost only in 1 of 4 eyes. However, Fayet *et al* [11] reported no punctal complication. Also, no punctal or corneal complications occurred in MCI in our study. However, the Pediatric Eye Disease Investigator Group found corneal complications in 1 of 309 eyes with MCI[19,20].

No other complications (tube-related keratopathy, canaliculitis and punctal plug migration to canaliculus) were seen in either group.

The most important limitation of our study was the small number of patients enrolled, precluding the firm conclusion about the treatment success and subgroup analysis based on the probing history.

In conclusion, our results indicate that MCI had higher success rate in CNLDO treatment compared with PMCI in this small series of patients.

## ACKNOWLEDGEMENTS

**Conflicts of Interest: Andalib D,** None; **Mansoori H,** None.

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