

# Outcome of External Dacryocystorhinostomy and Monocanalicular Intubation in Patients with Total Obstruction of One Canaliculus

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**Purpose:** We sought to evaluate the outcomes of external dacryocystorhinostomy (DCR) and mono-canalicular intubation in patients with total obstruction of one canaliculus.

**Methods:** Sixteen eyes of 16 patients with nasolacrimal duct obstruction and a single canaliculus obstruction who had undergone external DCR and monocanalicular intubation of the intact canaliculus were retrospectively included in the present study. The monocanalicular tube (Mini Monoka) was left in place for at least two months. Munk epiphora grading for the evaluation of epiphora and irrigation was performed both preoperatively and at 6 months postoperatively.

**Results:** Mean patient age was  $46 \pm 14.2$  (range, 18 to 76) years. The inferior canaliculus was obstructed in nine eyes (group A) and the superior canaliculus was obstructed in seven eyes (group B), respectively. Eight eyes had chronic dacryocystitis and two of these eyes also had a history of acute dacryocystitis attack. Mean preoperative Munk scores were 3.89 in group A and 4.0 in group B. Ocular surface irritation occurred in one eye in group A. Artificial eye drops were prescribed and early tube removal was not performed. Spontaneous tube dislocation was recorded in one eye in group B. No other corneal, punctal, or canalicular complications were found. At six months, irrigation of intact canaliculus was patent in all eyes. Mucoïd discharge, conjunctival hyperemia, and chronic conjunctivitis were also resolved. Postoperative Munk scores were  $1.11 \pm 0.9$  in group A and  $0.86 \pm 0.9$  in group B. Of note, preoperative and postoperative Munk scores were significantly different in both groups (group A,  $p = 0.006$ ; group B,  $p = 0.017$ ). The postoperative Munk scores were not statistically different between the two groups ( $p = 0.606$ ).

**Conclusions:** In patients with nasolacrimal duct obstruction and a total of one canaliculus obstruction, external DCR and monocanalicular intubation of the intact canaliculus is an effective surgical option.

**Key Words:** Dacryocystorhinostomy, Lacrimal apparatus diseases, Lacrimal duct obstruction

Single canaliculus obstruction with nasolacrimal duct obstruction (NLDO) is one of the most problematic situa-

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tions in lacrimal surgery. Endoscopic dacryocystorhinostomy (DCR) may be effective in these patients; however, one other surgical option is external DCR with monocanalicular intubation of the intact canaliculus. External DCR is one of the most performed surgeries by oculoplastic surgeons at this time [1,2]. To the best of our knowledge, there has been no study published yet that evaluates the efficacy

of DCR operation with monocanicular intubation in patients with one intact canaliculus.

Thus, in this investigation, we aimed to demonstrate the anatomical and the functional success of DCR with monocanicular intubation in patients with NLDO and one canaliculus obstruction.

## Materials and Methods

Sixteen eyes of 16 patients with NLDO and one canaliculus obstruction who had undergone external DCR and monocanicular intubation of the intact canaliculus were retrospectively included in the present study and their charts were reviewed. Patients with lid problems and/or previous lacrimal surgery as well as those younger than 18 years of age were excluded from the study. Surgeries were performed between 2011 and 2016. Total canaliculus obstruction is designated when the intact proximal part of the obstructed canaliculus is <8 mm and the obstructed part cannot be passed. We gently forced the obstructed canaliculus with Bowman probes. If the obstructed canaliculus segment could be passed by the Bowman probe, we performed bi-canicular silicone intubation. We did not perform forced intubation to avoid incorrect passage formation and traumatization of the intact canaliculus. All patients were informed about surgical options and possible complications. All procedures were performed according to the patients' preferences. All patients signed informed consent in accordance with the tenets of the Declaration of Helsinki. A local ethics committee approved the study (HN:2018-22).

External DCR was performed under local or general anesthesia. A skin and orbicularis incision was performed lateral to the angular vein. Next, we performed a periosteum incision and displaced the lacrimal sac laterally. A 15-mm × 15-mm bony window was created. Vertical incisions were made to open the lacrimal sac and nasal mucosa and mucosal flaps were created. Next, the common canaliculus opening and sac walls were examined. A Bowman probe was tried for insertion through the upper and lower puncta. If we could pass the obstructed part of the canaliculus, we performed bi-canicular intubation and these patients were excluded from further evaluation. However, if the patent part of the proximal canaliculus was <8 mm and we could not pass the obstructed part with a Bowman probe,

we didn't perform any additional intervention for the obstructed canaliculus. Instead, we intubated the other patent canaliculus with a Mini Monoka (FCI Ophthalmics, Pembroke, MA, USA) tube and we included these patients in the study group. The flaps of the lacrimal sac and nasal mucosa were then sutured over the silicone stent. We suspended the anastomosed flap with 6/0 polyglactin suture passing through the orbicularis. Finally, we sutured the orbicularis and the skin.

We prescribed corticosteroid and antibiotic eyedrops four times daily for two weeks and oral antibiotics twice daily for one week. Monocanicular tubes were left in place for at least two months. Patients were instructed not to rub or touch their eyes so as to reduce the risk of tube complications.

All patients were asked to rate their epiphora severity according to the Munk epiphora grading scale both preoperatively and at six months postoperatively [3]. No watering is defined as zero points and constant watering is defined as four points in this scale. Also, irrigation of the intact canaliculus was performed in all patients.

## Results

Mean patient age was  $46 \pm 14.2$  (range, 18 to 76) years. The inferior canaliculus was obstructed in nine eyes (group A), while the superior canaliculus was obstructed in seven eyes (group B). Eight eyes had chronic dacryocystitis, with two of these eyes having a history of acute dacryocystitis attack. Mean preoperative Munk scores were 3.89 in group A and 4.0 in group B. Ocular surface irritation occurred in one eye in group A. Artificial eye drops were prescribed and early tube removal was not performed. Spontaneous tube dislocation was recorded in one eye in group B. No other corneal, punctal, or canaliculus complications were observed. At six months, irrigation of the intact canaliculus was patent in all eyes. Mucoïd discharge, conjunctival hyperemia, and chronic conjunctivitis were also resolved. Postoperative Munk scores were  $1.11 \pm 0.9$  in group A and  $0.86 \pm 0.9$  in group B. Preoperative and postoperative Munk scores were significantly different in both groups (group A,  $p = 0.006$ ; group B,  $p = 0.017$ ). The postoperative Munk scores were not statistically different between the two groups ( $p = 0.606$ ).

## Discussion

Lim et al. [4] reported that proximal lachrymal system obstruction is mostly idiopathic in nature. Trauma was the most common known etiology. The same etiologic factors may also lead to NLDO. NLDO and chronic or acute dacryocystitis may also cause stenosis in the canalicular system. Stenosis at any junction point may indicate stenosis at other junction points in the excretory system [5]. However, in most cases involving proximal excretory lacrimal system obstruction, we cannot irrigate and so evaluate the nasolacrimal duct. In some cases, however, proximal canalicular system obstruction may involve only one canaliculus. In these patients, we can evaluate the nasolacrimal duct with the irrigation of the patent canaliculus and NLDO is diagnosed in some of these patients. In this study, we evaluated the surgical outcomes of patients with NLDO and complete obstruction of one canaliculus. If a patient showed epiphora as a result of canalicular obstruction where less than 8 mm of a patent lateral canaliculus remained, we gently forced the obstructed canaliculus with Bowman probes. If the obstructed canalicular segment can be passed by the Bowman probe, we performed bi-canalicular silicone intubation. We did not perform forced intubation to avoid wrong passage formation and traumatization of the intact canaliculus. These kinds of interventions result in the formation of wrong passages in the tissues and, after deintubation, these passages often do not work and are closed. If a patient with NLDO has total or subtotal single canaliculus obstruction, another surgical option is external DCR with or without monocanalicular intubation. To the best of our knowledge, there are no published reports about the results of external DCR in these patients. In our study group, ocular surface irritation occurred in one eye in group A. We prescribed artificial eye drops and did not perform early tube removal. Spontaneous tube dislocation was recorded in one eye in group B. We did not note any other intraoperative or postoperative complication after external DCR.

In our study, the postoperative irrigation of non-obstructed canaliculus was patent in all eyes. Mucoïd discharge, conjunctival hyperemia, and chronic conjunctivitis were also resolved. Postoperative Munk scores were  $1.11 \pm 0.9$  in group A and  $0.86 \pm 0.9$  in group B. Also, preoperative and postoperative Munk scores were significantly different in our study group. Complete or partial relief from

epiphora was noted in all patients. In a separate study, Kaynak et al. [6] reported that the mean Munk score was 1.5 after conjunctiva-DCR with tube implantation and 1.6 after botulinum toxin-A injection at six months postoperatively in their study group with proximal lachrymal obstruction. Our results were satisfying for us and for our patients. None of our patients needed additional intervention.

Mono-canalicular intubation has been popularized for the management of lacrimal drainage system lacerations and obstructions [7]. Mini Monoka tubes have special endings that lock within the punctum and ampullae. They are stable without protrusion and prevent occlusions and adhesions in the punctum and canalicular system. Detoraxis et al. [8] reported that monocanalicular intubation with the Mini Monoka tube was safe and effective in external DCR patients. We also performed routine monocanalicular intubation to protect the intact canalicular system. These patients may have a tendency to present canalicular obstruction. Also, they may have had some subclinical stenosis and structural or acquired problems in their nonoccluded canaliculi that we could not determine. Furthermore, silicone tubes may act as epithelial traffickers and facilitate the creation of a fistula at the rhinostomy site [9]. The benefit of the intubation process must be further evaluated in future studies involving these patients.

We demonstrated that one patent canaliculus may be sufficient after external DCR operation. We generally repair all canalicular lacerations in routine practice with Mini Monoka tubes. The tube plugs obstruct the punctum and we do not see epiphora in most of these individuals. Also, in some patients with traumatic single canalicular obstruction, epiphora does not occur. Several reports demonstrate that tear production and outflow from the eye are linked. Some patients with acquired obstruction of the drainage system may not have symptoms of epiphora. Yen et al. [10] performed punctal occlusion of the lower punctum in 10 healthy eyes and reported that tear clearance was not significantly changed. Postoperative Munk scores of superior or inferior canaliculi-obstructed eyes were not statistically significant in our study. The function and adaptation of the lacrimal drainage system must be evaluated in future studies to establish guidelines for the management of partial lacrimal system obstructions.

Simsek et al. [11] demonstrated the long-term efficacy of external DCR in functional NLDO patients with presac de-

lay. External DCR may be also effective in the management of epiphora in patients with one intact canaliculus without NLDO by facilitating lacrimal drainage. Our postoperative low Munk scores may be related to this facilitation.

According to our results, external DCR and mono-canalicular intubation may constitute an alternative surgical option with low complication rates in patients with NLDO and total or subtotal one canalicular obstruction.

## Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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