Original article

Self-adjusting monocanalicular intubation for congenital lacrimal obstruction


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Abstract

Objective: To present our work with the Masterka self-adjusting monocanalicular intubation without nasal recuperation in congenital lacrimal obstruction in children over 12-months old.

Methods: A total of 40 children between the ages of one and seven (average age 2.6 years) were consecutively operated on.

The Masterka catheter has a flexible metal guide inside the silicone tube that covers it completely. The proximal end is fixed onto the lacrimal punctum by pushing it with a dilator or forceps. Its correct position was monitored and visually checked in real time during surgery in all cases.

Results: The average surgery time, excluding anesthetic, was 1.56 min, ranging from 1.05 to 4 min.

The final success was 97.5%, considering absence of epiphora, disappearance of coloring in lacrimal meniscus, and mucopurulent secretion.

The average follow-up time was 15 months (ranging from 7 to 21 months).

Conclusions: Masterka intubation is an effective primary treatment. It is no more difficult than a simple catheter, since the surgical technique is similar, but with better functional results. It avoids the possibility of having to repeat the catheterization and it is easier to carry out than bicanalicular intubation, since there is no need to manipulate repeatedly or use surgical instruments in the inferior meatus, thus simplifying the process.

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Intubación monocanalicular autoajustable para la obstrucción lagrimal congénita

RESUMEN

Objetivo: Presentar nuestra experiencia con la intubación monocanalicular autoestable Masterka, sin recuperación nasal, en la obstrucción lagrimal congénita en niños mayores de un año.

Métodos: Un total de 40 niños con edad media de 2,6 años (rango 1-7 años) fueron intervenidos de forma consecutiva.

La sonda de Masterka incluye una guía metálica flexible dentro del tubo de silicona que la cubre totalmente hasta su extremo distal. El extremo proximal se ancla a punto lagral tras presionarlo con el terminal de un dilatador o pinza.

Hubo monitorización y comprobación visual endoscópica de su correcta ubicación en tiempo real en todos los casos.

Resultados: El tiempo medio de maniobras quirúrgicas, excluyendo el tiempo anestésico, fue 1,56 min (rango 1,05-4).

Los éxitos finales fueron un 97,5%, entendiendolos como ausencia de epífora, la desaparición del colorante en menisco lagral y de secreción mucopurulenta. El tiempo medio de seguimiento fue 15 meses (rango 7-21).

Conclusiones: La intubación con Masterka es un tratamiento primario efectivo. No ofrece más dificultad que el sondaje simple, puesto que la técnica quirúrgica es similar, sin embargo sus resultados funcionales son mejores, evita la posibilidad de tener que repetir el sondaje y es más fácil de realizar que la intubación bicanalicular clásica, al no precisar manipulaciones repetidas ni tener que introducir instrumental quirúrgico en el meato inferior, simplificando el proceso.

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Introduction

Lacrimal system intubation in congenital obstruction is indicated in children over one year of age and in primary probe failure.

The classic method for intubation has been bicanalicular or monocanalicular intubation, which requires the withdrawal of the distal metallic end and which extends from the probe, or most current and less traumatic methods such as Prolene strings at a level which require an external mechanic guide introduced up to the nasal fossa.1,2

The most novel and latest design utilizes a thin, metallic and flexible internal guide covered in silicone up to the distal end which pushes it through the lacrimal punctum, the upper canaliculus, the common canaliculus, nasolacrimal bag and duct up to the inferior meatus, at which point the guide is gently withdrawn leaving the silicone tube in the optimum place. This procedure is based on the same principles of the vascular catheterism described by Forssmann.3

The 2 types of probes available in ophthalmology are Masterka1,3 (monocanalicular) and Nunchaku2,6 (bicanalicular), both by the same manufacturer (FCI, France Chirurgie Instrumentation, Issy-les-Moulineaux Cedex, France). As these probes are self-stable, no surgical instruments or sutures are needed for fixing them at the inferior meatus.

The 90° angled proximal end facilitates the implant stability by introducing it through the lacrimal punctum up to the canaliculus. The 4 mm terminal collar prevents intracanalicular migration (Fig. 1).

Endoscopic monitoring in real-time discards other diseases at the nasolacrimal duct or inferior meatus, as well as confirming the adequate placement of the probe and warning about possible retraction of the silicone when withdrawing the mechanical guide.

The probe is withdrawn in the consulting room after 2 months, by applying soft traction on the collar at the level of
the upper punctus with tweezers, in a very simple procedure which avoids a second surgery.

The objective of this study is to analyze a number of patients intervened for congenital lacrimal obstruction with the new self-stabilizing monolateral probe.

**Material and methods**

A longitudinal prospective observational study. Overall, 40 children with NASA lacrimal obstruction over one year of age were treated with the Masterka probe.

The diagnostic was based on the clinical history of epiphora and purulent secretion since shortly after birth and the fluorescein disappearance test (Table 1), which consisted in assessing the amount of stain retained in the lacrimal meniscus 5 min after instilling a 2% fluorescein drop in the conjunctival sac fundus (Fig. 2).

None of the patients had undergone previous surgery.

All the interventions were carried out between July 2012 and October 2013.

Overall, 40 lacrimal in 15 females and 25 males between 12 and 84 months (mean 30 months) were intervened.

The surgery was performed by the same team: one ENT specialist (MAAF) and one ophthalmologist (FJAF) in our clinic.

The tutors of the patients accepted the informed consent, both verbally and in writing.

![Image](http://www.elsevier.es)

**Table 1 – Fluorescein disappearance test.**

| Grade 0 | Without residual staining after 5 min |
| Grade 1 | Staining at 5 min 25% of initial stain or lower |
| Grade 2 | Staining at 5 min between 26 and 50% of initial stain |
| Grade 3 | Staining at 5 min between 51 and 75% of initial stain |
| Grade 4 | Staining at 5 min between 76 and 100% of initial stain |

Both types of interventions were performed under anesthetic sedation with laryngeal mask. Both lacrimal points were dilated and both canaliculi were explored.

Excreted lacrimal pathway cleansing was carried out with 0.5% bupivacaine and 0.0005% epinephrine (Svedocain 0.5% with adrenaline, Laboratorios Iniba, Madrid, Spain) followed by viscosdissection with 1% sodium hyaluronate.

The length of the lacrimal system was measured from the upper lacrimal punctum to the lower meatus without touching the ground but going beyond Hasner’s valve with a new exploratory probe (S1.1289. FCI, France Chirurgie Instrumentation, Issy-les-Moulineaux Cedex, France) with markings which would easily indicate the measure to be utilized. If the distance exceeded 35 mm, the appropriate probe would be 40 mm. If the length was between 25 and 35 mm, which is frequent in infants under 36 months, the ideal size would be 35 mm. If smaller than 25 mm, as is frequently the case in infants under 24 months, the recommendable size would be 30 mm. Ideally, the probe should project about 5 mm beyond the nasolacrimal duct.

A cotton swab soaked with 1% tetracaine and 1/100,000 epinephrine for vasoconstriction and adequate visualization was placed in the nasal cavity 5 min before endoscopic surgery. In addition, 2 drops of 1 mg/ml tetracaine anesthetic and 4 mg/ml oxibuprocarine (Colirio Anestésico Doble, Alcon Cusil S.A, Barcelona, Spain) were instilled in the inferior conjunctiva and sac 2 min prior to surgery. The periorbital area was cleaned with 10% iodine povidone.

After extracting the probe from its wrapping, the movement of the guide must be verified with a smooth rotation movement to avoid the retraction of the silicone when withdrawing the flexible metal.

Monolateral intubation was performed through the punctum and upper canaliculus, common canaliculus until reaching the hard surface of the lacrimal bone, at which point and without losing contact with the bone a rotation is made in the inferior vertical direction through the lacrimal sac and nasolacrimal duct to the inferior meatus, creating a channel in the obstructed area (Fig. 3). No resistance must be found in said passage up to the end of the vertical path, at which point the nasolacrimal obstruction is perforated, confirming the operation in real time with video endoscopy.

Subsequently, the metal guide is softly rotated with 15 min clockwise and reverse rotation, withdrawing it easily without changing the axis and maintaining the proximal end without losing contact with the upper eyelid skin (Fig. 4).

The proximal collar or fixation head is anchored to the superior lacrimal punctum with the tip of a dilator or tweezers (Fig. 5).

A 2.7 mm endoscopic and 30° optics was used (Storz TriCam SL Endoscope; Tutlingen, Germany) with xenon light source.

For adequate endoscope positioning in the inferior meatus, the turbinate was medially dislocated with a Freer spatula.

The adequate location of the probe in the inferior meatus was verified in all cases.

The viscoelastic was not washed because it was virtually eliminated through the inferior meatus and in smaller proportion through lacrimal points while performing the

![Fig. 2 – Pathological stain disappearance test. Persistence of instilled fluorescein after 5 min.](http://www.elsevier.es)
previously described surgical maneuvers. This elimination was also enhanced by the low density of the utilized product (1%).

All the interventions were carried out in major outpatient surgery, releasing the patients 3 h after the intervention without hospital admittance.

Tobramycin and dexamethasone were prescribed for the post-surgery period, 4 times a day during 7 days and antibiotic-corticoid nasal drops 3 times a day during 5 days. For the purposes of the present study, all the cases were reviewed the day after surgery, at 2 months for withdrawing the intubation in the practice, at 3 months and at least at 6 months after withdrawing the probe.

Surgical success was considered with the disappearance of epiphora and secretion as well as the absence of fluorescein retention applied in the inferior conjunctival sac.

Fig. 3 – Canalization with self-stable monocanalicular probe in one case of congenital nasolacrimal obstruction.

Fig. 4 – Withdrawal of metal guide maintaining the silicone probe “in situ”.

Fig. 5 – Anchoring the proximal fixation header in the upper lacrimal punctum.

Results

The mean time of the surgical maneuvers, excluding the period for anesthetics, was 1.56 min (range 1.05–4). No epistaxis was observed. In 20% of the interventions, false pathways occurred which were corrected by intra-surgery.

As regards intubations, 15% were lost before being withdrawn at 12 months but did not impact the final success. One case of corneal erosion was documented due to friction but after its withdrawal it healed without leaving sequelae.

Epiphora persisted in the presence of intubation in 20% of the patients. When the intubation was withdrawn, epiphora was resolved in 7 patients and persisted in one.

The probe was withdrawn without difficulties in the consulting room; in all cases the tubes remained intact as verified with biomicroscope.

Epiphora and dye retention disappeared in 97.5% of the cases with a minimum follow-up of 6 months. The mean follow-up time was 15 months (range 7–21). No losses occurred in this series.

Discussion

Intubation with nasal withdrawal of the silicone distal extreme is commonly used in lacrimal surgery. More recently, intubation with pressure and self-fixation of the terminal is being utilized.

The size could be of 30, 35 and 40 mm depending on the lacrimal system length, it should go beyond the nasolacrimal duct but without reaching the mucosa floor of the nasal fossa, as this could cause granulomas in the nasal fossa.

Insertion with the Masterka probe is simple and resolves nasolacrimal obstruction. Endoscopic findings about the
functionality thereof are the same as with other probes, and therefore its indications are identical.

Viscodissection prior to the introduction of the probe in the lacrimal pathway has allowed us to use the probe in a pioneering and original manner in cases of complex obstructions and fibrosis as it dilates the pathway and facilitates such a sensitive passage. If this maneuver were not performed, the flexible guide would perforate the silicone due to the pressure being exerted with possible destruction and rejection of the intubation system, in addition to the potential creation of a false pathway.

When comparing the percentage of success (97.5%) of this method with other studies, it is higher than probes without endoscopy, 84% in patients under 24 months and 72% in patients over said age, and similar or superior to bicanalicular intubation, 93% and to those obtained with monocanalicular probe, between 90% and 97.14% according to different studies in patients over 2 years of age. The reason for the improved results of this study and comparison to those of other authors could be the intra-surgery detection and correction of 20% of false pathways with submucosa pathways or insufficient apertures. This technique does not avoid the use of endoscopy as, together with other probe types, it confirms the correct location during surgery in order to avoid post-surgery failures.1

The authors agree with Lee and Kominek in that, even though there were no clinically significant differences in the success rates between the mono- and bicanalicular systems, monocanalicular intubation exhibited the advantages of easier insertion, lower rates of point lacerations and canaliculi as well as easy withdrawal in the consulting practice in all cases. The implantation of the Masterka probe is very smooth and easier to introduce through stenotic ducts due to being thinner and more flexible (0.9 mm) than the terminals of typical bicanalicular probes (1.28 mm) or the Ritleng external metallic guides (1 mm).

Whenever possible, the authors used the lacrimal punctum and upper canaliculus due to the lesser importance of this portion in lacrimal drainage in order to avoid possible iatrogenic injuries in the manipulation of such narrow and delicate anatomic structures as well as because in the upper pathway it is easier to align the probe with the nasolacrimal duct because the angle is less acute than the lower pathway and because the upper lacrimal punctum is generally more medial than the lower one, thus reducing the hypothetical corneal irritation due to the proximal end of the probe.

After successive designs, the 4 mm proximal collar has increased stability and diminished intracanalicular migration without affecting the ocular surface.

The selection of the adequate probe length preempts its extrusion as it must not be anchored on the floor of a nasal fossa. It also prevents post-surgery failures because it need not remain inside the nasolacrimal duct as it is convenient for it to protrude about 5 mm, in the inferior meatus.

The endoscopic findings of the authors confirm that self-stable intubation is not associated to more bleeding than probing.

In the cases presented herein, reduced surgery time was not observed when comparing it to the monocanalicular intubation technique with the Monoka probe, because the time required for introducing the proximal collar in the upper lacrimal punctus with the Masterka probe using dilators or tweezer is very similar to the traction time of the distal prolene extreme with microtweezers at the level of the inferior meatus in the case of the Monoka probe. Even so, in the latter case, the use of said microtweezers is not familiar to the general ophthalmologist, which could make it easier and faster to apply the Masterka probe for surgeons who are not trained in endoscopic lacrimal surgery. In addition, it prevents the possibility of damaging the mucosa due to operating repeatedly in a small space such as the inferior meatus in infants, and of lacerating the lacrimal punctum and the potential intracanalicular migration due to excessive traction at the nasal level.

The Masterka probe was very well tolerated.

The cost of this technique is justified with the avoidance of surgical failures of primary probes and re-interventions. Its functional results are better and the surgery time is shorter. The applied anesthetics are identical to those used in later probes.

Accordingly, the Masterka probe intubation is an alternative treatment to simple probing in patients over one-year old because it is a simple, easy to insert and safe technique which does not require manipulation within the nasal cavity. In addition, it is less invasive and traumatic than classic bicanalicular intubations where the distal metal of the probe frequently caused iatrogeny at the level of the nasal mucosa. A comparative prospective study with bicanalicular intubation was not carried out because the authors do not consider it ethical to submit infants to a second anesthesia which is necessary for withdrawing said probes if the process can be resolved with a single intervention.

Conflict of interests

No conflict of interests has been declared by the authors.

REFERENCES