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ORIGINAL ARTICLE

Treatment of congenital obstruction of the lachrymal route, by means of ball catheter, intubation monocanalicular, and endoscopic control

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KEYWORDS
Endoscopic control;
Dilatation;
Silicone monocanalicular stent;
Congenital nasolacrimal duct obstruction;
Failed probing

Abstract
Introduction and goals: Congenital lacrimal obstruction is a frequent motive for consultation. Endoscopic control in the inferior meatus of the nostril allows performing controlled surgical procedures.
The aim of the study is to analyse the result obtained in the treatment of congenital obstruction of the lacrimal duct by monocanalicular intubation with Monoka and endoscopic control in children who had failed two lacrimal system probings.
Materials and methods: Between October 2004 and September 2008, this technique was performed in a prospective study on 36 patients with congenital nasolacrimal obstruction who had failed two lacrimal system probings. The mean age was 36.2 months (range, 12-66 months). Patients were followed up at 6 weeks, 3 months, and 6 months, with clinical evaluation by Munk's score and ophthalmologic exam using dye disappearance test. Success was defined as complete resolution of signs and symptoms (Munk 0) and no fluorescein remaining in dye disappearance test (grade 0).
Results: The procedure was successful in 91.66%of the cases and acceptable in 8.33%. We have not found any complications or side effects, and no further procedures have been needed on any patients.
Conclusions: Balloon dachryoplasty with monocanalicular intubation under endoscopic control is a safe, easy to perform and effective surgical technique for the treatment of congenital lacrimal obstruction with two previous failed lacrimal system probings.

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PALABRAS CLAVE
Control endoscópico;
Dilatación;
Tubos monocaliculares;
Obstrucción nasolagrimal congénita;
Sondaje fallido

Tratamiento de la obstrucción congénita de la vía lagrimal mediante balón catéter, intubación monocanalicular y control endoscópico

Resumen
Introducción y objetivo: La obstrucción lagrimal congénita constituye un motivo frecuente de consulta, siendo el control endoscópico de la fosa nasal a nivel del meato inferior el que permite llevar a cabo procedimientos quirúrgicos controlados. El objetivo de nuestro estudio es analizar el resultado obtenido en el tratamiento de la obstrucción congénita de la vía lagrimal mediante dilatación del conducto nasolagrimal con balón catéter e intubación monocanalicular con Monoka y control endoscópico en niños en los que habían fallado dos sondajes como tratamiento previo.
Material y métodos: Entre octubre de 2004 y septiembre de 2008 se practica esta técnica en un estudio prospectivo en 36 pacientes con una edad entre 12 y 66 meses (media de 36,2 meses) con obstrucción nasolagrimal congénita en los que ha fallado el sondaje en dos ocasiones.
Se incluye cuestionario con test de Munk y examen oftalmológico, incluyendo el test de desaparición de colorante a los 5min, efectuados en los controles a las 6 semanas, 3 meses, 6 meses y 12 meses en todos los casos. Se define éxito cuando se normalizaron todos los síntomas y signos (Munk 0) y en el test de desaparición de colorante hay ausencia de tinción residual (grado 0).
Resultados: En el 91,66 %de los pacientes se obtuvieron buenos resultados y en el 8,33% aceptables. Todos los casos (100%) mejoraron con respecto a los síntomas previos. No se precisó repetir el proceso ni practicar una dacriocistorrinostomía en ningún caso.
Conclusiones: El tratamiento de la obstrucción congénita de la vía lagrimal mediante balón catéter, intubación monocanalicular y control endoscópico es una técnica quirúrgica segura, efectiva y poco agresiva para el tratamiento de la obstrucción lagrimal congénita con fracasos de 2 sondajes previos.

Introduction

The nasolacrimal duct extends from the lacrimal sac to the inferior meatus of the nasal passage. This duct is contained in a bone sheath, where it is closely linked to the canal walls through a dense connective tissue containing a well-developed venous network with vessels that maintain connections to the orbit and the nostril. Its anatomical limits are at temporal and superior level, the lacrimal canal of the inner side of the superior maxilla and the unguis; nasal and superior, the unguis; nasal and inferior, the external wall of the middle meatus and inferior turbinate, and temporal and inferior, the eminence of the inner wall of the maxillary sinus.

The nasolacrimal duct. It travels downward, backward and inward. It measures approximately 15 mm on average, with a diameter of about 3 mm, with great variations depending on race, gender, individuals, or laterality. The inferior opening of the nasolachrymal duct ends in the inferior meatus, about 10 mm behind the anterior edge of the inferior turbinate and approximately 32.3 mm (range, 23-44 mm) from the greater palatine canal on the right side, and 36.4 mm (range, 30-45 mm) on the left side. This inferior orifice is limited in its inner surface by a mucosal fold called Hasner valve or plica lacrimalis, and it is at this level that most of the nasolacrimal obstructions with a congenital origin are produced.

Congenital lacrimal obstruction is the most common reason for ophthalmology consultation in children under 1 year.[1]

Endoscopic control of the nostril at the inferior meatus level, and more specifically at the level of the Hasner valve, allows probes to be placed with perfect control, preventing the procedure from failing due to submucosal routes, poor probe orientation, prominent inferior turbinates that act as a stop and hinder the process or different diseases that can be found in patients, such as rhinolites, nasal polyps, etc.

Nasolacrimal duct dilatation using a ball was inspired by transluminal angioplasties. The catheter was described in 1964 by Dotter and Judkins and first used by Grüntzing and Hooff in 1974 for arterial stenosis of atheromatous origin. For lacrimal route pathology, the angioplasty ball was initially applied in adults with epiphora under radiological control. Becker, after its use in adults, designed a catheter for children and published his results in 1991.[12]

Intubation of the lacrimal system with silicone is often recommended when 1 or 2 prior probes have failed. The advantages of monocanalicular intubation are its simple insertion, self-fixation and extraction.

The aim of our study is to highlight the importance of endoscopic control at the level of the nostril in this procedure, consisting in dilatation with ball catheter and monocanalicular intubation in patients in whom 2 previous probes have failed. With the endoscope and helped by manoeuvres during the procedure, such as the dislocation of the inferior turbinate and the reorientation of the probe or ball with the help of a Freer spatula or suction cannula, we ensure its correct action at the level of the Hasner valve; this avoids submucosal pathways and iatrogenic injuries at the level of the nostril that subsequently increase the risk

of bleeding and postoperative synechiae, thus making the procedure fail.

Material and methods

Between October 2004 and September 2008, we conducted a prospective longitudinal study with 36 patients with failure of 2 previous probes and aged between 12 and 66 months. We based the diagnosis of failure on persistence of watery eyes, mucosal or purulent secretion, secretion reflux upon digital pressure on the inner canthal region, scabs, agglutination of eyelashes and absence of dye disappearance after instilling 1 drop of 2% fluorescein in the conjunctival fornix after 5 min. We quantified the epiphora according to Munk's scale in the preoperative and postoperative period in all patients.

Patients with dacryocystocele, acute dacryocystitis, dacryocutaneous fistula, trauma in this region, alteration of punctum, and canaliculi or craniofacial abnormalities were not included in the study.

After obtaining verbal and written informed consent from the legal guardian, the intervention was carried out under general anaesthesia by the same surgeons. A cotton swab with 1%tetracaine and 1:100 000 epinephrine was placed in the inferior meatus 5 min before surgery. After dilating the upper punctum, the lacrimal system was washed with saline solution until no traces of mucus or purulent secretion remained; a viscoelastic substance was then introduced, differentiating between nasolacrimal stenosis or obstruction depending upon whether the viscoelastic passed the inferior meatus or not.

After entering a 0 Bowman probe by upper punctum and canaliculus, the LacriCATH® ball catheter (Quest Medical, Inc. Atrion Company, Allen, Texas) was inserted in the anterograde form, through the lacrimal punctum and superior canaliculus, passing it through the sac and nasolacrimal duct. Subsequently, by endoscopic control, we attempted to visualise the exit of the nasolacrimal duct or Hasner valve at the level of the inferior meatus; to this end, we used a Freer spatula or a suction cannula. Due to the small size presented by these nostrils, if necessary, we carefully carried out the dislocation of the inferior turbinate towards the nasal septum, trying to perform manoeuvres that produced little bleeding or nasal mucosa injury. With all this, we tried to control and visualise the exact level of performance of the nasolacrimal probe (Figure 1).

We used an endoscope of 2.7 mm and 30°, without fluoroscopy, and a flexible ball catheter, making the upper punctum of the lacrimal coincide with the proximal mark of the catheter. We used a flexible ball catheter, 2 mm in diameter (0.60 mm deflated) and 13 mm in length in patients aged 30 months or less, and a ball catheter 3 mm in diameter (0.65 mm deflated) and 15 mm in length in patients older than 30 months (Figure 2). The catheter was connected to a hydrostatic pressure pump fitted with a gauge for its monitoring, similar to those used in angioplasty (Figure 3) (Quest Medical, Inc. Atrion Company, Allen, Texas). The serum used was stained with a drop of fluorescein to improve visualisation.

The ball was inflated for 90 s at a pressure of 8 atmospheres, then it was deflated and re-inflated at the same pressure for 60 s; it was then deflated to enable its displacement. It was placed proximally at the level of the junction of the nasolacrimal duct with the sac, making the lacrimal punctum coincide with the distal mark of the catheter; the punctum was thus placed at 5 mm from the proximal portion of the ball. We repeated the same sequence: inflation for 90 s, deflation and inflation for 60 s at the same pressure. After deflation, we extracted the ball from the lachrymal system and we rinsed using saline with fluorescein. The fluid was usually easily rinsed after dilation, and should not have found any resistance. Permeability was confirmed through endoscopic control. The fluid was aspirated with a suction

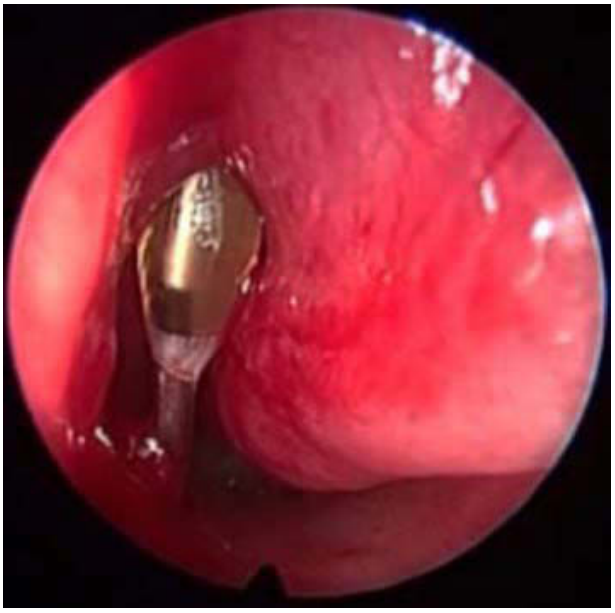

Figure 1 Ball catheter dilatation at the level of the Hasner valve.

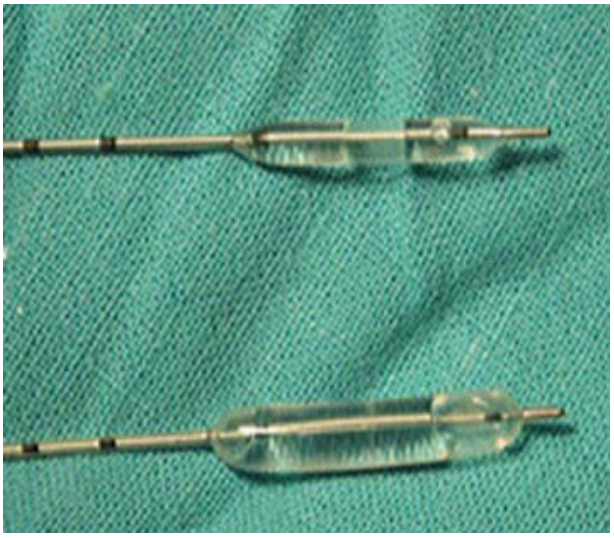

Figure 2 Different types of catheter balls.

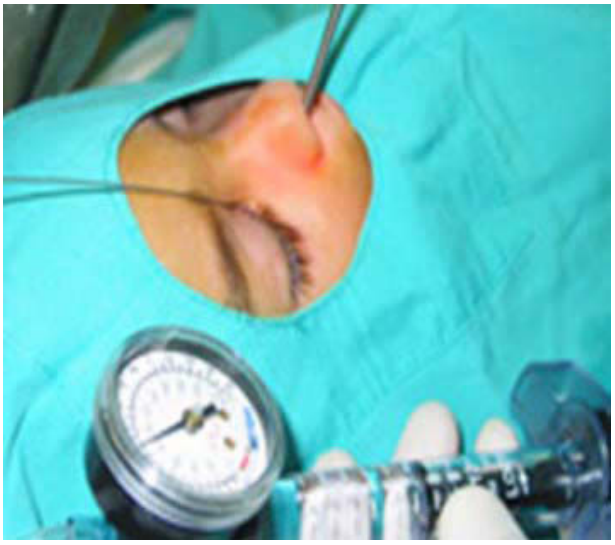

Figure 3 Control of ball catheter pressure through gauge.

Table 1 Results according to the type of obstruction

Type of obstruction	Results		
	Good %	Acceptable, %	Bad, %
Membranous	80	13.33	6.66
Proximal	83.33	0	16.66
Stenosis	100	0	0

Table 2 Results according to age

Age, mo	Results		
	Good, %	Acceptable, %	Bad, %
18-36	83.33	8.33	8.33
>36	85.71	7.14	7.14

catheter. Furthermore, in this way, the lacrimal excretory pathway was cleaned.

Next, a corrugated metal guide was introduced (Ritleng probe guide, FCI, Issy-les-Moulineaux Cedex®, France) through the upper lacrimal punctum, canaliculus, nasolacrimal sac and duct until its distal end was placed in the inferior meatus. The monocanalicular Monoka probe with atraumatic prolene wire and silicone (FCI, Issy-les-Moulineaux Cedex®, France) was inserted through the guide at the level of the upper punctum, extracting it through the slot at the inferior meatus. After recovering the catheter through the nostril, the metal guide was removed.

Finally, the proximal end of the Monoka monocanalicular probe was anchored to the upper lacrimal punctum, affixing it with the silicone strip of the proximal edge of the Monoka probe. This tab consisted of a plate of 4 mm on the outer side and an inner side with an angle of 90°, giving the mechanism stability and making it very well tolerated by patients.

The average time of surgery was 12 min (range, 9-15).

After surgery, we prescribed antibiotic-steroid eye drops 4 times daily for 10 days and antibiotic, corticosteroids and vasoconstrictor paediatric nasal drops with oxymetazoline at 0.025% 3 times daily for 5 days. We did not prescribe systemic treatment, unless we found abundant purulent discharge upon washing the lacrimal pathway; in this case, cefuroxime 15 mg/kg/day was applied for 1 week. We did not use systemic corticosteroids.

We evaluated the patients after 6 weeks, 3 months, and then every 6 months; the monocanalicular tube was removed after 6 weeks in consultation. We did not repeat the process in any patients. Follow up was between 13 and 26 months (average, 24 months). Subsequently, in each visit, we carried out the dye disappearance test with 1 drop of sodium fluorescein at 2% in each inferior conjunctival fornix, studying the residual staining after 5 min. The legal guardian was questioned about the presence of discharge and epiphora, quantifying this with the Munk test and examining whether there was regurgitation or loosening of pressure on the sac.

We classified the results as good if tearing and mucopurulent discharge disappeared and the colour faded from the tear meniscus (Munk 0 and staining grade 0); acceptable, if mucopurulent secretion disappeared and tearing improved by more than two degrees on the Munk scale, but did not disappear completely and the colour persisted for 5 min (grade 1 and 2); and bad if the result was the same as it was previously, improvement less than or equal to 1 degree in the Munk scale and retention of dye grade 3 or 4.

Results

The procedure was completed in 100% of patients. All patients were studied for over 12 months after surgery (range, 13-48 months). Results obtained were 84.52% good, 7.73% acceptable, and 7.73% bad.

The following results were obtained taking into account the age of the patients (Table 1) and depending on the type of obstruction (Table 2). One case presented corneal erosion after 2 weeks, secondary to monocanalicular tube extrusion, which was resolved after its withdrawal and medical treatment with lubricant and antibiotic; the lachrymal remained permeable. In 3 cases, there was rupture of the ball, which was easily identifiable since the serum with which it was inflated was dyed. This was due to rubbing with the nasal probe when performing the aspiration of mucosal secretions.

The most important observations of this study are that all cases improved compared to the previous stage, without having to resort to performing a dacryocystorhinostomy in any case.

Discussion

Congenital lacrimal obstruction affects approximately 6%-20% of newborns. Healing is spontaneous in most cases in the first year. In cases where there is no resolution in the first year, a first catheter is effective in 90% of cases. A further 6% of patients are healed with a second catheter. There is one group of patients that is unresponsive to probes. Risk factors for failure are patient age, failure of previous catheterization, false pathways, openings that are too small, bilateral obstruction, dilated lacrimal sac, and non-membranous complete obstructions.[3-5]

In cases where we found resistance to probing, we indicated inferior turbinate dislocation, dilation and monocanalicular intubation as the first treatment option. In addition to cases of failed probing, this option could also be expanded as first choice surgery in patients over 2 years old.[3,6,7]

We agree with the series of Chen and the comments of Kushner, in which this technique is probably not indicated for all children, and cases with simple obstructions may respond to probing alone. However, in cases of partial obstruction, Yüksel finds 100% success in all 4 patients tested.[6] These patients often have repeated colds with accumulation of chronic mucopurulent discharge.

Prior vasoconstriction is important to reduce the volume of the inferior turbinate, thus offering a wider surgical field. Occasionally, the dislocation of the inferior turbinate through endoscopic control helps to perform the procedure in a convenient manner, especially in all those cases where prior catheterisation failed, as well as in probings where resistance to advance is found when the inferior turbinate is impacted upon performing the probing of the nasolacrimal duct.

Probing acts only at the punctum, at the level of obstruction. An important advantage of expansion with respect to probing is the application of an efficient force along the nasolacrimal duct in a radial and longitudinal form, directly, leading to a greater expansion.

We insert the ball with endoscopic control since this allows direct visualisation, avoiding submucosal routes and exposure to ionizing radiation, as is the case with insertion using fluoroscopy.[9]

Becker used prior systemic antibiotics to eliminate infection and friability before surgery and to make the dilation more effective. Steroids were also used during and after surgery to reduce oedema post-dilation and prevent secondary fibrosis, in addition to enabling a faster recovery.[2] A controlled study of the ball with and without systemic medication would be desirable. In our series, we did not use systemic treatment by protocol.

We find, as Casas and Prat[2] do, that patient improvement usually occurs 1 week after surgery, perhaps due to the postoperative inflammation induced.

It is very interesting that the results of ball dilatation are much better in cases of congenital obstruction than in adults, even in cases of incomplete obstructions.[8] In adults, regression is the norm. This difference may be explained by differences in pathogenesis. In adults, epiphora is usually caused by aetiology with an acquired cause such as involutional stenosis, chronic inflammation and infection, therefore making the incidence of secondary stenosis high due to adhesions and fibrosis of these tissues, unlike in congenital cases.[9]

Kushner found recurrences in 2 of 23 cases when he compared patients between 6 weeks and 2 months.[4] Chen did not find changes.[7] In our series we found no recurrence to the previous stage in any patient.

Chen finds worse results in children with congenital bilateral obstruction; possible factors could be reusing the same ball, the more advanced age of these patients or perhaps a bias caused by the small size of the sample.[7]

Another treatment for patients with congenital nasolacrimal obstruction is bicanalicular intubation with silicone, which acts as a temporary implant.[10] It is an effective treatment that requires the retention of the silicone tubing in the duct, although these may be associated with complications in up to 20% of cases, such as breakage, loss of the probe and surgical failure,[11] corneal erosion and ulceration, recurrent conjunctivitis, laceration of the lachrymal point, granulomas, stenosis of the lacrimal excretory pathway,[12] and dacryocystitis. Bicanalicular intubation in children may also require a second general anaesthesia for tube removal. The non-mobilisation of the tubes may be linked to complications such as obstruction by granulomas and rhinolites in the nasal cavity.[13]

Monocanalicular intubation uses only the lacrimal punctum and superior canaliculus, leaving the inferior (responsible for more than 70% of drainage) free; it is only necessary to remove a guide through the nose. As it is autostable, it does not use mounting material, knots or stitches in the nasal cavity and it is therefore easier to extract. Since it is possible to extract it in consultation with simple tongs, it prevents complications, since it is removed at the desired time and does not require a second general anaesthesia and nasal manipulation. The prolene thread around the metal tube typically used at the end of the silicone probe avoids possible complications derived from friction and trauma to the nasal mucosa, such as lacerations, bleeding and synechiae.

The contraindications of this system are the presence of lacerations to the punctum, which will prevent the silicone tube from becoming fixed and will cause it to migrate or be more easily displaced, and the existence of ectropion of the punctum, where the plate of the collar will be directed towards the ocular surface and might erode the cornea and the conjunctiva.

In our series we found no side effects with dilation. Technical difficulty in its insertion, laceration of the punctum and canaliculi have been reported. Goldstein did not observe histopathological changes after its use and analysis in animal models.[14]

Endoscopic nostril control with dilation of the nasolacrimal duct and monocanalicular intubation is a treatment that is easy to perform; requires less nasal manipulation than dacryocystorhinostomy; reduces, therefore, operating time, with less mucosal lacerations and synechiae; is well tolerated; is not associated with postoperative complications of bicanalicular intubation; and does not require a second surgical step for removal, hence reducing costs.[15,16] It represents our treatment of choice in cases of failure of probing, before dacryocystorhinostomy.

Conflict of interests

The authors declare no conflict of interests.

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