The Safety and Efficacy of Endoscopic Lacrimal Duct Probing in Neonates with Acute Dacryocystitis

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Abstract

Objective: To observe the safety and efficacy of endoscopic-assisted lacrimal duct probing in neonates with acute dacryocystitis.

Methods: The prospective treatment of 148 eyes of 103 cases of neonatal acute dacryocystitis was studied. In the observation group, 58 cases (76 eyes) underwent endoscopic exploration of lacrimal passage under topical anesthesia. Make the child lie on the bed, after the surface anesthesia of hydroxybucaine hydrochloride, dot dilator is not easy to expose the dilatable lower point. With the assistance of nasal endoscope, the probe of the No. 6 lateral foramina lacrimal duct entered the lacrimal duct and dacryocyst successively. After entering the dacryocyst, the pus was sucked out with a syringe and rinsed repeatedly with normal saline until no obvious suppurative secretions were discharged. Postoperative topical anti-inflammatory eye drops and oral antibiotics were used. In the control group, 45 patients (72 eyes) were treated with hospitalized systemic antibiotics and conservative treatment with local antibiotic eye drops.

Results: In the observation group, 58 cases (76 eyes) underwent superficial anesthesia and nasal endoscopy assisted lacrimal duct exploration and achieved satisfactory results. Stenosis of the lower nasal passage was found in one eye. In all cases, there were no serious complications during and after surgery, and no recurrence was observed for 3 months to 1 year after surgery. In the control group, 45 cases (72 eyes) of neonates with acute dacryocystitis, 10 cases with conjunctival sac secretion disappeared after conservative treatment. Redness and swelling in the dacryocystitis were improved in 31 cases, of which 2 cases had facial scars due to drainage of pus from the conjunctiva sac through a percutaneous laceration incision. Four patients were discharged automatically due to the aggravation of symptoms. After 6 months of follow-up, about 50% of the children received exploratory treatment of lacrimal passage and completely healed.

Conclusion: Nasal endoscope-assisted dacryocystitis is a method for the treatment of neonatal acute dacryocystitis, which is worthy of clinical promotion.

Keywords: Neonatal; Acute dacryocystitis; Nasal endoscopy; Lacrimal duct probing.
Clinical features appropriately [4]. Postoperative Local use of antibiotic eye drops

aid of a nasal endoscope, and change the direction of the probe is a large resistance, Do not force the probe, but observe with the

Obvious purulent secretions, nasal endoscopy-assisted descend

ringe, and the normal saline was repeatedly flushed until no more

ing, it entered the lacrimal sac, the pus was aspirated with a sy

lacrimal canaliculus and the common lacrimal duct in turn, and

holes The lacrimal probe enters from the punctum, entered the

oxybucaine hydrochloride is under topical anesthesia, the puncta

child should be restrained by a bed sheet or surgical gown while

topical anesthesia. The specific methods are as follows: (1) The

nasal endoscopy-assisted lacrimal duct probing under outpatient

some children in the control group had systemic diseases such as

ic congenital diseases and other He had ophthalmic diseases, and

vation group agreed and informed, signed Informed consent, ap

case was the first time sick, and the family members of the obser

76 eyes of 58 cases in observation group were treated with

outcomes and complication statistics between the two groups are

further treatment, about 50% of the children underwent lacrimal

were automatically discharged to a higher-level hospital ,After

facial scars, 4 children with 7 eyes had aggravated symptoms, and

with percutaneous incision of the lacrimal sac drain Pus, leaving

sac drainage treatment. The evaluation criteria of treatment ef

fect are shown in Table 1.

All data involved in the study were tallied using SPSS 22. Age

treatment days were tested using independent samples t-
test, and response rate and cure rate were tested using paired

Table 1: Criteria for cure.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Clinical features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cure</td>
<td>no redness and swelling in the lacrimal sac area, smooth lacrimal duct flushing, and disappearance of epiphora and conjunctival sac secretion</td>
</tr>
<tr>
<td>Improvement</td>
<td>The redness and swelling of the lacrimal sac area of the child subsided, the lacrimal duct was blocked, and the epiphora and conjunctival sac secretion decreased.</td>
</tr>
<tr>
<td>Ineffective</td>
<td>The redness and swelling of the lacrimal sac area of the child did not improve, the lacrimal duct was blocked, and the epiphora and conjunctival sac were separated. Discharge did not improve.</td>
</tr>
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</table>

Results and Discussion

58 cases of 76 infants with neonatal acute dacryocystitis in the observation group were treated with the assistance of outpa-
tient anaesthesia and nasal endoscopy. All lacrimal duct probing

achieved satisfactory results, no inflammation spread in one eye, and 57 cases (75 eyes) underwent postoperative. On the first day,

the redness and swelling of the lacrimal sac area subsided sig-
ificantly, and the eye secretion of the child disappeared after 1-7
days of topical application. In 1 case (1 eye), it was found that the

space of the lower nasal passage was narrow, and the bone resis-
tance was encountered during probing. After the pus was drawn

out, gatifloxacin ophthalmic gel was injected, and the lacrimal sac

area was red and swollen on the first day after the operation. The

ocular secretions of the child improved, and the lacrimal sac area

bulged again after 1 month. After probing, the mass in the lacre-
imal sac disappeared, and the nasolacrimal duct probing was suc-

cessful after constricting the nasal cavity. There were no serious

complications after operation, and there was no recurrence dur-

ing the follow-up period of 3 months to 1 year. 45 cases in the con-

tral group 72 eyes of neonatal acute dacryocystitis, 10 cases of 16

eyes with dacryocystitis after conservative treatment Symptoms

subsided, conjunctival sac secretion disappeared, 31 cases of 49

children with lacrimal sac area improved and swollen, conjunctiva

Decreased sac secretion, of which 2 out of 31 children had 2 eyes

with percutaneous incision of the lacrimal sac drain Pus, leaving

facial scars, 4 children with 7 eyes had aggravated symptoms, and

were automatically discharged to a higher-level hospital ,After

further treatment, about 50% of the children underwent lacrimal

duct probing treatment after 6 months of follow-up. The clinical

outcomes and complication statistics between the two groups are

shown in Table 2.
Acute dacryocystitis in infants is one of the more difficult diseases in ophthalmology, caused by young age, poor resistance and delicate skin. Its mechanism has not been fully researched and there are characteristics of rapid disease progression and high family requirements that make it a struggle for ophthalmologists. Also the disease requires high puncture technique and is risky, plus most ophthalmologists are unfamiliar with systemic neonatal medications and lack of knowledge about the disease and sufficient confidence in treatment, so most children are referred to the neonatology department. However, neonatologists lack the expertise of ophthalmologists, and treatment of the disease is mostly symptomatic, such as systemic antibiotics, for acute dacryocystitis in infants. The underlying cause, however, is obstruction of the nasolacrimal duct disease. Some scholars believe that acute lacrimal sac inflammation in infants may be due to maternal weakness, poor resistance, contraction fatigue, prolonged labor, amniotic fluid contamination, and cephalopelvic disproportion causing squeezing of the head by the pediatrician, which results in myelomeningeal exudation of neonatal ocular tissue after edema in the lacrimal sac [7]. Some studies suggest that the disease may be due to cross-infection from incomplete flushing and disinfection of the birth canal during delivery and from contact between the child and medical personnel after delivery [8]. Most of the neonates with acute lacrimal saculitis treated in this study were caused by secondary infection in children with congenital lacrimal sacculitis, which is consistent with the 15 cases (16 eyes) reported by other investigators [9], and all neonates with acute lacrimal saculitis had lacrimal saculous mucous sacs immediately after birth, and acute lacrimal saculitis was caused by secondary infection at about 1 week of onset. Congenital lacrimal sac protrusion, also known as bulging congenital lacrimal sac disease or neonatal lacrimal sac mucocoele, is rare clinically and can occur at birth or a few days later. Due to the obstruction of the lacrimal duct, the lacrimal sac is enlarged by the accumulation of mucus secreted by the mucus glands in the inner wall of the lacrimal sac. It is characterized by nasal side down to the bottom of the internal canal ligament, is slightly blue, cystic, and non-tender. A slightly blue, cystic, non-tender hard mass may be found under the medial canalicular ligament in the nasal cavity of newborns [10]. Acute infection may be secondary to weakened resistance or incorrect massag [11]. Some investigators have suggested that congenital protruding lacrimal sacs are subject to secondary infection and form acute dacryocystitis in infants, which is recommended to be treated as soon as possible [12]. In the present study, based on clinical experience, it was observed that most children with congenital lacrimal sac protrusion had cysts visible under nasal endoscopy (Figure 1), it was difficult to have congenital nasolacrimal duct obstruction, and lacrimal tract exploration generally failed in most cases.

**Discussion**

Acute dacryocystitis in infants is one of the more difficult diseases in ophthalmology, caused by young age, poor resistance and delicate skin. Its mechanism has not been fully researched and there are characteristics of rapid disease progression and high family requirements that make it a struggle for ophthalmologists.

Previously, hot compresses, local or systemic antibiotics were used in the treatment of acute dacryocystitis in infants, or skin puncture to draw pus or abscess incision and drainage after controlling the inflammatory response. However, these methods are highly injurious, tend to destroy the normal structure of the lacrimal sac, have many complications, cause lacrimal sac fistula, are prone to repeated breakage, and even leave skin scarring, which affects the aesthetics of the child, and have a long treatment period, causing pain to the child. In this study, although the overall efficiency rate was not statistically significant, it only controlled the acute inflammation and did not solve the underlying problem of nasolacrimal duct obstruction, so half of the children in the control group still needed lacrimal tract exploration after 6 months.

In infants with acute dacryocystitis, the underlying cause is nasolacrimal duct obstruction, and traditional puncture or excision does not address the root cause of the obstruction. In recent years, the leidaoleidaot lacrimal tract exploration for the treatment of neonatal j-agent dacryocystitis in the course of d remains controversial. Some scholars have proposed that lacrimal ducts are not contraindicated, while others believe that lacrimal duct probing is appropriate after 3 months. However, lacrimal inflammation in children with acute dacryocystitis is persistent, and repeated lacrimal mucosal injury and repair predispose to obstructive fibrotic thickening of the lacrimal membrane, which affects the effect of evacuation. In advanced and long-term dilation of the tear sac, the tear sac wall loses elasticity, and the tear duct function is imperfect even if late lacrimal exploration is successful. And because of the long-term presence of excessive tearing, especially in children with cysts on both sides of the nose, there is a risk of respiratory distress, which is recommended to be treated as soon as possible. Some investigators believe that the use of "lacrimal aspiration + probing" in the early stages of acute dacryocystitis in neonates can shorten the treatment time and prevent the deterioration of the disease. Drawing on that experience, in this study, pus was aspirated from the lacrimal sac through the lacrimal punctum before lacrimal exploration (Figure 3A), and the lacrimal sac irrigation test device was used if necessary, and the lacrimal exploration technique was performed after the irrigation.
fluid was clear. However, because the child is in the acute phase, the eyelid is edematous and tear exposure is difficult, while there are difficulties with functional or mechanical locking of the tears mainly, and the passage of the agent tends to form a false channel, causing congenital damage and possibly even the spread of inflammation.

With the development of endoscopic transnasal approach in recent years, especially in the eye and nasal related fields, the contraindication of doing nasolacral sac anastomosis has been surpassed and the results are satisfactory. Therefore, some scholars have used nasolacrimal sac sac anastomosis [21], and although the surgical results were immediate, a number of problems have arisen, such as anesthesia and the possibility of anesthetic accidents. Some researchers concluded that anesthetic surgery in infancy and early childhood had no significant effect on the development of forward intelligence and sensory integration in children, but children in the anesthesia group had higher values of differences in working memory-verbal comprehension indicators in the intellectual structure and an increased incidence of vestibular imbalance after two anesthetic procedures in infancy and early childhood [22]. The role of the central nervous system in anesthesia is very important. The human central nervous system is not fully developed at birth, and the last 3 months of intrauterine development and the years after birth, especially the first 3 months of life, are the most important, known as the burst period of brain development or the synaptic period, which is the basis for the development of the central nervous system and cognitive functions [23]. Evidence from most retrospective studies supports that babies aged 2 to 3 years are more likely to develop cognitive and behavioral impairments, and the number of anesthesia sessions, duration of exposure, and exposure dose are directly related to the risk of cognitive dysfunction. Moreover, it is difficult for most families to accept general anesthesia for children. In addition, anesthesia requires the insertion of a laryngeal mask or endotracheal tube, which may cause damage to the child’s throat. In addition, the sinus structure is not fully developed in newborns, and if the nasal bone is removed prematurely, it may also have an impact on the long-term development of the child. Neonates are relatively close to the structure and operating area of the skull base, with small nasal cavities and limited operating space. Neonates have low hemoglobin and there are complications such as high trauma and bleeding with damage, therefore, this procedure is limited to children with bony nasolacrimal duct obstruction. In the treatment of congenital lacrimal sac cysts with apparently prominent sinus cysts just now [24], the results were more satisfactory and the procedure was minimally invasive compared to lacrimal sac nasal anastomosis, which is not recommended relative to the situation of the children in this study to start using this procedure. The main reason is the young age of the neonate and the need for general anesthesia for the procedure, the risk of anesthesia is then greater, especially for primary or specialized discipline hospitals, where resuscitation conditions are limited and the neonate’s condition changes rapidly, and safety cannot be guaranteed. Second, the procedure is more expensive. To improve the success rate, some scholars suggest that surgical treatment such as lacrimal drainage tube implantation into the lacrimal duct can be used for those who fail to explore [25,26]. However, lacrimal drainage tubes can cause ocular discomfort in children, with the potential for corneal damage and tearing of the tear dots. In addition, a second stage of extubation is required, and tube placement should be considered for children who have failed repeated visits.

In this study, for acute dacryocystitis in neonates, the observation group was treated with nasal endoscopy-assisted descending lacrimal duct exploration, which was performed under outpatient surface anesthesia only, without the risk of hospitalization and general anesthesia, and without the need for systemic infusion of fluids. After treatment, the erythema in the lacrimal sac area of the child disappeared significantly (Figure 4), supplemented with local antibiotic eye solution, lacrimal sac massage, and oral antibiotics if necessary for severe inflammation, with no erythema in the lacrimal sac area and disappearance of conjunctival sac secretions on the first postoperative day (Figure 2 and Figure 3B). There was no recurrence at 3 to 6 months of follow-up. This approach is relatively the most minimally invasive and has a high cure rate, and the child recovers quickly. Moreover, with the aid of nasal endoscopy, it is visualized that the child has more factors affecting the passage of the agent through the nasal cavity, such as cysts in the nasal cavity and adhesions in the lateral nasal wall of the inferior turbinate. The success rate of tear duct passage is high and relatively safer. However, at the same time, it is more demanding for the surgeon, requiring extensive experience in infant lacrimal duct exploration through, as well as a strong psychological profile, which should not be affected by the sound of crying newborns, but rather the requirement of a fixed head for the assistant. Another assistant is also needed to cooperate with the nasal endoscopic observation, especially during the probing process through the probe into the tear sac, which cannot be forcibly removed through the tear duct, because the child’s tear duct does not go in. The procedure should also take care to prevent bleeding, which can walk into the false tract and subsequently lead to the spread of inflammation and injury to the child’s infection.

The effect of ophthalmic gel can be carried out after successful lacrimal duct injection with broad-spectrum antibiotics through the preparation, which can be anti-inflammatory and support the lower nasolacrimal duct. One study reported a gel with antibiotics injected after lacrimal tract exploration for congenital dacryocystitis, which used 0.3% ofloxacin ophthalmic gel, but the general safety remains to be observed [27]. It was found that after 7 consecutive days of drops of gatifloxacin ophthalmic gel, the concentration of tifloxacin drug in all plasma samples was below the lower limit of quantification [28], indicating that the drug is safe for topical use and can adhere to the surface of the eye after drops due to its viscosity and fluidity. Gatifloxacin with the patented technology of extra-strength-technology can maintain the duration of action in intraocular tissues and rapid release of the drug quickly, effectively and durably, and increase bioavailability, which is supplemented by lacrimal tract probing for local administration of postoperative anti-inflammatory drugs in neonates, with obvious advantages over antibiotic eye drops.
Conclusions

In conclusion, transnasal endoscopy-assisted descending lacrimal duct exploration for the treatment of acute dacryocystitis in neonates is safe, relatively simple to operate, with short treatment time, rapid recovery of the child, and definite efficacy, providing a new protocol for the diagnosis and treatment of this disease.

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