

## SUCCESS RATE OF LATE PROBING IN CONGENITAL NASOLACRIMAL DUCT OBSTRUCTION IN CHILDREN UNDER SEVEN YEARS

Fatemeh Eslami<sup>1</sup>, Mohamad ali seifrabie<sup>2</sup>, Nooshin Jafari<sup>3</sup>, Pejman Khatibian<sup>4\*</sup>

*2.Department of Community Medicine, School of Medicine, Hamadan University of Medical Sciences, Hamadan, Iran.*

*3.School of Medicine, Hamadan University of Medical Sciences, Hamadan, Iran .*

*1,4.Department of Ophthalmology, Hamadan University of Medical Sciences, Hamadan, Iran.*

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### ABSTRACT

**Background and objectives:** Nasolacrimal duct obstruction can be found in 2% to 6% of children, which is improved in 90% of patients within 6 months through massage and topical antibiotics. In the absence of therapeutic response, the next step is surgery that leads to healing in 90% of cases. The present study was conducted because of high prevalence of the disease and inconsistencies in success rate of probing after one year of age.

**Materials and methods:** This retrospective cross-sectional study was performed on 313 patients (365 eyes) under probing at Farshchian Hospital of Hamadan, Iran, during 2009-2015. The success rate of the surgery was determined by the elimination of tearing and eye discharge. The data were recorded in a checklist and analyzed statistically by SPSS software.

**Results:** The study patients consisted of 173 (55.27%) females and 140 (44.73%) males. Most of the subjects were in the age group of 12 to 24 months (64.21%). The involvement included 38% on the right, 46% on the left and 16% on both sides. The success rate of first probing was 88.6%, 87.6%, 61.36% and 53.4% in the age group of less than 12 months, 12 to 24 months, 24 to 48 months and over 48 months. The second probing was performed for 88 eyes that did not succeed in probing; total success rate was 80.48%.

**Conclusion:** The present study demonstrated no significant relationship between surgical success rate and gender as well as between recovery rate and involved side. As the age grows, the success of probing is reduced but due to the high percentage of recovery in children under two years of age as well as considering noninvasive and low cost nature of probing compared with other surgical methods, probing is recommended until the age of two in the absence of the response to topical antibiotics and lacrimal sac massage.

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### Introduction

Nasolacrimal duct obstruction can be found in 2% to 6% of children, which is improved spontaneously in 90% of patients within 6 months through massage and topical antibiotics. In the absence of therapeutic response, the next step is surgery that leads to healing in 90% of cases. Probing of the nasolacrimal duct will result in recovery in 90% of cases. Treatment for congenital nasolacrimal duct obstruction should be decided upon by each individual profile and all children should be treated with massage and antibiotics before surgery regardless of their age. The lacrimal system consists of structures involved in tear production or drainage. The nasolacrimal drainage system includes puncta, canaliculi and nasolacrimal duct that eventually carry tears into the nasal cavity (1).

The duct opens into the anterior part of the inferior meatus. The distal end of the duct is called Hasner's valve.

The congenital nasolacrimal duct obstruction may occur in puncta, canaliculi or common canaliculus, but obstruction at the site of nasolacrimal duct into the nasal cavity is Hasner's valve that is guarded by a fold of mucous membrane (4).

The congenital nasolacrimal duct obstruction is the most common cause of tearing in children. Many babies are born with nasolacrimal duct obstruction that will be resolved in the first months of birth. Clinical obstruction is seen in only 2% to 6%

of term neonates at weeks 3-4. The prevalence is the same in both sexes and eyes (2, 3); one-third of cases have bilateral involvement.

The assessment of congenital tearing is usually simple. Parents provide a history of tearing, discharge or both shortly after birth. Other symptoms include conjunctivitis, red eye or lower eyelids dermatitis (5).

The disease is diagnosed with clinical signs, returning discharge from the lacrimal ducts after pressure on the lacrimal sac and fluorescein dye disappearance test (6, 7).

The first step in the treatment of lacrimal duct obstruction is medical treatment. This obstruction is resolved in 90% of cases over a period of 6 months by itself, either by massage on lacrimal sac or topical antibiotics. In the absence of response to this treatment, the next step can be surgical interventions (8, 9). In most cases, this includes probing to open the Hasner's membrane. Topical antibiotics are applied after surgery. If the symptoms remain after first probing, second probing could be performed. Silicone tube or DCR (Dacryocystorhinostomy) can be employed if the tearing continues.

Treatment for congenital nasolacrimal duct obstruction should be decided upon by each individual profile and all children should be treated with massage and antibiotics before surgery regardless of their age (10).

There are different views on the appropriate time for probing the congenital nasolacrimal duct obstruction (6, 7).

The probing is done at the age of 12 months, as the chance of spontaneous opening of the nasolacrimal duct is high up to 12 months (11-13). The probing of nasolacrimal duct is the most common surgical procedure to open congenital obstruction and its success rate has been reported from 54.7% to 97% in various studies, depending on the age of the children under study (4, 6, 7, 11 and 13).

#### MATERIALS AND METHODS

This retrospective cross-sectional study based on medical records was performed on all patients with congenital lacrimal system obstruction under probing at the Farshchian Hospital of Hamadan, Iran, during 2009-2015. Those patients who were re-examined one month later to follow up and evaluate the success rate of surgery were enrolled in the study. The surgical success rate was determined as the elimination of tearing and eye discharge in a patient's history and examination.

The data were recorded in a checklist and analyzed statistically by SPSS software.

The patients who had incomplete information in the medical records or did not refer to revisit were excluded. The surgical success rate was defined as the elimination of tearing and eye discharge after one-month follow-up.

#### RESULTS

The current research evaluated the medical records of 313 patients (365 eyes) with congenital obstruction of lacrimal system under probing. The subjects were divided into four age groups of less than 12 months, 12 to 24 months, 24 to 48 months and over 48 months. Most of the patients were in the age group of 12 to 24 months (64.21%), and the lowest number of patients had the age of over 48 months. In terms of gender distribution, the highest number of subjects was female (55.27%).

Concerning the frequency of the involved side, the most cases of surgery were in the left eye (n=143, 45.68%), 118 (37.69%) cases were related to the right eye and 52 (16.61%) had bilateral involvement.

The tearing problem and regurgitation of discharge were eliminated in 75.42% of 118 patients with lacrimal system obstruction in the right eye. The tearing problem was eliminated in 111 (77.62%) of 143 patients with tear system obstruction in the left eye. Of 52 people with bilateral obstruction, the tearing problem was eliminated in both eyes in 33 (63.46%), only in the left eye in 6 (11.53%) and only in the right eye in 5 (9.61%). Eight people (15.38%) still had tearing problems. With regard to single eyes in people with bilateral involvement, generally the tearing problem was eliminated in 77 (74.03%) of 104 eyes (table\_1).

**Table 1-** Results of regurgitation test and tearing problem based on involved side

Involved side	Negative results, n (%)	Positive results, n (%)
Left	111 (77.62)	32 (22.38)
Right	89 (75.42)	29 (24.58)
Both	77 eyes (74.03)	27 eyes (25.97)

**The success rate of probing** has been measured according to elimination of tearing and negative regurgitation test in children.

All those who showed tearing recovery had also negative results for the regurgitation test. These people were considered as being successful in probing. Thus, the success rate of probing was 77.62% for those with left lacrimal obstruction and 75.42% for those with right lacrimal obstruction. The success rate of probing was 74.03% in subjects with bilateral tear system obstruction. The total success rate of probing was 75.89%. Comparison of the success rates of probing in the right, left and both sides with chi-square test showed no significant difference between the surgical success rate in the three parameters, indicating no association between success in probing and the involved side (P-value = 0.820). The success rate of probing in the left eye was lower in male (76.08%) than in female (76.92%). However, the Chi-square test showed no significant difference in the success rate of probing in left eye between the two genders (P-Value = 1.000). In addition, the success rate of probing in the right eye was lower in males (69.13%) than in females (79.54%), but the difference was not statistically significant (P-value = 0.121).

Comparison of success rate of probing between different age groups was done by Chi-square test. With aging, the success rate of probing in the right and left eyes was decreased (Value = 0.001), indicating a significant relationship between age and success rate of probing in the right and left eyes (P-value = 0.000).

The success rate was higher in males than in females. However, there was no significant difference in success rate of probing between the genders. With aging, the success rate was decreased significantly, meaning there was a negative correlation between age and success rate of probing. The success rate of probing was lower in the left eye and in bilateral cases. The success rate of probing in the left, right and both eyes was not significant; this means that the success rate of probing was not related to the involved side.

### Determining the success rate of probing in children requiring reoperation

According to the results, 32 (22.37%) of 143 patients with lacrimal system obstruction had no successful first probing, of which 17 needed reoperation so that 15 (88.23%) had successful second probing and 2 (11.76%) had unsuccessful surgery.

Of the 118 who had left lacrimal system obstruction, 29 of them (24.57%) had unsuccessful first probing. Of these, 15 had reoperation including 11 (73.33%) successful surgery and 4 unsuccessful surgeries. Of 52 people having bilateral problem, 8 (15.38%) had unsuccessful first probing in both eyes, of which three had reoperation including two (66.66%) successful probing in both eyes and one (33.33%) unsuccessful surgery in both eyes.

In general, 20 people had second probing in the left eye and the surgical outcome was successful in 17 people (85%), 18 people had probing in the right eye and the surgical outcome was successful in 14 patients (77.77%). Three people had probing in both eyes and the surgical outcome was successful in two (66.66%) in both eyes and unsuccessful in one in both eyes. Total success rate of second probing was 80.48%.

The frequency of success rate of second probing in the right, left and both eyes was compared with Chi-square test, and no significant difference was found in the success rate of second probing between the right, left and both sides. In other words, the success rate of second probing is not related to the involved eyes (P-value = 0.876).

### DISCUSSION

The nasolacrimal duct obstruction is one of the most commonly reported congenital abnormalities, with an incidence rate of 1.75% -20% in children (1) and may occur in 70% of newborns. Control of this disorder is beneficial with antibiotics and lacrimal massage until the age of 6 months, and half of the obstructions are treated with protective measures in children aged 6 months to 10 months (2). This obstruction exists usually at the inferior end of the duct, especially near Hasner's valve, where the nasolacrimal duct opens into the inferior meatus (3). The obstruction may occur on any of the parts of the nasolacrimal system including puncta, canaliculi, common canaliculus and Hasner's valve. The obstruction may also be simultaneous in more than one site, for example, in the dacryocoele, in both Hasner's and Rosenmüller valves (1). There is a controversy about the course of the disease and the appropriate treatment, so that Peterson and Ropp recommend waiting for self-recovery up to six months. Johns, Wobring and Ffoors suggested the early probing of lacrimal duct after several weeks of treatment with topical antibiotics, and Ffoors believes that there is possibility of lacrimal sac abscess in the event of delay in surgical treatment (4-6). Some ophthalmologists that delay in surgery can lead to infections in the lacrimal system resulting in lacrimal duct fibrosis and the success rate of probing decreases, as well as the patient may need to go on to costly, prolonged and invasive treatments later, while others believe in long-term treatment (4, 7). It is necessary to explain that DCR in case of failure in probing is one of the preferred measures as a time-consuming and costly surgery for the patient.

RajatMaheshwari et al. in 2006 in India evaluated the success rate of this surgery in children under 5 years and over 5 years, which was respectively 85% and 55.55% (14).

Robb and Peterson reported a recovery rate of 92% at the age of less than 12 months and 42% at the age of 48 to 60 months (6).

A further study in Tehran in 2003 reported that this rate was 49.55%, 39.44% and 28.39% in 3 age groups of 13 to 18 months, 19 to 24 months and 25 to 60 months respectively.

A study in Kashan, Iran, from 1998 to 2001 showed that with the aging of children from 1 to 5 years, the success rate of probing is reduced in opening the obstruction (16). In a study conducted in Rafsanjan University of Medical Sciences in Iran, the success rate of surgery in children under one year of age was 92% in less than 18 months, 76.88% in less than 18 months, 51.7% in over 18 and 48.6% in over 24 months. This study showed a negative relationship between age and success rate of probing, which is decreased with age (17).

Another study at Shahid Beheshti University, Iran, in 2009 found no significant relationship between age and success rate (18). A study in 2013 in Tehran University indicated that the failure rate of surgery with the age over 36 months was not associated (19).

A study at Gilan University of Medical Sciences in 2013 also found that the success rate in three age groups of less than 12 months, 12 to 24 months and over 24 months was 91%, 89% and 60% respectively (20).

In the present study, the majority of patients were in the age range of 12 to 24 months (64.21%) and the number of female patients (55.27%) was higher in this study than in male patients. In the study of Heidari et al., 66.66% of the patients were in the age range of 12 to 24 months and 55.27% were female (9). In the study of Aghadoust et al., the mean age of the subjects was 12.75 months and 41.1% of the patients were male (9). In a study by Maheshwari et al., the majority of subjects (73.46%) were males (3). In a study of Kashkouli et al., the mean age of the subjects was 24.4 months and 47.44% were female (10). In a study of Abrishami et al., 52.6% of the patients were female and most of the patients were in the range of 15- 24 (65.82%) months (1). In a study of Eshragi et al., 63% of the subjects were male (2). The prevalence of nasolacrimal duct obstruction seems to be generally higher at the beginning of the birth, but most ophthalmologists prefer to prescribe medications by 6 to 12 months and delay surgery. In other words, the probing rate for this period is low (2). For this reason, most patients in majority of studies are in the age range of 12 to 24 months. After two years of age (24 months), the prevalence of this disease is also reduced due to the management and treatment. Our study and other investigations indicate that the probing rate in male and female patients is identical and the nasolacrimal duct obstruction has no relationship with gender.

In addition, 83.38% of the cases had unilateral obstruction, 45.68% were in the left eye and 37.69% in the right eye, and the rest were those who had obstruction in both eyes (16.61%). Razzaghinejad et al. also showed that 21.5% of patients had bilateral involvement in the eye and 78.5% of cases were unilateral (11). In the study of Aghadoust et al., the nasolacrimal duct obstruction was seen in 41.1% in the right eye, 32.1% in the left eye and 26.8% in both eyes (9). In the study by Maheshwari et al., 51.02% had right eye involvement and 48.98% had left eye involvement (3). In a study of Kashkouli et al., 40.5% of the right eyes, 22.7% of the left eye and 36.6% of both eyes were involved (10). In the study by Eshragi, 43.9% of patients had left eye involvement, 39.1% of the patients had right lacrimal system obstruction and 17% had obstruction in both eyes (2). In the study of Jeylan et al., 50.72% of the patients had left eye involvement and 49.28% had right eye involvement

(12). The results of most studies are similar to our study and show that the probing rate in the right and left eyes was almost identical, and the bilateral probing rate was less than unilateral ones. In our study, there was no significant difference between the frequency of left and right tear system obstruction (P-value = 0.137), but the frequency of bilateral tear system obstruction was significantly lower than the left and right eye obstruction (P-value = 0.000).

In the current study, success rate of probing was measured according to the results of regurgitation test and tearing examination. In most studies, these two factors have been used to evaluate the response to treatment (1, 13-16). The total success rate in the first probing was 75.89% in our study.

The success rate of probing in left and right eyes in males (left: 76.08%, right: 69.13%) was lower than in females (left: 76.92%, right: 79.54%), but no significant difference in success rate of left and right eye probing was found between the two genders (P-value = 1.000, left, P = 0.121, right). The success rate of probing in the right eye was 93.33% in the age group of less than 12 months, 77.88% in the age group of 14-24 months, 51.72% in the age group 24-48 months, and 33.33% in the age group over 48 months.

The success rate of probing in the left eye was 87.87% in the age group of less than 12 months, 77.60% in the age group of 12-24 months, 60% in the age group of 24-48, and 75% in the age group over 48 months. Overall, the success rate of probing decreases with age. According to previous studies, 80-85% of patients with congenital nasolacrimal duct obstruction are improved through the medical treatment (17). In a study of Soleymani, the total success rate was 71.4% (similar to our study), and the success rate was 94.4% in children less than 6 months, 92% in less than one year, 88.76% in less than 18 months, 51.7% in over 18 months and 48.6% in over 24 months, and there was a significant negative correlation between the age of the child and the success rate of probing (18). In the study of Aghadoust et al., the success rate of first probing was 78.6% in total and 78% in boys and 78.4% in girls. In addition, the majority of patients (60.9%) were in the age group of 6 to 12 months. Aghadoust et al. showed that the success rate of probing is not related to the involved side and the patient's gender, but has a significant relationship with age, so that the success rate of probing was decreased with age (9). Moreover, Heidari et al. showed that recovery of nasolacrimal duct obstruction had no statistically significant relationship with gender (19). In the study of Maheshwari et al., the success rate of probing was 79.60% in total and 85% in the subjects less than 5 years old and 55.55% in over 5 years; this study also reported a decrease in success rate with age (9). In a study by Kashkuli et al., the success rate was 84% in total, 89% in the age group of 13-24 months and 72% in the age group of over 24 months (10). In the study of Abrishami, in contrast to our study, the success rate was higher in subjects with bilateral involvement (83%) than in unilateral ones (72%), but there was no significant difference. Furthermore, in this study, there was no association between age and sex with the success rate of probing (1). In the study of Eshragi et al., there was a correlation between the unsuccessful rate of probing and the bilateral involvement. However, no significant relationship was found between age over 36 months and unsuccessful rate of probing (2). Also, Jeylan El-Mansoury et al. found a high success rate in probing (93.5%) among people over 13 months of age and suggested that probing should be postponed until at least 13 months (12), which was inconsistent with the results of a study by JAMES et al., that the success rate 97% in subjects under 13 months and 54.7% in people over 13 months (7). Santosh found a significant relationship between the failure to success of probing and the age of 36 months as well as the bilateral involvement (20). Richard M, unlike Geva, found no significant correlation between age and reduction in success rate of probing with age. In general, the majority of studies similar to our study have reported a decrease in success rate of probing with age. Some researchers have suggested that the cause of decreased success with age may be due to the incidence of fibrosis and chronic infections with age (7, 22). This failure may also be due to a variety of complex obstructions that do not respond to simple drug therapy or probing. Paul, Honavar, Kushner, Kashkouli, and Maheshwari have stated that a variety of complex obstructions is more likely to occur in older children (3, 10, 17, 20 and 23).

It should be noted that, 13.09% of the subjects underwent second probing and the success rate of second probing was 79.54%, which is, the success rate of second probing was more than first probing (80.48%). In the study of Santosh et al., the success rate of second probing (80%) was higher than first probing (73.3%) (20). In a study of Richard et al., 2.6% of patients experienced second probing and the success rate of first and second probing was 92% and 100% respectively (8). In a study of James et al, 11.22% of patients need to second probing and the success rate of second probing was 39.53%, which was lower than the success rate of first probing (63.09%) (7). In the study of Jeylan El-Mansoury, 6.5% of the subjects had second probing and the success rate of first and second probing was 93.5% and 100% respectively (12). Most studies, like our study, show that the success rate of second probing is more than the first probing so that it is recommended to be performed due to lower complications before more invasive and costly methods, if necessary (12).

## CONCLUSION

The results obtained from the present study indicated that the success rate of probing decreases with age. Regarding the findings of this and previous studies, probing is suggested to be performed for better success at the age of one year in the absence of severe and chronic infections. In the absence of a referral of patients over the age of one year, due to the high percentage of success rate of first probing as well as considering the noninvasive and low cost nature of probing in comparison with other surgical methods, probing is recommended at least once for all children with congenital nasolacrimal duct obstruction.

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