EXTENDED REPORT

Late and very late initial probing for congenital nasolacrimal duct obstruction: what is the cause of failure?

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Aims: To find the cure rate of late (second year of age) and very late (3–5 years of age) initial probing for congenital nasolacrimal duct obstruction (CNLDO) and to identify the factors contributing to the failure rate of the probing in older children.

Methods: In a prospective interventional case series study, 169 eyes of 125 consecutive patients (1–5 years old) with CNLDO underwent probing under general anaesthesia. Cure was defined as absence of tearing and discharge in the affected eye.

Results: 138 eyes of 101 patients aged 13–60 months (mean 23.4 (SD 10.2)) were included. Of 15 eyes (10.8%) with complex CNLDO, 80% presented after 24 months of age ($p < 0.0001$). The cure rate was 89% in patients 13–24 months of age and 72% after the age of 24 months ($p = 0.01$). It was 90.2% in the membranous and 33.3% in the complex CNLDO in both late and very late probing ($p < 0.0001$). There was a high correlation ($r = 0.97$) and no significant difference between the cure rate at 1 week and final follow up.

Conclusion: Accumulation of the complex CNLDO is the main risk factor for failure of probing in the older children. The outcome of the nasolacrimal duct probing at 1 week follow up is highly indicative of the final outcome.

Congenital nasolacrimal duct obstruction (CNLDO) is a common problem in the early years of life.¹ Standard management in the first few months of life includes hydrostatic massage of the lacrimal sac and topical antibiotics. Where the condition persists beyond several months, early office probing² or hospital based probing around the age of 1 year³ yields good result. Some authors reported that increasing age significantly decreased the success rate of probing beyond the age of 1 year.^{4–6} Therefore, some clinicians prefer to perform silicone intubation as the initial surgical procedure for older children (typically older than 18 months) with CNLDO.⁷ Some investigators, however, claimed that increasing age has no significant effect on the success rate of the probing in older children.^{8–11}

There are two hypotheses for the lower cure rate of probing in the older children with CNLDO. Whether this is because of prolonged inflammation and fibrosis in the lacrimal drainage system with increasing age^{5, 12} or the result of accumulation of complex obstruction with time as less severe obstruction clears spontaneously,^{6, 7, 10} is not clear. There are few reports that specifically addressed the problem of complex CNLDO and its impact on probing of the older children.^{7, 13}

The aim of this study was to find the cure rate of the initial probing for CNLDO in children between 13 and 24 months (late) and 25 and 60 months (very late) of age and to assess the factors affecting the cure rate of late and very late initial probing for CNLDO.

SUBJECTS AND METHODS

In a prospective non-comparative interventional case series, 169 eyes of 125 consecutive patients between the age of 1 and 5 years with CNLDO were probed in two university based hospitals from November 1999 to December 2001. Twenty four patients were excluded because of associated lid malposition (one), acute dacryocystitis (seven), canalicular obstruction (four), and incomplete follow up (12). No patient with previous probing, history of trauma, punctal agenesis, and

associated ocular disease was included in the study. Finally, 138 eyes of 101 patients were included. The diagnosis of CNLDO was based on a history of tearing or discharge since or shortly after birth and confirmation on the dye disappearance test. After instillation of topical anaesthesia (Tetracaine 0.5%), moistened fluorescein paper was placed into the inferior fornix. Excess dye was wiped away and each eye was evaluated for clearance at 5 minutes in a semidarkened room with the blue filter light of the slit lamp or indirect ophthalmoscope. Chronic low grade dacryocystitis was defined as mild erythema of the lower lid margin and the region overlying the lacrimal sac associated with consistent reflux of mucopurulent material following a gentle pressure over the lacrimal sac. Different surgical options, complications, and prognosis were discussed with the parents and informed consent was obtained. The probing was performed by oculoplastic surgeons (three of us) under brief general anaesthesia. After dilatation of the upper punctum, the Bowman's probe (no 0 or 00) was introduced vertically into the punctum and ampulla and then rotated horizontally 90 degrees in the same plane to enter the canaliculus. With lateral tension placed on the lid to prevent kinking of the canaliculus, the probe was then advanced until it touched bony firmness, indicating that it had reached the nasal wall of the lacrimal sac. Associated canalicular stenosis was defined as a membranous fold sensation on the tip of probe, in spite of realignment of the probe, which could be overcome easily. The probe was then slightly withdrawn and rotated upward 90 degrees, in the same plane and advanced down the nasolacrimal duct and inferior meatus. After confirming metal to metal contact by a second probe under the inferior turbinate, the probe was left in place for 1 minute and then removed.

A membranous CNLDO was defined as a membranous obstruction at the end of the nasolacrimal duct that was overcome without much resistance or absence of resistance in the probing of the tear drainage system. A complex CNLDO was defined as a lack of resistance to the probe until it entered the

Table 1 Cure rate of the late (second year of age) and very late (3–5 years of age) initial probing for congenital nasolacrimal duct obstruction in 138 eyes

Age (months)	Cure* (%)	Failure (%)
Group 1 (13–18)	49/55 (89)	6 (11)
Group 2 (19–24)	39/44 (88.6)	5 (11.3)
Group 3 (25–60)	28/39 (71.7)	11 (28.2)

*Cure = complete resolution of the signs and symptoms.

NLD, at which point the probe was felt to fit snugly within the NLD. In such cases, a tactile sensation similar to that felt when passing an instrument across sandpaper was transmitted to the surgeon's fingers through the probe. Repeated probing did not alter this sensation. The severity of this condition was different. An incomplete type of the complex CNLDO was considered when the probe could reach the nasal cavity and metal to metal contact was felt after some effort. The complete type of the complex CNLDO was defined when firm bony resistance prevented the probe from reaching the nasal cavity. The association of the canalicular stenosis, as described, with the membranous CNLDO was considered to be an incomplete type of the complex CNLDO.

Postoperatively, the patients were given antibiotic (sulfa-cetamide 10%) and steroid (betamethasone 1%) drops, four times daily, for 1 week. Patients were re-evaluated at regular intervals of 1 week, 1 month, and 3 months postoperatively by the operating surgeons. Complete disappearance of symptoms (based on history taken from parents), which was confirmed by a normal dye disappearance test, was considered as "cure." Prospectively, completed data forms in the patients' hospital charts were used to extract the data. Data were entered with software SPSS MS Window Release 9.0, Chicago. The χ^2 test, Fisher's exact test, and logistic regression analysis test were used for statistical analysis.

RESULTS

The age range was 13–60 months (mean 23.4 (SD 10.2) months). Fifty three patients (52.4%) were male. Of 101 patients (138 eyes), 72 (99 eyes) were aged 13–24 months and 29 (39 eyes) were 25–60 months (Table 1). In 41 patients (40.5%) the right eye, in 23 (22.7%) the left eye, and in 37 (36.6%) both eyes were involved.

The number of patients with bilateral CNLDO was not significantly different in the two age groups. The main presenting symptom was tearing in 129 eyes (93.4%). Nine eyes (6.5%) were diagnosed with chronic (low grade) dacryocystitis. There was a membranous obstruction in 123 eyes (89.1%) and a complex obstruction in 15 eyes. There were four eyes with complete and 11 eyes (four eyes with associated canalicular stenosis) with incomplete type of the complex CNLDO. Of 15 eyes with the complex CNLDO, three (incomplete type) presented at 13–24 months of age (3/99, 3%) and 12 presented at more than 24 months of age (12/39, 30.7%) (Table 2). This difference was significant in the Fisher's exact test ($p < 0.0001$). The type of the presenting sign and symptom was not significantly different between the eyes with membranous and complex CNLDO.

Overall, 116 eyes (84%) were cured (Table 1). The cure rate was 89% in patients aged 13–18 months and 88.6% in patients 19–24 months ($p = 0.5$). There was, however, a significant reduction of the cure rate after the age of 24 months (71.7%) ($p = 0.01$). The cure rate was significantly different ($p < 0.0001$) between the membranous (111/123 = 90.2%) and complex (5/15 = 33.3%) CNLDO in both late and very late probing. Five eyes with the incomplete type and none of the eyes with the complete type of the complex CNLDO were cured. The cure rate of complex CNLDO among patients aged

Table 2 Frequency of the complex obstruction and its cure rate among 138 eyes with late (second year of age) and very late (3–5 years of age) initial probing for congenital nasolacrimal duct obstruction

Age group (months)	Total number	Number of complex obstruction (%)	*Cure (%)
13–18	55	2 (3.6)	1/2 (50)
19–24	44	1 (2.2)	0/1 (0)
25–36	25	5 (20)	2/5 (40)
37–48	7	4 (57.1)	1/4 (25)
49–60	7	3 (42.8)	1/3 (33.3)

*Cure = complete resolution of the signs and symptoms.

13–24 months (1/3 = 33.3%) and older than 24 months (4/12 = 33.3%) was the same (Table 2). The cure rate of the membranous CNLDO was not different with late (90.6%) and very late (88.8%) probing ($p = 0.5$).

In the logistic regression analysis, complex CNLDO ($p < 0.0001$) and not increasing age ($p = 0.8$) was the cause of failure of probing in the older children.

There was a high correlation ($r = 0.97$) and no significant difference between the cure rate at 1 week follow up (83.4%) and final cure rate at the 3 month follow up (84%). The same cure rate was achieved at the 1 and 3 month follow up.

Sex ($p = 0.4$), right or left involvement ($p = 0.7$), bilateral or unilateral involvement ($p = 0.3$), and chronic dacryocystitis ($p = 0.2$) did not have a significant impact on the cure rate.

Intraoperative mild bleeding from the punctum occurred in 31 eyes (22.4%), including all eyes with the complex CNLDO, which spontaneously resolved.

DISCUSSION

Probing of the NLD is a standard therapeutic procedure in the management of the CNLDO. Controversy, however, exists regarding the outcome of probing in children older than 1 year. We found an overall cure rate of 88.6% and 89% in the patients aged 13–18 and 19–24 months, respectively ($p = 0.5$). This cure rate is comparable with the cure rate in early probing (around the first year of life). The cure rate of very late initial probing was 71.7%, which was significantly ($p = 0.01$) less than the late probing (89%) for CNLDO. Sturrock and colleagues¹⁴ reported a success rate of 72% in the second year and 42% in children more than 2 years of age. Young and associates¹⁵ stated a cure rate of 54% in children probed after 2 years of age. MacEven and associates¹⁶ found a cure rate of 85% in a combined probing and nasal endoscopy among 40 children 10–89 months of age. Mannor and colleagues⁴ found a negative correlation between the age and the success of probing. Katowitz and Welsh⁵ believed that increasing age after 13 months not only decreases the cure rate but also increases the number and complexity of future procedures. In sharp contrast to those reports, Robb,⁸ Zwaan and colleagues,⁹ and El-Mansoury and colleagues¹⁰ found more than 90% success rate in late and very late probing for CNLDO. Some authors reported an insignificant effect of the increasing age on the success rate of initial probing after the age of 12 months.^{8–11} However, the issue of complex CNLDO was not noted in their reports.

Based on the type of CNLDO that was assessed intraoperatively, we divided the CNLDO into the membranous and complex type. Kushner⁷ reported approximately the same categorisation for CNLDO. There are two schools of thought for the lower cure rate with probing in older children. Some investigators suggested that it might be a result of chronic infection and fibrosis with increasing age.^{5,12} Alternatively, Paul and Shepherd⁶ considered that it might be due to a self selection process. They suggested that possibly older children

with CNLDO are more likely to represent the pool of children born with a more complicated type of obstruction. Kushner⁷ and Honavar and associates¹³ showed that the complex CNLDO was more likely to be found in the older patients. Similarly, we found a significantly higher number of complex CNLDO after the age of 24 months. We reviewed past history of patients with the complex CNLDO and did not find history of recurrent dacryocystitis. The type of presenting signs and symptoms was not different between the patients with membranous and complex CNLDO either. It seemed that the significance of the increasing age on reduction of cure rate in patients older than 24 months was the effect of complex CNLDO. Logistic regression analysis showed the significance of complex obstruction and insignificance of increasing age on the failure of initial probing in older children. The complex (firm, non-membranous, or complicated) CNLDO has also been identified as a major risk factor predictive of the failure of probing in some other studies.⁷⁻¹³ In our study, the number of patients treated after 24 months of age was small (39 eyes from 29 patients). The number of patients with the complex obstruction was also too small to be statistically compared for recovery rate in different age groups (table 2). The question is whether patients with complex CNLDO have the same cure rate in early, late, and very late initial probing. A multicentre prospective study would be helpful to find an answer to this.

The outcome at the 1 week postoperative follow up (cure rate, 83.3%) was highly correlated with the final result at the 3 month follow up (cure rate, 84%). The cure rate was the same for the 1 month and 3 month follow ups. Hence, it seems that the early result could represent the final result in probing for CNLDO. Kushner⁷ found the same outcome in 21 of the 23 patients at the 6 week and 1 year follow up.

We consider that the evidence from the present study would support the theory of self selection. Overall, the cure rate of probing at the age of 13–24 months is high enough to justify an initial late probing in CNLDO. On the other hand, three quarters of the patients with very late probing were cured. Based on this finding, simplicity, and low rate of complication, very late probing could be considered as an initial surgical step in the management of CNLDO. However, in cases of complex CNLDO one might consider silicone tube insertion following intraoperative assessment of the type of obstruction. Kushner⁷ suggested that a reasonable approach to the older child with a CNLDO is to plan a probing procedure with possible alternative plans if a complex obstruction is found. MacEwen and associates¹⁶ suggested a stepwise probing combined with nasal endoscopy to find and treat the different types of the CNLDO. Some investigators have also suggested intranasal endoscopy with probing or silicone intubation especially in patients with previous failed probing.^{17,18} The outcome of probing at 1 week is highly indicative of the final outcome.

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