http://doi.org/10.4038/cjms.v41i2.4890

Management of congenital nasolacrimal duct obstruction

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The Ceylon Journal of Medical Science 1998; 41: 67-73

Summary

Spontaneous resolution of congenital nasolacrimal duct obstruction in infancy is common. However, little is known about its course in childhood. The aim of the study was to determine the frequency of resolution with medical therapy (spontaneous resolution) in infancy and childhood, the timing and application of interventional procedures.

A total of 585 infants and children , with 802 congenital nasolacrimal duct obstructions, were treated during a ten year old period, from June 1985 at St.Michael's and St.Anne's hospitals in Colombo. All patients were initially treated medically (massage), and failures were subjected to probing, and when probing failed, to dilatation. Resolution with medical therapy was 86% in patients under two years, while there was a progressive decline in the success rate (27%). Success rate for initial and second probing was 78% and 100% repectively, in children over two years, while in the two to eleven year age group the overall rate was 43%, without success above eight years. There was a progressive decline in success rate with probing, with increasing age in children.

Dilatation with Nettleship dilator was done in failed probing in 33 obstructed ducts, the success rate being 90%.

The results suggest that in nasolacrimal duct obstruction in children under two years, probing gives excellent results (1st probing 78% , 2nd 100%). In failed probing in childhood, dilatation with Nettleship dilator is a useful alternative to complicated procedures such as intubation or dacryocystorhinostomy.

Key words - Congenital nasolacrimal duct obstruction, massage, probing, "dilatation"

Introduction

Congenital nasolacrimal duct obstruction (CNLDO) is common, affecting about 20% of all infants (1). The usual obstruction is at the lower end of the duct, where the epithelium of the lacrimal duct and mucosa of the nose about each other and form an imperforate membrane. The commonest outcome is spontaneous resolution, with out surgical intervention (2,3). In a population based cohort study, 96% of the effected infants were free of symptoms by their first birthday without treatment (1).

In the management of CNLDO in infancy and childhood, the natural history of the condition, especially the incidence of spontaneous resolution must be known, in order to assess fully the results of intervention, like massage of the obstructed nasolacrimal sac or probing and syringing the nasolacrimal duct. Information on the frequency of spontaneous resolution in children is wanting (2,3). However, Nuci et al (4) reported that in 23 of 29 children over the age of 12 months, the condition resolved within 90 days of commencing treatment with sac compression (Crigler method) and topical antibiotics. Studies by Katowitz and Welsh (5) on non-resolving CNLDO gives a success rate of 97% under 12 months of age, 76% between 12 to 23 months and 32.3% after 24 months.

Complicated procedures like, dacryocystorhinostomy (DCR) has been advocated as the treatment of choice in persisting CNLDO in childhood (over 5 years), with silastic intubation when indicated (6).

The objective of the study was to establish the frequency of spontaneous resolution in CNLDO in

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infancy and childhood, to provide a base line against which any interventional treatment can be assessed and the applicability of massage, probing or dilatation with Bowman's nettleship dilatator as an alternative to complex procedures in the relief of CNLDO.

Methods

A total of 585 infants and children with 802 CNLDOs, were treated during a ten year period from June 1985 to May 1996, at the Ophthalmic unit of St.Michael's and St.Anne's Hospitals, Colombo, Sri Lanka. The clinical diagnosis was based on a history of epiphora (excessive tearing) and / or discharge starting within three months of birth and an abnormal fluorescein dye disappearance test (FDDT) (8). The FDDT was performed and recorded at 5 or 10 minutes, in children who failed the conservtive treatment.

All patients were placed on conservative medical regime of lacrimal sac massage by Crigler method (7). In adition, the parents were instructed to apply a topical antibotic drug, whenever a mucopurulent discharge or crusting of the lashes were present. The accompanying parent was shown how to place the index finger on the child's lacrimal sac and to stroke in inferior direction, over the nasolacrimal duct with moderate pressure.

They were instructed to do this for approximately 10 strokes at least twice daily. This conservative medical regime was continued for a minimum of 6 weeks in every patient and was discontinued only if there was no spontaneous resolution of epiphora. However, in infants and children under 12 months of age, medical therapy was continued for 3 months or till they reached the age of 12 to 16 months and where spontaneous resolution was noted, were taken off the study. Parents were informed that spontaneous resolution could occur with medical therapy, even beyond 16 months of age, but were also given the option of early probing.

Patients with failed medical regime, determined by the FDDT, were subjected to probing. Children over two years were given medical therapy for six weeks and failures were subjected to probing using Bowman's probe.

Probing with Bowman's probe

Probing of CNLDO was done under general anaesthesia. Bowman's probe (00-0, maximum size 0.73 mm diameter. Prior to probing, the upper punctum and lower punctum and the canaliculi were expanded by Nettleship dilator. The probe was inserted into the upper lacrimal punctum perpendicular to the eye lid margin and then advanced toward the medial canthal tendon, while maintaining lateral traction on the eye lid to straighten the canaliculus, to decrease bunching of the canalicular mucosa and creation of false passage by perforation of the mucosa. As the probe was advanced, tactile sensation of hard stop was felt, as the adjacent bone of the lacrimal sac was encountered. The probe was then rotated superiorly, till it lay over the supraorbital notch and then the tip was directed posteriorly and laterally into the nasolacrimal duct. Entry into the nasolacrimal duct distal orifice was felt as a sudden decrease in the hard stop sensation. The membranous obstruction at the site of valve of Hasner (usually at the nasal end of nasolacrimal duct opening) was relieved by sharp thrust of the probe to break the obstruction. This is approximately 20 mm from the canalicular orifice. The probe was rotated (circular motion) till the circular bony nasolacrimal duct orifice was totally identified without obstruction by tactile sensation.

Confirmation of successful probing was done via the lower punctum and the free entry of tip of the probe into the nasolacrimal duct was confirmed. The probe was removed and the passage was syringed with saline mixed with 2% fluorescein or methylene blue and free flow of fluid in the passage, without regurgitation through the upper or lower puncta was noted. The staining of the throat pack after extubation of the patient confirmed the patency. Cure was defined as absence of epiphora and discharge and parents satisfaction six months after initial probing.

The dilator is a rigid mettalic one, with increasing diameter from the distal tip (0.5 mm) to 2.7 mm at a distance of 25 mm from the distal end.

In children under two years, whole CNLDO was not relieved after two probings and in children over two years with failed first probing, (at the initial procedure probe not passed into the nasal cavity) underwent dilatation with Nettleship's dilator. In the latter group dilatation was used as an alternative to silastic intubation or dacryocystorhinostomy. In failed dilatation, silatic intubation or DCR was done.

The results were graded as : total cure - no epiphora no discharge. Failure as persistant epiphora with or without discharge. In children under two years, with failed first probing, a second probing was done after six months.

Follow up - Patients were seeen at regular intervals, postoperatively, two weeks, 3 months, 6 months and one year. At the end of 6 months the cure rate was assessed. A cure was defined as the absence of epiphora and other symptoms as confirmed by observation and dye disappearance testing.

Statistical analysis : The Chi-Square Test with Yates correction was used to evaluate relationship of cure rate to age, in the application of different methods of treatment. Comparison of study subsets were made by Student's t test, $p < 0.05$ considered significant.

Results

The study sample consists of 802 CNLDO, in 585 patients from 0 to 11 years. The series of patients were divided into the following age categories, (based on initial examination) 0 to 6 , 7 to 12, 13 to 18. 19 to 24 months and over two years (from 2 to 11 years) and for purpose of comparison with other recent studies in the under 24 month age group, 13 months was selected as a division point between 6 and 18 months of age (3,5). The number of patients and eyes treated on each group and the percentage success from initial medical regime (massage) is summarised in Tables 1 and 2. The data regarding resolution with medical therapy does not represent any controlled study.

Resolution with medical treatment

In patients under two years, the optimum results of cure was in infants under six months (98%), with the lowest rate in the 18 to 24 month age group. Chi-square analysis confirm that increasing age at the time of initial medical treatment (Table 1) is associated to a significant degree with a decreased cure rate in patients under two years ($P = 0.0001$). The overall resolution with medical regime in 528 patients under 24 months of age was 85.9%.

The relationship of age to resolution with medical treatment in the 2 to 11 year age group is shown in Table 2. In the 2 to 3 year age group, the cure rate was 53.5%, then a sharp decline, with almost no response above the age of five years. The overall incidence of successful medical therapy in the 2 to 11 year age group was 26.7%. These findings suggest that medical treament has limited application in children over two years.

Relationship of age to success rate of probing in patients under 24 months of age is shown in Table 3. The overall results of probing in the patients under two years was a cure rate of 100% in the 0 to 6 months age group, with a decline to 61.2% at the age of 18 to 24 months, suggesting an age related trend in the cure rate, ($p = 0.0001$).

Relationship of age to success rate of probing or dilatation in the 2 to 11 year age group is shown in Table 4. In children over 4 years, attempts at initial probing was unsuccessful, due to the arrest of the probe at the site of obstruction (probe not passed into the nose). These patients were subjected to 'dilatation' as a primary measure using Nettleship dilator.

The overall success rate of initial probing in 64 obstructed eyes in the 2 to 11 year age group was 42.8% with optium results in the 2 to 3 year group (76.9%), declining to zero from the age of eight years. Second probing was done for seven obstructed eyes, in children between 2 to 4 years, with a cure rate of 42.8%.

Table 1
Relationship of age to resolution with medical treatment

Age	CNLDO *		Total patients		Resolution with medical treatment	
Months	n	(%)	n	(%)	n	(%)
0 - 06	251	(34.9)	183	(34.7)	246	(98)
06 - 12	243	(33.8)	178	(33.7)	224	(93)
12 - 18	160	(22.4)	116	(22.0)	112	(70)
18 - 24	64	(8.9)	51	(9.6)	33	(57.5)
Total	718		528		617	(85.9)

* congenital nasolacrimal duct obstruction

Table 2
Relationship of age to resolution with medical treatment in the over two age group

Age	CNLDO *		Total patients		Resolution with medical treatment	
Years	n	(%)	n	(%)	n	(%)
02 - 03	28	(32.6)	16	(28.1)	15	(53.5)
03 - 04	16	(18.6)	11	(19.4)	06	(37.5)
04 - 05	12	(13.9)	07	(12.3)	01	(9)
05 - 06	11	(12.8)	08	(14)	0	(0)
06 - 07	06	(6.9)	06	(10.5)	0	(0)
07 - 08	06	(6.9)	04	(7.0)	01	(16.6)
08 - 09	03	(3.6)	02	(3.5)	0	(0)
09 - 10	03	(3.6)	02	(3.5)	0	(0)
10 - 11	01	(1.1)	01	(1.7)	0	(0)
Total	84		57		23	(26.7)

Table 3
Relationship of age to success rate of probing with Bowman's probe

Age	CNLDO *	Resolution initial probing		Resolution 2nd probing	
Months	n	n	(%)	n	(%)
0 - 6	05	05	(100)	0	(0.0)
6 - 12	17	15	(88.2)	2	(100)
12 - 18	48	40	(83.3)	8	(100)
18 - 24	31	19	(61.2)	12	(100)
Total	101	79	(78.2)	22	(100)

* congenital nasolacrimal duct obstruction

Table 4
Relationship of age to success rate of probing, dilatation and DCR ** in the 02 to 11 year age group

Age Years	CNLDO * n	Resolution initial probing n (%)	Resolution second probing* n (%)	Dilatation n (%)	DCR **
02 - 03	13	10 (76.9)	2 (66.6)	1 (100)	
03 - 04	10	06 (60)	1 (25)	3 (100)	
04 - 05	11	06 (59.6)	-	5 (100)	
05 - 06	11	03 (27.3)	-	7 (87.5)	1
06 - 07	06	01 (16.6)	-	5 (100)	
07 - 08	05	01 (20)	-	4 (100)	
08 - 09	03	0 (0.0)	-	2 (66.6)	1
09 - 10	03	0 (0)	-	3 (100)	
10 - 11	01	0 (0.0)	-	0 (0.0)	1
Total	63	27 (42.8)	3	30 (90)	3

* Congenital nasolacrimal duct obstruction
** Dacryocystorhinostomy; *second probing not done in 04 to 11 age group

Dilatation was done in 33 obstructed NLD with a success rate of 90% ($p < .0001$) (Table 4). In 3 obstructed eyes where dilatation failed, one had silastic intubation and other two dacryocystorhinostomy. Dilatation with Nettleship dilator for failed probing in children with CNLDO gives good results, which is statisticaly significant obviating the need for complicated procedures, (silastic intubation, DCR).

Discussion

Congenital nasolacrimal duct obstruction clears spontaneously with time in most infants. Between 90 and 95% of obstructed ducts will open by one year of age (8). Reported studies have been predominantly in the under two age group. The present study sample consists of 802 obstructed nasolacrimal ducts in 585 patients in the 0 to 11 year age group. Unlike some of the early reports (5) obstruction of the ducts were confirmed by dye studies, rather than by observation, but sodium techrictium use and 'gamma scanning' was not done.

The aim of the study was to determine the clinical significance of spontaneous resolution, probing, "dilatation" in CNLDO in infancy and childhood. Our study shows that spontaneous resolution with medical treatment is excellent in infancy, confirming earlier reports (1). However there is a progressive decline in the success rate with medical therapy from 3 to 4 years (37.5%) to no response above the age of five years, suggesting an age related association to spontaneous resolution ($P = 0.001$). This observation suggests that medical treatment has its application only in infants and children under three years, and that probing should be recommended as an initial therapy for children above three years.

Parents need to be informed of the sequelae of resolution with medical treatment, the ineffectiveness of medical therapy in children over three years and the treatment options available to enable them to decide on the therapeutic options.

Spontaneous resolution remains a common occurence in the first and second year of life, and should be taken into account, when assessing the merits of the many treatments that have been proposed for CNLDO.

Although a number of studies advocate early

probing in order to avoid inflammatory sequelae (9), others have shown that at least 80% of patients with CNLDO can be cured with conservative management by 12 to 13 months of age (10, 11). Nevertheless, the real problem lies in the other 20%, in whom treatment becomes increasingly difficult. Havins & Wilkins (12) quote a success rate of 94% with simple probing done under eight months of age, as compared to 56% in patients 18 months and older. In contrast to these reports, a recent study by El Mansoury et al, does not support the concept that probing after 13 months of age gives decreased success rates (13).

The current study in contrast, corroborates (14, 15,16) that success rate of intital probing decreases significantly when initial probing is done after 36 months of age. Further, there is a progressive decline in the success rate from 60% in the 3 to 4 age group, to 16.6% in the 6 to 7 year group, to nil above eight years. Although about 86% cure can be achieved, when initial probing is done under 18 months of age, there is a progressive reduction in the success rate after this age, culminating in a poor success rate of 34% in those children initially probed at three years of age and older (p=0.0001) (Table 4).

In the above four year age group, initial probing was a failure during the procedure (probe could not be passed into the nasal cavity) was due to arrest of the probe in the nasolacrimal duct. This is attributed to significant blockage to the canalicular system, rigid type of ducts as suggested by Baker (17) or due to fibrosed rigid calcified valve of the nasolacrimal duct (Hasner valve).

It has been observed that not only was there a reduced success rate with initial probing done after three years of age, but the number and additional steps required for cure, also increased with each age category (15, 16, 17, 18, 19). In our study, second probing was not required in patients in the 0 to 6 months category (success rate of initial probing 100%)

However, above the age of six months , the need for probing rose significantly with each increasing age category, to a level of 40% by age of 3 to 4 years (p=0.0001). Whilst probing when indicated is effective in overcoming congenital membranous obstruction in the duct during the first six months of life, the results of the procedure are deplorably bad in the older children. Indeed there is generally no lasting benefit from this procedure (18). Various additional manoeuvres such as silicone intubation:, fracture of inferior turbinate, DCR, have been suggested to establish and maintain the patency of the lacrimal drainage system, if simple probing does not work (19).

There were 47.6% failures following probing with Bowman's probe in patients between age of 3 and 11 years. This group of patients were subjected to dilatation, as an alternative to silastic intubation or DCR. A success rate of 90% was obtained p<.0001 (Table 4). Of the three failed dilatations, one had silatic intubation, and two DCR. Our study shows that dilatation with Nettleship dilator for CNLDO in childhood offers good results. The procedure is a simple alternative to complex manoeuvres like intubation or DCR. The study patients have been followed up for a minimum period of one year. A further period of follow up is necessary to evaluate long term restenosis.

Conclusions

In the relief of CNLDO in infancy and childhood various options are available. Consideration of the natural history and timing of the procedure is the key to success. Evidence from the present study suggests probing at about 13 months of age for those infants with severe signs and symptoms of CNLDO. In less severe cases intervention can be delayed until 18 months, during which period there is a 70% chance of spontaneous resolution. Delay in initial probing beyond 18 months results in decreasing success. Dilation using Nettleship dilator is a viable alternative to complex procedures like intubation or DCR, in failed probing using Bowman's probe in childhood.

Acknowledgements

I thank Mrs. Shirane de Silva, Ophthalmic Tech-

nologist and Sister Ingrid for assisting with the tests and collection of the data and Dr. Ruwan Wijesuriya for the statistical analysis.

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