Multi-disciplinary management of paediatric nasolacrimal duct obstruction at a tertiary hospital: A 5-year review

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Abstract

Introduction: Nasolacrimal duct obstruction (NLDO) is the most common cause of childhood epiphora. Congenital NLDO is usually conservatively management in the first year of life, failing which surgical interventions such as syringing and probing (S&P), insertion of stents (intubation) or dacryocystorhinostomy (DCR) are offered in a stepwise manner. Methods: This is a retrospective study at a tertiary paediatric hospital. Nasolacrimal surgeries were retrieved from Hospital Episodes Statistics (HES) data for a 5-year period between May 2017 to April 2022. Retrospective case note review was undertaken looking into demographics, presentation, surgical interventions, and outcomes (resolved, partially resolved or persistent). Results: In our institution, NLDO surgeries are performed on a joint ophthalmology/ENT list. A total of 301 procedures were performed on 218 patients (293 eyes). Causes for epiphora were Congenital NLDO (n=193, 88.5%), Secondary NLDO (n=10, 4.6%), Dacryocystitis/Mucocele (n=8, 3.67%) among others. Median age at first procedure was 26 months (range 2-189). Median number of procedures for congenital NLDO is 1(range 1-5). Complete resolution of symptoms was achieved by syringing and probing in 133 cases (73%), intubation in 23 cases (78%) and DCR in 7 cases(58.3%). Patients with craniofacial syndromes required a statistically significant higher number of DCRs. Overall, epiphora was completed resolved in 81% cases, 6.3% partially resolved and is persistent in 12.7%. Conclusion: Multi-disciplinary approach to NLDO ensured efficient delivery of care by minimising number of procedures and hospital attendance. Congenital NLDO can be successfully treated in vast majority of cases with S&P and intubation. In cases with anatomical abnormalities, DCR should be considered early.

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Key Points

- This article describes our experience with management of 293 cases of paediatric nasolacrimal duct obstruction as a joint Ophthalmology-ENT service
- Congenital NLDO can be successfully managed in vast majority of cases with syringing and probing +/- intubation with monocanalicular silicone stent
- NLDO associated with craniofacial or bony abnormalities warrant early dacrocystorhinostomy.
- Bilateral intubation was required in most cases of Down's syndrome with NLDO

Introduction

Nasolacrimal duct obstruction (NLDO) is common in the paediatric age group. It is most likely congenital in origin (cNLDO) and is reported to occur in 11-20% of newborns.(1) This obstruction is due to incomplete canalization of nasolacrimal duct (NLD) during embryonic life. The site of obstruction in cNLDO is commonly at the distal end of nasolacrimal duct at the membrane of Hasner. However, cNLDO can result from bony abnormalities as well as more proximal obstructions involving canaliculi and lacrimal sac.

Conservative approach is widely advised as the first line of management up until 12-18 months of life. This includes use of topical ocular antibiotics, in addition to regular lacrimal sac massage. Persistent symptoms would warrant surgical intervention, which are offered in a step-wise manner; syringing and probing(S&P), intubation and dacryocystorhinostomy (DCR). There is significant variability in the choice of surgical interventions across the UK, particularly in the use of nasal endoscope.(2)

The aim of this study was to evaluate our joint ophthalmology-ENT service in management of NLDO and its outcomes.

Methods

This is a retrospective cohort study conducted at a tertiary paediatric centre in the UK. All nasolacrimal surgeries performed at our institution between 1st May 2017 and 30 April 2022 were included. Data was retrieved using Hospital Episodes Statistics (procedural code C27.1-C27.9). There were no strict exclusion criteria.

Our clinical service for patients referred with watery eye begins with an evaluation in the paediatric ophthalmology clinic. Diagnosis of NLDO is confirmed with fluorescein dye disappearance test (FDDT). If clinical history is suggestive of NLDO with a high tear meniscus on examination, FDDT is not undertaken. Patients with cNLDO are conservatively managed up to 12-18 months of age and are advised primarily lacrimal massages and occasional use of antibiotic eye drops if there are signs of infection If symptoms are persistent and/or complicated with recurrent conjunctivitis or dacryocystitis, surgical intervention is offered.

All primary procedures are performed under general anaesthesia with nasal endoscopic guidance in a joint Ophthalmology-ENT operating list. Majority of patients are consented for S&P as the first intervention unless more extensive interventions such as intubation or dacryocystorhinostomy are anticipated from clinical history.

The patients' nasal cavities are prepared with 1:10000 adrenaline soaked neuropatties which are placed in the inferior meatus before surgery. Bowman's probe is passed through the superior or inferior punctum. Inferior meatus is visualized using a zero degree endoscope (Storz, Tutlingen, Germany) and true probe passage through the valve of Hasner is confirmed.

Common intranasal interventions performed along with S&P include excision of membranous stenosis at valve of Hasner, in-fracture of inferior turbinate and removal of adhesions in the inferior meatus (more commonly in secondary NLDO).

Intubation is conducted utilizing Masterka mono-canalicular silicone stent (Masterka, France Chirurgie Instrumentation SAS, France). Masterka stents are removed 3-6 months postoperatively during a clinic visit under topical anaesthesia. Rarely, removal of stents may require general anaesthesia.

Endonasal DCR is performed jointly with placement of Crawford's bicanalicular stent, which is removed 3-6 months postoperatively in clinic.

Outcomes were classified as complete resolution, partial improvement and no improvement. Success rate was measured by inclusion of both complete resolution and partial improvement, as both outcomes did not require further surgical intervention. STROBE guidelines were followed to report this study. Approval was received from Institutional clinical audit team. Data analysis was performed on RStudio Version 1.3.1093 © 2009-2022 RStudio, PBC. Fisher exact test was used to examine association between categorial data.

Results

Two hundred and eighteen patients (293 eyes) with NLDO required surgical intervention. Diagnoses included cNLDO (89%), secondary NLDO (5%), dacryocystitis/mucocele (4%) among others. Median age at first intervention was 26 months (range 2-189 months).

Interventions

A total of 301 interventions were performed in 293 eyes. These included 63% (185) S&P, 31% (98) intubations and 6% (17) DCRs. Mean follow-up was 22.5 +/- 17.3 months.

Median number of procedures per patient was 1 (range 1-5). Out of 218 patients, 160 patients (73.3%) required only a single intervention. These include 81.1% S&P, 14 % intubations and one DCR (this was a case of facial fracture).

Outcomes

Complete resolution was achieved in 81% of our patient cohort, partial improvement in 13% and no improvement in 6%. Success rates were 73% for all S&P, 78% for intubation and 56% for DCR.

Craniofacial syndromes

There were 15 patients with craniofacial (CF) syndromes (Table 1). This cohort required a median of 2 procedures (range 1-5) with overall success rate of 66.6%. DCR was required in 33% of CF group compared to 4% of non-CF group (OR = 10.5, 95% CI = 2.3-43.8,*p-value=0.001*). Our success rate with DCR for CF group was 25% (2/8), compared to 77.7% (7/9) in non-CF group (OR:0.11, 95% CI = 0.005-1.26, *p- value = 0.056*).

Down's syndrome

There were 12 cases with Down's syndrome. This cohort required a median of 2 procedures (range 1-3) with success rate of 50%. Bilateral intubation was required in 5 patients. Two patients in this cohort await DCR.

Discussion

This study reports outcomes of our joint Ophthalmology-ENT service in the management of paediatric NLDO. Our service offers nasal endoscopic guided probing, intubation and DCR as surgical interventions for paediatric NLDO. Complete resolution of symptoms was achieved in 81% of 293 eyes, with a median requirement of 1 procedure per patient.

Joint Ophthalmology-ENT service

Outpatient clinic S&P continues to be highly uncommon in the UK, with vast majority performed under general anaesthesia.(2) Most paediatric ophthalmologists in the UK consider at least two S&P before proceeding with intubation.

Conventional S&P is a blind procedure, and is reported to have variable success rates.(3) Creation of false passage, unexplained failure and traumatic stenosis/adhesions are known complications of unguided probing. Sener and Onerci suggested nasal endoscopy for proximal obstructions which have a higher risk of false passage formation.(4) Han et al illustrated various abnormalities at the distal end of NLDO, such as stenotic valves, thick membranes with resultant false passage, stretchable "elastic" valves and re-closure by redundant ballooned nasal mucosa as reasons for probing failure. (5) Sun et al described Hasner valvulotomy to optimize distal end of NLD. (6)

According to recent survey of paediatric ophthalmologists and oculoplastic surgeons in the UK, only 27% of primary S&P are done under nasal endoscopic guidance.(2) There is increasing evidence to support higher success rates of endoscopically assisted probing, especially in lowering false passage formation.(3,4)

Our case series has demonstrated excellent outcomes in cNLDO with primary nasal endoscopic S&P, comparable with other studies.(3) Availability of ENT surgeon in operating theatre expands the range of treatment options available at the outset especially in cases where probing is challenging. With over 73% cases only requiring a single intervention, and in effect minimizing the exposure to GA, there is a strong argument to support nasal endoscope guided primary S&P.

Craniofacial syndromes and Down's syndrome

We assessed outcomes for Down's syndrome and other CF syndromes separately due to difference in pathogenesis of nasolacrimal duct obstruction in either of these conditions. Down's syndrome is commonly associated with pre-saccal abnormalities, such as canalicular stenosis and atresia(7) whereas, bony abnormalities such as narrowing of NLD or stenosis is frequently encountered in CF syndromes (Figures 1 and 2).

We found statistically significant difference in the requirement for DCRs in CF group compared to non-CF group. Our DCR success rate was 25% which is comparable to Jones et al (2007), who found success with DCR in only one out of 11 eyes (9%) in a CF group, concluding that NLDO in CF patients is difficult to manage.(8) Another study of 20 DCRs in syndromic anomalies reported 95% success rate.(9) However, 42% of this study cohort were patients with Down's syndrome, which may explain the better results.

Our cohort of patients with Down's Syndrome demonstrated high rates for bilateral intubation (41%) and poor success rates (50%) although we were limited to the small number of cases. Landau Prat et al reported 128 cases with Down's syndrome with similar findings of high rates of bilateral involvement and poorer surgical outcomes.(10) Intubation and DCR were undertaken in 68% and 24% of patients in this study, compared to intubation in 71% in our cohort of patients with Down's syndrome with 2 awaiting DCR.

Limitations

As a tertiary referral centre with a craniofacial unit, our patient cohort may not be generalisable and is likely subjected to sampling bias. Our mean follow-up period was 22.5 months and further review will follow in the future to assess long term results. We had a 10% lost to follow-up rate, primarily owing to the COVID pandemic where patients opted for patient-initiated follow-up.

Conclusion

Multidisciplinary approach to paediatric NLDO through combined skills and collaborative teamwork ensures efficient delivery of care by minimising number of procedures and hospital attendance while optimizing clinical outcomes. Congenital NLDO can be successfully managed in vast majority of cases with syringing and probing +/- intubation. Early intubation is recommended in symptomatic patients with Down's syndrome taking in consideration of its pathology. DCR should be considered early on in patients with craniofacial anomalies and bony anatomical abnormalities

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Tables

Table 1 Outcomes in craniofacial disorders (n=15)

No.	Craniofacial disorder	Involved side	No. of procedures	Last intervention	Outcome
1	OAVS*	Bilateral	5	DCR	Complete resolution
2	Tessier cleft	Bilateral	2	Dacryocystectomy	Partial improvement
3	Kabuki syndrome	Bilateral	1	Intubation	Complete resolution
4	18q deletion	Bilateral	1	Intubation	Complete resolution
5	Branchio-oto-renal syndrome	Right	4	DCR	Complete resolution
6	Branchio-oto-renal syndrome	Bilateral	3	Intubation	No improvement
7	Noonan syndrome	Bilateral	1	S&P	Complete resolution
8	Goldenhar syndrome	Left	1	S&P	Partial improvement
9	Alagille syndrome	Right	3	Intubation	Complete resolution
10	Tessier cleft	Right	2	DCR	No improvement
11	Cleft lip and palate	Right	2	S&P	Complete resolution
12	Saethre-Chotzen syndrome	Bilateral	1	S&P	Complete resolution
13	Rothmund Thompson syndrome	Left	3	DCR	No improvement
14	Tessier cleft	Right	1	S&P	Complete resolution
15	Menke-Hennekam syndrome	Bilateral	1	Intubation	Complete resolution

*Oculo-auriculo-vertrebral spectrum

Table 2 Outcomes in patients with Down's syndrome (n=12)

No.	Involved side	No. of procedures	Last intervention	Outcome
1	Bilateral	3	Intubation	Complete resolution
2	Left	2	Intubation	No improvement
3	Right	1	Intubation	No improvement
4	Bilateral	2	Intubation	Complete resolution
5	Left	2	Intubation	No improvement
6	Left	2	Intubation	Complete resolution
7	Bilateral	2	Intubation	No improvement
8	Right	2	S&P	Complete resolution
9	Bilateral	2	Intubation	No improvement
10	Bilateral	2	Intubation	Complete resolution
11	Left	1	S&P	Complete resolution
12	Bilateral	1	S&P	No improvement

Figure Legends

Fig 1. CT sinus demonstrating a complete bony stenosis at the distal end of bilateral nasolacrimal ducts in a case with Saethre-Chotzen syndrome.

Fig 2. MRI STIR sequence demonstrating narrowing of nasolacrimal duct on the left side in a case with Rothmund Thompson syndrome.