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Endoscopic dacryocystorhinostomy: a retrospective study of our experience

Louay Salfity, George McNally, Bertie Fernando and Anu Daudia

ENT Department, Royal Blackburn Teaching Hospital, Blackburn, UK

Abstract

Objectives. This study aimed to assess the surgical and patient reported outcomes for monocanalicular and bicanalicular silicone stent insertion in endoscopic dacryocystorhinostomy for distal nasolacrimal duct obstruction.

Methods. A retrospective cohort study was undertaken for all endoscopic dacryocystorhinostomy cases performed collaboratively by ENT and ophthalmology at Royal Blackburn Hospital.

Results. A total of 60 patients were included in the study. Tubes were used in 95 per cent of cases; 92 per cent reported a positive outcome. Minor post-operative complications occurred in 30 per cent. When further broken down by tube type, success rates were 94 per cent for monocanalicular and 95.5 per cent for bicanalicular stents, however, the difference was not statistically significant. In contrast, the complication rates were 22 per cent for monocanalicular stents and 63.6 per cent for bicanalicular stents, with this difference being statistically significant.

Conclusion. Both monocanalicular and bicanalicular stents showed similar high surgical success rates. However, monocanalicular stents were better tolerated by patients and associated with fewer complications.

Main Article

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Corresponding author: Louay Salfity;
Email: louaysalfity@gmail.com

Introduction

Dacryocystorhinostomy (DCR) is a well-established surgical procedure for the management of lacrimal duct obstruction, creating a drainage pathway between the lacrimal sac and nasal cavity. It can be performed via an external or endoscopic endonasal approach. Endoscopic DCR is performed using a 0 degree rigid endoscope and the creation of a posteriorly based axillary mucosal flap above and anterior to the lacrimal sac. The frontal process of the maxilla covering the anterior sac is removed using Kerrison punches inferiorly and a power assisted angled diamond burr superiorly, whilst the posterior lacrimal bone is flaked off to fully expose the lacrimal sac. The lacrimal puncta are then dilated and a probe inserted into the lacrimal sac until the tip is visualised endoscopically. A vertical incision is then made in the lacrimal sac mucosa to establish a wide communication with the nasal cavity, followed by marsupialisation, opposing the sac and nasal mucosa. The posteriorly based flap is trimmed along the middle and positioned to cover exposed bone above and below the neo-ostium to reduce osteitis.

Silicone stents or Lester Jones tubes (LJTs) are typically inserted to maintain patency of the newly created drainage pathway. LJTs are permanent pyrex tubes used for proximal nasolacrimal obstruction, whereas silicone stents are temporary tubes used for distal obstruction with planned removal at approximately 2–3 months. Silicone stents are further subdivided into monocanalicular and bicanalicular stents, depending on whether they traverse one or both lacrimal canaliculi.

There is conflicting evidence in the literature on the outcomes of monocanalicular versus bicanalicular stents;[1,2] however, overall findings suggest that bicanalicular stents tend to have higher success. This study aimed to compare surgical and patient reported outcomes of the different stent types inserted in endoscopic DCR surgery, including the effectiveness and rates of complications for monocanalicular versus bicanalicular silicone stents.

Methods

Retrospective data were obtained for all DCR cases performed jointly by a single ENT surgeon working in collaboration with the same oculoplastic surgeon at our Trust between March 2012 and January 2023. Patient records were reviewed and data on demographics, indications, operative details and patient outcomes were extracted (Table 1). Duplicate cases and records with insufficient data were excluded.

As this study was conducted retrospectively and patient records were anonymised, formal ethics approval was not sought. All patient data were handled in accordance with Caldicott principles and information governance to ensure confidentiality.

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Table 1. Data extracted from patient records

Age	Indication of surgery	Type of tube placed	Objective outcome: visible ostia or not
Gender	Site of surgery	Length of time tube was kept in situ	Objective outcome: free flow of fluorescein or tears
Date of surgery	Primary or revision	Post-operative complications	Subjective improvement: yes or no
Referring specialty	Any additional procedures	Follow-up visits	Subjective outcome: symptoms resolved, significantly improved, partially improved, unchanged

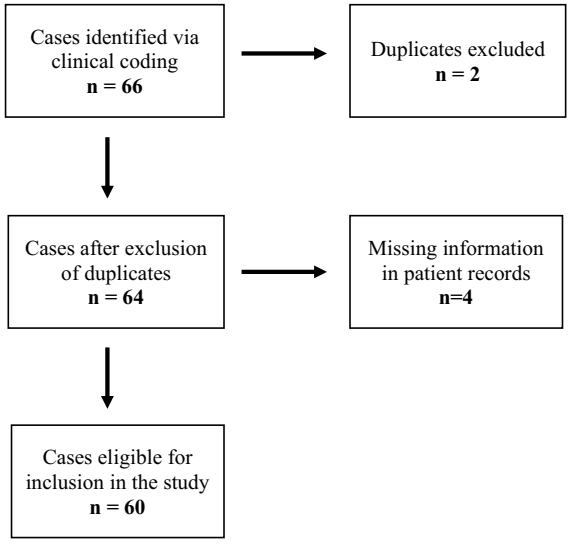


Figure 1. Flow diagram of total number of cases (n) identified and those included in the study.

Results

A total of 66 cases were identified. Two duplicates were excluded. Of the remaining 64 cases, 4 were excluded from the study due to missing information (Figure 1). The mean patient age was 46 years (range, 30–78 years), with 62 per cent female. A total of 80 per cent of referrals were made by ophthalmology, followed by 10 per cent by ENT. The remaining referrals were made by other specialties including general practitioners (GPs) and paediatrics. The two most common indications for surgery were epiphora and recurrent dacryocystitis at 52 and 30 per cent, respectively. Other indications included nasal lesions, such as inverted papillomas and mucoceles, trauma, scarring and congenital causes. In some cases, multiple factors contributed to the need for surgery as these indications were not mutually exclusive.

Operative details

A total of 57 per cent of DCRs were left sided. Primary operations accounted for 75 per cent, whereas 25 per cent were revision cases. Of the revision cases, 58 per cent were previously performed via an endoscopic approach with the rest performed primarily via an external approach. The mean number of years from primary to revision surgery was 8 years (range, 1–18 years). A total of 57 per cent of cases required additional procedures, most commonly septoplasty to improve access in 33 cases (94 per cent). Two cases (6 per cent) had DCR performed as part of an endoscopic medial maxillectomy for removal of a sinonasal inverted papilloma. The mean follow-up period was 5.6 months (range, 1–27 months).

Tubes

Tubes were inserted in 95 per cent of cases, which were either silicone stents ($n = 49$) or LJT ($n = 8$) (Figure 2). Three procedures did not include tube insertion due to difficulty intubating the lacrimal canaliculi. A total of 22 bicanalicular silicone stents were inserted and were either Crawford ($n = 13$) or O'Donoghue stents ($n = 9$). Eighteen procedures inserted monocanalicular stents. The remaining nine were indeterminant due to insufficient information about the stent type included in the operation note or follow-up records. In the early part of the study years, bicanalicular stents were used; however, monocanalicular stents were used since 2016 due to their ease of insertion and removal. Unlike bicanalicular stents, monocanalicular stents could be removed externally in ophthalmology clinic, eliminating the need for using a rigid nasal endoscope for intra-nasal knot cutting in the ENT clinic. Silicone stents were removed after an average of 12 weeks.

Complications

Thirty per cent of silicone stent cases cases had minor complications, which were predominantly minor self-resolving issues that did not affect the overall outcomes. The most common complications were simple post-operative infection (33.3 per cent) and tube displacement (27.8 per cent). These were followed by scarring and recurrence of symptoms both with a complication rate of 16.7 per cent. Simple tube blockage represented 5.6 per cent of the total complications. Complications of LJT were also examined: seven out of eight extruded, one caused irritation that necessitated removal whilst another developed a simple post-operative infection.

Outcomes

Subjective and objective outcome measures were used to determine the success of surgery. Subjectively, patients were asked to report whether they had complete resolution of symptoms, improvement or no change. Objectively, two measures were assessed: visible ostium and patency. Visible ostium was assessed via nasendoscopy at follow-up visits, and LJT cases were excluded from this assessment. Patency was assessed with fluorescein dye or free flow of tears, and LJT cases were included in this.

Among silicone stent cases, 92 per cent had an overall positive outcome with 71 per cent stating complete resolution, 21 per cent improvement and 8 per cent no change in symptoms. A total of 65.4 per cent had a visible ostium, and only one case did not. The remaining cases did not have documentation of this assessment or did not attend appointments; therefore, after exclusion of these cases, the success rate of visible ostia was found to be 97 per cent. For patency, 56.7 per cent had a patent tract and 6.7 per cent were still blocked. After excluding cases with missing data, the success rate for patency was 89.5 per cent.

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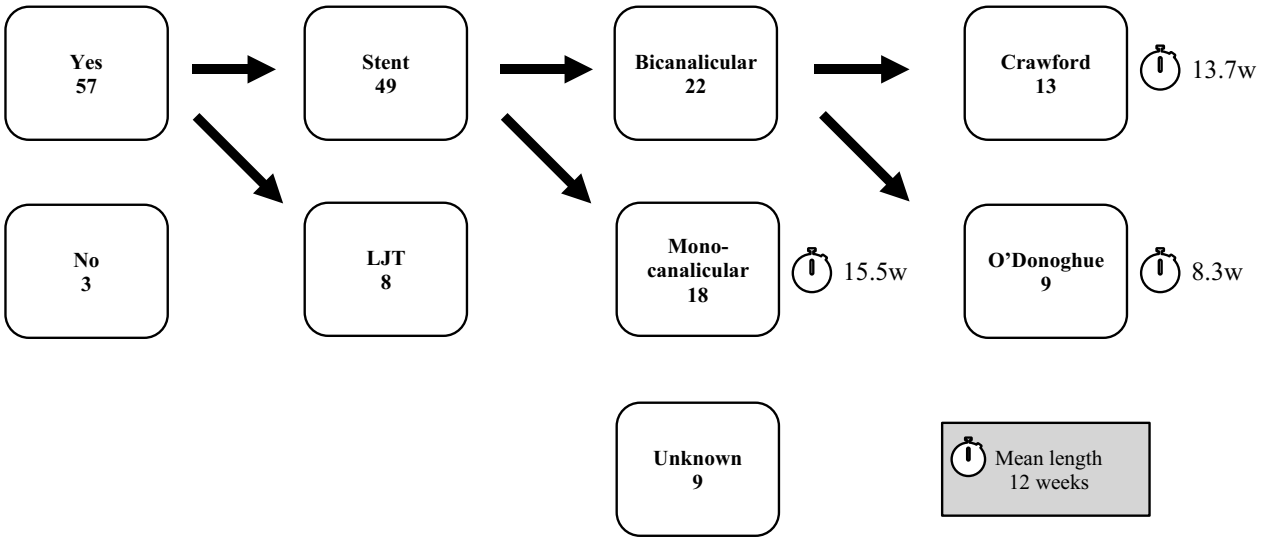


Figure 2. Diagram illustrating whether a tube/stent was inserted, type used and length of placement.

Table 2. Complications and outcomes of monocanalicular, bicanalicular and Lester Jones tubes

Parameter	Monocanalicular ($n = 18$)		Bicanalicular ($n = 22$)		LJT ($n = 8$)
Complications	22.2% (4)		63.6% (14)		112% (9)
Subjective outcome	94% (16)		95% (21)		87.5% (7)
Objective outcome	Patency *9 N/A excluded* Y: 89% (8) N: 11% (1)	Visible Ostia *13 N/A excluded* Y: 100% (5) N: 0	Patency *7 N/A excluded* Y: 87% (13) N: 13% (2)	Visible Ostia *3 N/A excluded* Y: 95% (18) N: 5% (1)	Patency *4 N/A excluded* Y: 100% N: 0

Monocanalicular (n = 18)

Firstly, after excluding cases with missing data, all monocanalicular cases had a visible ostium at follow-up and 89 per cent had tract patency. A total of 94 per cent reported a positive outcome, with complete resolution in 65 per cent and improvement of symptoms in 29 per cent. Secondly, four cases (22.2 per cent) developed complications, mainly infections ($n = 2$) with one case of displacement and one of tube blockage.

Bicanalicular (n = 22)

Firstly, after exclusion of cases with missing data, 95 per cent had a visible ostium and 87 per cent had patency. A total of 95.5 per cent reported a positive outcome, with complete resolution in 86.4 per cent and improvement of symptoms in 9.1 per cent. A total of 14 cases (63.6 per cent) developed complications. These were infections (four), displacement (four), recurrence (three) and scarring (three).

p-Values were calculated to better compare the outcomes of monocanalicular and bicanalicular stents. This found no statistically significant difference in the success rates between the two stents ($p = 1.0$). On the contrary, the difference in complication rates was statistically significant ($p = 0.012$).

LJTs were inserted in eight cases, with seven experiencing tube extrusion. One case developed an infection, and another had irritation that required removal. Despite the high extrusion rate, 87.5 per cent reported a positive outcome, with complete resolution in 50 per cent and improvement of symptoms in 37.5 per cent.

A breakdown of the complications and outcomes of the different tube types used in our study can be found in Table 2.

Discussion

In this study, the subjective success for monocanalicular stents and bicanalicular stents was high at 94.0 and 95.5 per cent, respectively, but there was no statistical difference between the two techniques. Despite the similarity in success, bicanalicular stents were associated with a statistically significant higher complication rate of 63.6 per cent compared with 22.2 per cent for monocanalicular stents. Monocanalicular stents were better tolerated by patients and were easier to remove in clinic as there are no knots to be cut inside the nasal cavity via nasendoscopy. Various studies have been conducted to compare the success of monocanalicular and bicanalicular stents. It is thought that bicanalicular stents have more success by offering more support to the lacrimal system; however, evidence in the literature is limited. A randomised controlled trial that studied the difference between both stents in external DCR concluded that bicanalicular stenting was associated with significantly higher success rates of 72.4 per cent when compared to monocanalicular stents (42.9 per cent).[1] This conflicts with a systematic review of several randomised controlled trials that found comparable success rates between monocanalicular and bicanalicular stenting of around 88 per cent for both.[2]

Multiple studies have compared the outcomes of external and endoscopic DCR to determine the most effective technique. One

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study concluded that the success rates for both techniques are comparable and found this to be between 80 and 96 per cent.[3] Despite the comparable success rates, endoscopic DCR offers the advantages of being less invasive, avoids an external scar and has shorter healing times.[3] The overall success rates in our study were similar, with subjective success in 92 per cent and objective success in 93.2 per cent.

Recognised complications of DCR include scarring, infection, bleeding, nasal crusting, disruption of the medial canthal ligament, slitting of the canaliculi or puncta, granuloma formation, displacement and failure of procedure.[4,5] In our study, 30 per cent of silicone stent cases developed complications; however, none were severe of life threatening. The majority were due to mild infections, followed by tube displacement, recurrence and scarring. LJTs had higher complication rates with extrusion in 87 per cent of them. Despite this, they had high success rates with some achieving complete resolution of symptoms even after extrusion.

The limitations of this study include missing information from patient records which limited the information available for analysis. Another limitation was the absence of a standardised protocol for follow-up visits, which contributed to variation in the documentation and post-operative assessment of patients. Furthermore, the relatively small sample size, heterogeneity of study groups and short follow-up period further limit the strength of our data.

- Our study shows endoscopic dacryocystorhinostomy (DCR) to be an effective procedure and compares well with the literature for both endoscopic and external DCR outcomes
- Choosing the appropriate stent type requires balanced consideration on success rates, potential complications and patient comfort
- Both monocanalicular and bicanalicular stents yielded comparatively high success rates in our study
- Monocanalicular stents had fewer complications, were better tolerated by patients and were easier to remove in clinic post-operatively
- Despite the well-known higher extrusion rate, Lester Jones tubes provided overall positive outcomes

Conclusion

Monocanalicular and bicanalicular stents yielded similar success outcomes in our study, although monocanalicular stents were better tolerated by patients, easier to remove in clinic post-operatively and associated with fewer complications. Although our study supports the use of monocanalicular stents in endoscopic DCR, further research with more statistical power is required for better comparison.

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Competing interests. The authors declare no conflicts of interest.

Ethical standards. As this study was conducted retrospectively and patient records were anonymised, formal ethics approval was not sought. All patient data were handled in accordance with Caldicott principles and information governance to ensure confidentiality and privacy.

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