Original Article

Outcomes of external and endonasal dacryocystorhinostomy according to a modified Lacrimal Symptom Questionnaire (Lac-Q)

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ABSTRACT

Background: Nasolacrimal duct obstruction is usually treated using endoscopic or external dacryocystorhinostomy (DCR). The anatomic outcomes of both the endoscopic and external approaches are considered excellent. However, anatomic success does not translate into patient satisfaction. The current study assessed pre- and postoperative lacrimal problems using the symptom-based Lacrimal Symptom Questionnaire (Lac-Q) and investigated patient satisfaction depending on the choice of surgical technique.

Methods: A total of 112 eligible patients with lacrimal problems treated using external or endonasal DCR at the ophthalmology and ear, nose, and throat clinics at Skane University Hospital, Scania, Sweden, over a four-year period, were enrolled in this retrospective study. Patients were considered eligible if they experienced preoperative epiphora and had lacrimal duct stenosis. They were offered treatment using either external or endonasal DCR and were allowed to freely choose the technique. Exclusion criteria consisted of previous ipsilateral DCR, congenital NLDO, age < 18 years, presence of cancer, previous orbital trauma, or noncompliance with postoperative follow-up. After surgery, the patients were sent the Lac-Q to evaluate their lacrimal symptoms pre- and postoperatively. Complementary questions were added pertaining to the operative scar and the patients' overall satisfaction with the operation.

Results: In total, 67 (60%) patients with ages ranging from 18 to 88 years completed the questionnaire, 33 (49%) of whom underwent external DCR and 34 (51%) endonasal DCR. Of the 67 respondents, 51 (76%) were women and 16 (24%) were men. Patients scored preoperative lacrimal problems highly on the Lac-Q, reporting both symptomatic and social problems due to epiphora. Following surgery, the group that underwent external DCR remained home from work for 2 – 14 days (median, 3.5 days). However, 17 (52%) were retired. After the endonasal DCR, the patients remained home for 0 – 7 days (median, 2 days). Most patients were satisfied after DCR surgery, with both techniques significantly improving total, lacrimal symptom, and social impact scores (all $P < 0.001$). No differences in postoperative satisfaction were observed between the external DCR and endonasal DCR groups ($P > 0.05$). A small number of patients expressed scar-related concerns after external DCR.

Conclusions: The patients perceived lacrimal problems as a significant symptomatic and social burden. Postoperative satisfaction and symptom relief were good regardless of the surgical approach. Further prospective studies assessing patient satisfaction and its correlation with anatomical and functional success rates after external and endonasal DCR could provide robust, practical, real-world implications.

KEYWORDS

nasolacrimal ducts, nasolacrimal duct obstruction, epiphora, dacryocystitides, dacryocystostomy, dacryocystorhinostomies, questionnaire, Lac-Q questionnaire, social impact, retrospective study

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INTRODUCTION

Ophthalmic patients frequently encounter lacrimal problems. Epiphora can have several etiologies, including dry eye disease or an obstruction along the lacrimal system preventing the drainage of tears [1]. Acquired nasolacrimal duct obstruction (NLDO) is a common cause of epiphora [2]. The annual incidence of acquired lacrimal duct obstruction has been reported as 30.47 / 100 000, and NLDO is the most common form of stenosis, with an incidence of 20.24 / 100 000 [3]. The symptoms of lacrimal stenosis vary from mild epiphora to more severe and constant epiphora, mucus discharge, and chronic dacryocystitis [4]. Interestingly, some patients with complete distal duct blockage have no lacrimal symptoms [5]. The reasons for this may include reduced tear production and absorption of a certain volume of tears by the lacrimal sac [6].

Patients with symptoms indicating complete NLDO are usually treated with bypass surgery in the form of dacryocystorhinostomy (DCR) [7-9]. The objective of DCR is to construct an anastomosis between the lacrimal sac and the nasal mucosa [8, 10-13]. This is accomplished using an external or endonasal approach. The external approach has long been considered the reference standard, as the outcome has traditionally been more favorable, with reported anatomical success rates between 90% and 98% [8, 9, 11]. The success rate of the endonasal approach has steadily improved and is now 89% to 95% [8, 12]. However, anatomic success does not guarantee functional success, and some patients have lacrimal problems even after an anatomically successful DCR [14, 15].

Patient satisfaction is the most important outcome measure with lacrimal surgery [16]. For this reason, we are interested in patients' self-reported lacrimal problems before and after external or endonasal DCR. Mistry et al. developed a symptom-based questionnaire, known as the Lacrimal Symptom Questionnaire (Lac-Q), to evaluate the impact of lacrimal problems on quality of life [17]. The numerical score for each patient is the sum of three scores representing three separate domains: a symptom score for the right eye; a symptom score for the left eye; and a score reflecting social impact. The Lac-Q score is used to assess the severity of lacrimal symptoms and the outcome of DCR [18].

The aim of this study was to assess lacrimal problems before and after external or endonasal DCR using this symptom-based questionnaire and to investigate patient satisfaction depending on the choice of surgical technique.

METHODS

This study was approved by the Swedish Ethical Review Authority and complied with the principles of the Declaration of Helsinki. Written consent to participate was obtained from all participants. Administrative permission to access clinical data was acquired from the Scania Regional Council.

We recruited a consecutive series of 112 eligible patients who underwent external or endonasal DCR at the ophthalmology and ear, nose, and throat (ENT) clinics at Skane University Hospital, Scania, Sweden, over a four-year period. The study was retrospective in design and included patients with acquired NLDO. Patients were considered eligible if they experienced preoperative epiphora and had lacrimal duct stenosis. They were offered treatment using either external or endonasal DCR and were allowed to freely choose the technique. Exclusion criteria consisted of previous ipsilateral DCR, congenital NLDO, age < 18 years, presence of cancer, previous orbital trauma, or noncompliance with postoperative follow-up.

Eligible participants underwent complete ophthalmological examinations by the ophthalmologist preoperatively and at their scheduled postoperative follow-up visits with documentation in their medical records. Examinations included measurement of best-corrected distance visual acuity using a Snellen chart, intraocular pressure measurement using the Goldmann applanation tonometer (Haag-Streit, Koeniz, Switzerland), and undilated (in some instances, dilated) slit-lamp biomicroscopy (Photo-Slit Lamp; Haag-Streit). The diagnosis of NLDO was made by clinical assessment and lacrimal syringing and probing to confirm the level of obstruction. When the level of obstruction was uncertain, a dacryocystogram was performed. The most common cause of epiphora was dacryocystitis, followed by primary NLDO.

All external DCR procedures were performed by the same surgeon (K.E.). The operation was performed under standard general anesthesia [19]. Briefly, the skin was incised and an ostium was created by removing the lacrimal bone and part of the frontal process of the maxilla. The nasal mucosa was incised and the lacrimal sac

Table 1. Complementary questions

Question	Yes / Explain / Score	No / Explain
1. How satisfied are you with the operation?	Answer on a scale from 1 to 10 **(1 = not at all satisfied; 10 = very satisfied)**	
2. Do you regret having the operation?	Yes ☐	No ☐
3. Did the tear duct tubes relieve your symptoms?	Yes ☐	No ☐ If no, why?
4. External DCR only: Does the scar on your nose bother you?	Yes ☐ If yes, in what way?	No ☐
5. If you work: How long did you have to stay home after the operation?		

Abbreviations: DCR, dacryocystorhinostomy.

opened. The anterior and posterior flaps of the lacrimal sac were sutured to the anterior and posterior flaps of the nasal mucosa, respectively, creating an anastomosis from the lacrimal sac into the nasal cavity. Silicon tubes (BIKA® for DCR; FCI Ophthalmics, Paris, France) were inserted and left in place for three months. All patients received the same postoperative care [19].

Endonasal DCRs were performed by an ENT specialist (P.B., C.S., or A-M.L.) together with an ophthalmic surgeon (K.E. or B.S.). The surgery was performed under general anesthesia, as described previously [20]. Briefly, a luminescent probe was introduced through the canaliculus into the lacrimal sac to determine the exact location of the lacrimal sac using the nasal endoscope. A posteriorly based flap of the nasal mucosa was elevated just anterior to the middle turbinate to expose the frontal process of the maxilla and lacrimal bone. A diamond DCR burr (Medtronic-Xomed, Jacksonville, FL, USA) was used to create the osteotomy and expose the lacrimal sac. The canaliculi were then probed and the sac opened while the probe distended the sac, visualized using the endoscope. The lateral nasal mucosa was trimmed to cover the superior and inferior exposed bone around the rhinostomy and was reflected back so that it was in apposition with the mucosa of the opened lacrimal sac. Finally, silicon tubes (BIKA® for DCR; FCI Ophthalmics) were inserted and left in place for three months. All patients received the same postoperative care [20].

There were no intraoperative or postoperative complications such as intraoperative bleeding, postoperative spontaneous extrusion of silicone stents, wound infection, wound dehiscence, or fistula formation. No patients experienced postoperative epistaxis or cheese wiring of the puncta.

The original Lac-Q [17], which was published in English, was translated into Swedish by a qualified translator. This version was then translated back into English by another translator to ensure accuracy of the Swedish translation and the preservation of information. Complementary questions were added to further investigate the patients' perceptions of their lacrimal problems and the outcomes of DCR (Table 1). The Lac-Q and the complementary questions were sent by post to the patients eligible for inclusion in the study. All patients received the Lac-Q [17] and complementary questions (Table 1) during the postoperative period to simultaneously evaluate their pre- and postoperative perceptions. Of the complementary questions, only the first question was assigned a numerical value, and it was not included in the total Lac-Q score. A description of the study and instructions on completing the questionnaire were enclosed in the letters to the patients.

Data were collected and the analyses were conducted using R statistical software (R Version 4.2.2) [21]. Before testing, approximate normality was assessed by visual interpretation of histograms. Comparisons were made using the *t*-test, paired *t*-test, or the Mann – Whitney U test when applicable. The level of significance was set as $P < 0.05$.

RESULTS

A total of 112 patients fulfilled the inclusion criteria, 86 (77%) of whom were women. Many of these had bilateral NLDO; thus, a total of 77 endonasal DCRs and 56 external DCRs were performed. We sent letters together with the questionnaires to these 112 patients. Those who did not reply within eight weeks were sent the questionnaire

again. In total, 67 (60%) patients with ages ranging from 18 to 88 years completed the questionnaire, 33 (49%) of whom had external DCR and 34 (51%) endonasal DCR. Of the 67 respondents, 51 (76%) were women and 16 (24%) were men. Six (9%) patients underwent bilateral procedures (all endonasal DCR), and 61 (91%) had unilateral DCR. None of the patients had repeated surgery.

The group that underwent external DCR had a median preoperative Lac-Q score of 18.0 (Q1–Q3, 16.0–22.0) points and a median postoperative score of 2.0 (Q1–Q3, 0.0–10.0) points (Table 2), representing a statistically significant improvement of 12.3 (Q1–Q3, 9.6–15.1) points ($P < 0.001$) (Table 3). The median social inconvenience score was 4.0 (Q1–Q3, 3.0–5.0) points preoperatively and 0.0 (Q1–Q3, 0.0–2.0) points postoperatively (Table 2), indicating a statistically significant improvement of 2.6 (Q1–Q3, 2.0–3.2) points ($P < 0.001$) (Table 3). The median score for satisfaction with external DCR was 10.0 (Q1–Q3, 7.8–10.0) points (Table 2), out of a possible 10 points, based on answers to the first complementary question (Table 1) (one patient did not answer the question). Four (12%) patients were bothered by the scar on the side of the nose; two of these considered the scar ugly, and one reported problems wearing glasses. Following surgery, the patients remained home from work for 2 – 14 days (median, 3.5 days). However, 17 (52%) were retired.

The group that underwent endonasal DCR had a median preoperative Lac-Q score of 16.5 (Q1–Q3, 13.0–18.0) points and a median postoperative score of 1.0 (Q1–Q3, 0.0–4.8) point (Table 2), indicating a statistically significant improvement of 12.7 (Q1–Q3, 10.3–15.1) points ($P < 0.001$) (Table 3). The median score for social inconvenience was 4.0 (Q1–Q3, 3.0–4.8) points before surgery and 0.0 (Q1–Q3, 0.0–1.0) points after surgery (Table 2), representing a statistically significant improvement of 2.9 (Q1–Q3, 2.4–3.5) points ($P < 0.001$) (Table 3). The degree of satisfaction with endonasal DCR was 10.0 (Q1–Q3, 8.0–10.0) points (Table 2), out of a possible 10 points, based on the answers to the first complementary question (Table 1). After the operation, the patients remained home for 0 – 7 days (median, 2 days).

Combining external and endonasal procedures, a paired *t*-test was used to analyze the overall social impact of surgery, revealing a significant improvement of 2.7 points ($P < 0.001$) in the Lac-Q score. The postoperative reduction in symptoms was also analyzed, showing a significant reduction of 5.96 points ($P < 0.001$). Considering both symptoms and social inconvenience, surgery yielded a statistically significant mean improvement of 9.9 points in the total Lac-Q score ($P < 0.001$).

Based on the answers to the first complementary question, most patients were very satisfied with the results of DCR: 38 of 67 (57%) patients gave the highest score (10 points) and only 3 of 67 (4%) patients reported a score less than 6 points. A Mann – Whitney U test was applied to investigate differences in satisfaction between

Table 2. Pre- versus postoperative Lac-Q scores in the external and endonasal DCR groups

Variables	External DCR (n = 33)		Endonasal DCR (n = 34)	
	Preoperative	Postoperative	Preoperative	Postoperative
Total score, Median (Q1–Q3)	18.0 (16.0 – 22.0)	2.0 (0.0 – 10.0)	16.5 (13.0 – 18.0)	1.0 (0.0 – 4.8)
Lacrimal symptom score, Median (Q1–Q3)	14.0 (12.0 – 17.0)	2.0 (0.0 – 6.0)	12.0 (9.3 – 14.0)	1.0 (0.0 – 4.0)
Social impact score, Median (Q1–Q3)	4.0 (3.0 – 5.0)	0.0 (0.0 – 2.0)	4.0 (3.0 – 4.8)	0.0 (0.0 – 1.0)
*** Postoperative satisfaction with operation, Median (Q1–Q3)**	10.0 (7.8 – 10.0)		10.0 (8.0 – 10.0)	

Abbreviations: Lac-Q, Lacrimal Symptom Questionnaire [17]; DCR, dacryocystorhinostomy; n, number of patients; Q1, first quartile; Q3, third quartile. Note: * This score is based on the first complementary question given in Table 1, which is answered on a scale from 1 to 10 (1 = not at all satisfied; 10 = very satisfied).

Table 3. Changes in Lac-Q scores for the external DCR group, the endonasal DCR group, and all participants

Variables	External DCR (n = 33)		Endonasal DCR (n = 34)		All participants (n = 67)	
	Change (95% CI)	*P*-value	Change (95% CI)	*P*-value	Change (95% CI)	*P*-value
Total score	12.3 (9.6 – 15.1)	**< 0.001**	12.7 (10.3 – 15.1)	**< 0.001**	12.5 (10.7 – 14.3)	**< 0.001**
Lacrimal symptom score	9.8 (7.6 – 12.0)	**< 0.001**	9.8 (7.8 – 11.8)	**< 0.001**	9.8 (8.3 – 11.2)	**< 0.001**
Social impact score	2.6 (2.0 – 3.2)	**< 0.001**	2.9 (2.4 – 3.5)	**< 0.001**	2.7 (2.3 – 3.1)	**< 0.001**

Abbreviations: Lac-Q, Lacrimal Symptom Questionnaire [17]; DCR, dacryocystorhinostomy; n, number of patients; CI, confidence interval. Note: *P*-values < 0.05 are shown in bold.

the groups that underwent external versus endonasal DCR. The median score in both groups was 10, with a *P*-value of 0.760 confirming that the difference was not statistically significant. This implies that most patients were as satisfied as possible, and there was no statistically significant difference in the satisfaction of patients undergoing either procedure.

A *t*-test was used to investigate differences in patient satisfaction, using the Lac-Q scores (social inconvenience and lacrimal symptoms), according to operating technique. Both the endoscopic and the external techniques yielded an improvement of 10 points. The mean improvement was 0.30 points lower in the endoscopic group; however, this difference was statistically insignificant ($P = 0.840$). No statistically significant differences were found between the two groups in satisfaction scores with respect to social inconvenience and lacrimal symptoms ($P = 0.410$) and lacrimal symptoms per se ($P > 0.99$).

DISCUSSION

Our patients reported high scores for preoperative lacrimal problems using the Lac-Q. They expressed both symptomatic and social problems due to epiphora. Most patients were satisfied after DCR surgery, and there were no significant differences between the two surgical techniques with respect to patient satisfaction after the operation. A small number of patients were concerned about the nasal scar after external DCR.

Studies have demonstrated anatomic successes of 80% to 95% for DCR [8, 9, 11, 12, 22]. However, relatively few studies have focused on the patient's perception of the operation and the postoperative result. Interestingly, several studies have found discordance between objective findings and patient satisfaction [23-25]. For this reason, we focused specifically on the patient's satisfaction with the outcome of DCR. External and endonasal DCR both yielded good results according to the Lac-Q scores [17]. Lac-Q scores significantly decreased after surgery regardless of the technique used, indicating patient satisfaction with both procedures. The average improvement in Lac-Q score was 10 for both techniques, with no statistically significant difference between groups. We can therefore conclude that DCR alleviated symptoms in most patients and that they were particularly satisfied. Only one patient regretted having undergone DCR.

Epiphora reduces the quality of life [26], and its social impact should not be underestimated [27]. Excessive tearing renders the tear film irregular, interfering with light reflection and disrupting vision. Patients with epiphora can experience visual disability to the same degree as those awaiting a second eye cataract [28, 29]. Many of our patients with lacrimal stenosis had problems not only with epiphora, but also with social interaction, preoperatively. Both of our study groups reported rather high preoperative Lac-Q scores concerning social problems due to epiphora. These findings are consistent with those of a prospective study by Wong et al. [24]. Numerical scores allow comparisons, not only before and after surgery, but also between problems associated with epiphora and other diseases. A significant postoperative reduction in the Lac-Q score affirms the social benefits of DCR. Further studies comparing the social impact of lacrimal problems with those of other conditions would be of interest.

Waly et al. evaluated the subjective significance of the external DCR scar, and 27.5% of participants described their scars as cosmetically significant [30]. Rizvi et al. reported a significant objective and subjective change in external DCR scar grading from grade 3 to grade 0 within three months of postoperative follow-up [31]. One of our complementary questions asked the patient whether the scar posed a problem, and four patients reported that it did. All patients were preoperatively informed about the scar associated with the external DCR technique, and that the scar would be avoided with the endoscopic technique. We can speculate that the patients' preoperative lacrimal problems overshadowed the consequence of having a scar; however, when the lacrimal problems were resolved, the scar became an issue. It is thus important to give patients adequate information on the various techniques available.

Our study had certain limitations. First, this was a retrospective study, and recall bias is inherent in this study design. In some of our cases, five years had elapsed since the patient's operation. There is thus a risk that their responses to the questionnaire were affected by time, resulting in more or less negativity about their preoperative symptoms. However, the patients had adequate time to reflect on their preoperative symptoms and to compare them to those experienced after surgery. Another limitation of the study was the lack of validation of the translated Lac Q questionnaire. However, assessing its validity involves many considerations beyond Cronbach's alpha and was beyond the scope of this study. One factor affecting the choice of DCR technique is the required length

of time out of work after the operation. Patients are commonly advised to remain at home for 2 – 3 days after DCR; however, we could find no studies reflecting how long patients typically wait before returning to work. On average, our patients undergoing endonasal DCR stayed home one day less after the operation than those undergoing external DCR. Most patients recovered quickly, and those who worked returned to duty after a few days. This study could confirm that our recommendations for postoperative rest are in line with the actual period in which patients remain at home. Further prospective studies assessing patient satisfaction and its correlation with anatomical and functional success rates after external and endonasal DCR could provide robust, practical, real-world implications.

CONCLUSIONS

Both external DCR and endonasal DCR yielded good symptomatic relief for most patients. No significant differences were found in patient satisfaction between the two surgical techniques. Further studies are needed to verify these preliminary findings.

ETHICAL DECLARATIONS

Ethical approval:. This study was approved by the Swedish Ethical Review Authority and complied with the principles of the Declaration of Helsinki. Written consent to participate was obtained from all participants. Administrative permission to access clinical data was acquired from the Scania Regional Council.
Conflict of interest: None.

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