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RESEARCH ARTICLE

Endoscopic dacryocystorhinostomy with marsupialization of the lacrimal sac. [version 1; referees: awaiting peer review]

Erika Celis-Aguilar , Angel Castro-Urquiza , Lucero Escobar-Aispuro, José Alarid-Coronel, Nadia Villanueva-Ramos, Eugenia Nemiliztli Hernández-Castillo, Vicente Solórzano-Barrón, Rómulo Perdomo-Martínez

Centro de Investigación y Docencia en Ciencias de la Salud, Universidad Autónoma de Sinaloa, Culiacan, Sinaloa, Mexico

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Abstract

Objective: To analyze the efficacy of endoscopic dacryocystorhinostomy (DCR) with marsupialization of the lacrimal sac compared with other techniques of endoscopic dacryocystorhinostomy.

Material and methods: Clinical chart review. Patients with lacrimal sac pathologies and endoscopic DCR with or without marsupialization of the lacrimal sac were included from 2011 to 2015. The outcome measurements were absence of ocular symptoms and permeability of the lacrimal sac.

Results: A total of 24 patients were evaluated, 17 women and 7 men, average age was 47 years. Seven patients underwent DCR with marsupialization, 17 patients underwent other endoscopic techniques. Average follow-up was 18 months. The efficacy (absence of symptoms and permeability of the lacrimal sac) of the DCR technique with marsupialization was 71%, without significant difference compared to other techniques ($p = 0.686$).

Conclusion: Similar results were found in the different types of endoscopic DCR techniques. More studies are needed to corroborate our results.

Keywords

dacryocystorhinostomy, marsupialization, lacrimal sac, endoscopy.

Open Peer Review

Referee Status: Awaiting Peer

Review

Any reports and responses or comments on the article can be found at the end of the article.

Corresponding author: Erika Celis-Aguilar (erikacelis@hotmail.com)

Author roles: **Celis-Aguilar E:** Conceptualization, Data Curation, Formal Analysis, Investigation, Project Administration, Supervision, Validation, Visualization, Writing – Review & Editing; **Castro-Urquiza A:** Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Supervision, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; **Escobar-Aispuro L:** Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Supervision, Validation, Visualization; **Alarid-Coronel J:** Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Supervision, Validation, Visualization; **Villanueva-Ramos N:** Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Resources, Supervision, Validation, Visualization, Writing – Original Draft Preparation; **Hernández-Castillo EN:** Data Curation, Investigation, Methodology, Project Administration, Supervision, Validation, Visualization, Writing – Original Draft Preparation; **Solórzano-Barrón V:** Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Resources, Supervision, Validation, Visualization; **Perdomo-Martínez R:** Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Supervision, Validation, Visualization

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Introduction

Lacrimal disease manifests clinically as epiphora, recurrent conjunctivitis, or dacryocystitis, and it occurs most frequently in pediatric patients. Dacryocystorhinostomy (DCR) creates a low-pressure system by diverting tear flow through the lacrimal bone and an artificial opening. Toti first described external DCR in 1904, and Caldwell used an endonasal technique in 1893 that West modified in 1914¹⁻³.

Endoscopic DCR is the surgical procedure of choice to treat saccular or post-saccular nasolacrimal obstruction; this technique has been gaining popularity, with high success rates (sustained ostium patency, symptom relief, or both) comparable with external DCR rates, primarily because of the technological advances of endoscopes and surgical instruments. Multiple modifications have been suggested regarding endoscopic DCR procedures, with pros and cons. Previous endoscopic DCR procedures included making a small opening in the lacrimal sac and removing the nasal and lacrimal mucosa; this procedure likely contributes to surgical failure because the small neoformed ostium is obstructed by the granulation tissue or synechia formed during the postoperative period¹.

Currently, two techniques are used to perform endoscopic DCR: laser-assisted and “cold steel”; both can be performed with or without powered drilling equipment. The former technique is less effective, perhaps because of the size of the ostium and the laser heat that results in fibrosis and stenosis⁴.

Generally, the size of the ostium created during surgery is crucial to the procedure's outcome. Therefore, the anatomical characteristics of the lacrimal sac should be evaluated to achieve complete exposure when approaching the sac intranasally^{5,6}.

Massegur *et al.* suggested a modification to the technique known as marsupialization of the lacrimal sac, which causes the flaps of the lacrimal mucosa to contact the nasal mucosa after the resection of the bone surrounding the sac, thereby incorporating the lacrimal sac in the lateral nasal wall^{1,3}.

The current study describes the results of a DCR with lacrimal sac marsupialization compared with other endoscopic techniques.

Methods

Study background

A clinical chart review study was conducted in patients who presented with obstruction of the lacrimal route in their excretory portion and were submitted to endoscopic DCR. The inclusion criteria were any patient with obstruction of the lacrimal duct or sac that resulted in epiphora or lacrimal sac infection. Exclusion criteria were incomplete clinical information or lack of surgical data. This study was conducted at the Ophthalmology and Otorhinolaryngology clinic in a secondary care center, (Hospital Civil de Culiacán, Rosales, México), from November 2011 to September 2015. Data regarding age, gender, affected side, symptoms, relevant background for the condition

(e.g., trauma, infection, and previous ocular surgery), operative experience and patient follow-up results, were retrospectively collected.

A team of two otorhinolaryngologists and two certified ophthalmologists performed the surgical intervention using the following standardized technique with small individual variations.

Standard lacrimal sac surgery

The surgery was performed under general anesthesia. A topical decongestant was placed in the nasal cavity, and the lateral wall was infiltrated with 2 ml lidocaine with epinephrine at 2%. The surgery was guided using a 0° nasal endoscope. A scalpel was used to section a mucosal flap approximately 5–8 mm on top of the middle turbinate insertion in the lateral wall, extending the incision anteriorly by 8 mm. A vertical incision was made halfway up the middle turbinate. The flap was raised with a Freer elevator and hidden around the middle turbinate to avoid obstructing the dissection later. The frontal process of the maxilla was extracted or removed with a 90° Kerrison rongeur, until the medial and anterior wall of the lacrimal sac was exposed.

Marsupialization of the lacrimal sac

To perform the marsupialization, the wall of the medial lacrimal sac was incised vertically along its entire length and then horizontally in a “cross-like shape”. The flaps of the lacrimal sac were exteriorized toward the lateral wall, leaving the lacrimal sac open (Figure 1). The superior and inferior canaliculi were canalized; then, a bicanalicular silicone probe was passed whose ends were knotted inside the nostril (Figure 1). A Gelfoam sponge with a dexamethasone patch was lightly squeezed into the exposed sac.

Other techniques

Once the lacrimal sac is exposed, a resection of the medial wall is performed with various surgical instruments, such as rongeurs, and/or Blakesly forceps. There is no intent to preserve

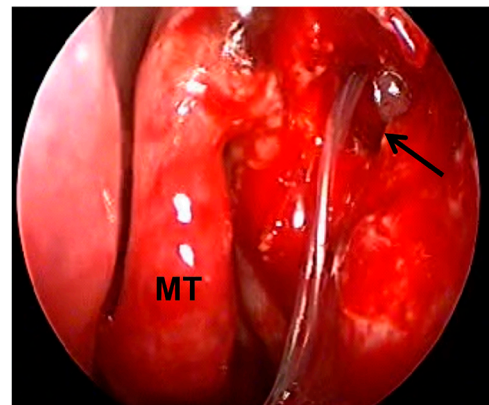


Figure 1. Intraoperative image of lacrimal sac marsupialization. MT, middle turbinate.

the lacrimal sac. The superior and inferior canaliculi were canalized; then, a bicanalicular silicone probe was passed whose ends were knotted inside the nostril.

Follow-up and clinical outcomes

A follow-up assessment of the patients was conducted. The results were measured subjectively based on improvements in the symptomatology (i.e., the absence of ocular symptoms and lacrimal sac permeability) compared with the preoperative conditions. Objective measures were conducted via endoscopic controls that enabled the observation of an open fistula (Figure 2).

The Research Committee at Hospital Civil de Culiacán approved this research (Comité de Investigación del Centro de Investigación y Docencia en Ciencias de la Salud, number: 278). Since this was a retrospective chart review and the clinical images were non-identifying, the ethics committee waived the need for participant consent.

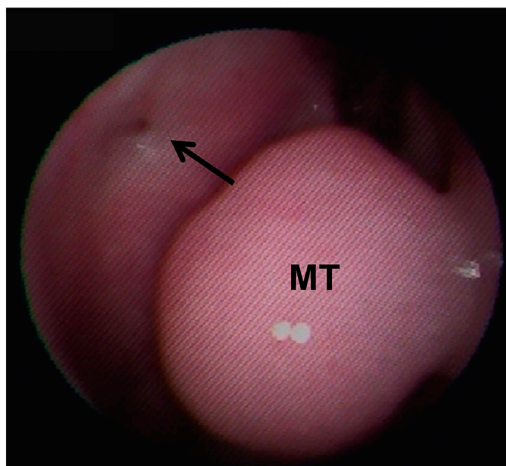


Figure 2. An example of a successful DCR fistula. MT, middle turbinate.

Statistical analysis

The information was entered into a database using SPSS version 22 for Windows. Frequencies and percentages were calculated for the categorical variables. The numerical variables were evaluated considering the means, confidence intervals, minimums, and maximum. The qualitative variables were measured using frequencies. The continuous variables were compared with Student's t-test, whereas the categorical variables were compared with a chi-square test. A p-value of ≤ 0.05 was considered significant.

Results

Subjects

During the study period, 24 endoscopic DCRs were performed on 17 women and 7 men with a mean age of 47.21 years (7–82 years). Of these patients, two patients presented with congenital disease, five suffered from traumatism, and one patient reported a history of eye surgery (Table 1).

Techniques used

A total of seven patients (29.2%) underwent endoscopic DCR with lacrimal sac marsupialization. The remaining 17 patients underwent other endoscopic techniques. The follow-up period was 18 months (4–43 months). One patient received previous dacryointubation and two had previous dacryocystorhinostomies. Electric drilling equipment was used for five patients. Bone removal was performed via a Kerrison clamp for 19 patients. There were three patients lost to follow up.

Efficacy of procedures

The efficacy (i.e., the absence of symptoms and patent lacrimal sac) was 71% ($n=5/7$ patients) for the lacrimal sac marsupialization and 71% ($n=10/17$ patients) for the other endoscopic techniques. No significant differences were found in the surgical outcomes between the techniques ($p=0.686$). Raw data are available on figshare⁷.

Follow-up

A total of seven patients presented with postoperative complications: six with infection and one with granuloma and infection (Table 2).

Table 1. Demographic variables of patients with DCR with and without marsupialization.

Variable	Without marsupialization (n=17)	Marsupialization (n=7)	P value
Mean age, years	45.8	50.4	0.69
Female, n	11	6	0.30
Time of evolution, days	1183	3089	0.30
Insufficiency of lacrimal passages, n	3	4	0.05
Chronic dacryocystitis, n	9	3	0.65
Other lacrimal disorder, n	5	0	0.10
Previous surgery: dacryocystorhinostomy, n	2	0	0.29
Previous surgery: dacryointubation, n	0	1	0.51
Other previous ocular surgeries, n	1	0	0.51

Table 2. Surgical outcome of patients with DCR with and without marsupialization.

Variable	Without marsupialization, n	Marsupialization, n	P value
Surgical technique	17	7	
Complications			
• Infection	4	2	0.76
• Granuloma	1	0	0.51
Technique failure	4	2	
Resolution achieved	10	5	1.00
Lost to follow up	3	0	

A total of seven patients presented with postoperative complications: six with infection and one with granuloma and infection (Table 2). Patients with infection resolved with topical and oral antibiotics (typically a cephalosporin) and the one patient with granuloma resolved once it was removed the silastic tube. No long-term complications were reported in the study.

Three of our patients were lost to follow up. Unfortunately, six cases reported no improvement, regardless of endoscopic technique.

Discussion

External DCR became popular because of its high success rates. However, the endoscopic DCR described by McDonogh and Meiring in 1989^{1,4,5} has been used more often because of the simplicity of its innocuous endonasal approach. In addition, it offers advantages over the external approach such as reduced surgical trauma and hemorrhage, the avoidance of facial scars, the maintenance of intact medial canthus structures, and a faster time to return to work^{3,5,6}. Failures of up to 12% of patients have been reported⁸. The main causes of failure of endoscopic DCR have been attributed to failure to locate the lacrimal sac, insufficient osteotomy, granulation tissue, synechiae, and closure due to premature scarring, fibrosis, and osteogenesis^{1,5,8}.

The additional advantages offered by endoscopic DCR are better visualization of intranasal structures, the avoidance of angular vein damage, the preservation of the pumping function of the nasolacrimal sac, the corroboration of the adequate site for nasolacrimal tube insertion, the better correction of errors, and the identification of surgical failures⁹.

To avoid or prevent the obstruction of the neoformed ostium, multiple techniques have been tried with several modifications (e.g., complete marsupialization of the lacrimal sac, i.e., the use of mucosal flaps after a wide resection of the bone that surrounds the sac)^{3,10}. Massegur *et al.* proposed this modification in 2004, with surgical success ranging from 87 to 92%³. The present study used a similar technique, an endoscopic DCR with marsupialization of the mucosal flap sac and resection of the

bone using Kerrison's rongeur. A mean follow-up time of 18 months was conducted. The other endoscopic techniques used in the study were partial resection of the lacrimal sac mucosa and maxillary line graft, using Blakesley forceps or Kerrison's rongeur.

A learning curve of the surgeons could explain similar results in both techniques. The first seven cases of DCR marsupialization are described in this case series.

Yigit *et al.* (2007) compared the results of external DCR (55 patients) to those of endoscopic DCR (48 patients) in 103 patients with chronic dacryocystitis. The evaluated results were considered as successful if the epiphora decreased, infections were reduced, or reflux from the canaliculus was absent during lacrimal irrigation. The patient management success rate was 69.9% for those undergoing external DCR, and it was 89.7% for those receiving endoscopic DCR. These results were evaluated based on a 1-year follow-up period¹¹.

Likewise, the use of a silastic tube has been a matter of debate. Grigori *et al.* (2008) examined 46 patients undergoing DCR via a prospective, randomized study: half with silastic tube insertion and the other half without a catheter. Success was defined as the absence of epiphora, decreased conjunctival discharge, and fewer infections. The success rate for the 46 patients was 89%; the success rates with and without the use of a silastic tube were 78% and 100%, respectively, a significant difference ($p=0.049$). The follow-up period was 6 months. In addition, the controversial use of a silastic catheter was demonstrated¹².

Conclusions

A similar efficacy was found between endoscopic DCR with lacrimal sac marsupialization and the other endoscopic techniques in this study. Studies with larger patient samples are needed. Appropriate follow-up and postoperative care are recommended for all cases.

Data availability

Figshare: Dacryocystorhinostomy dataset 2019, celis-aguilar *et al.* <https://doi.org/10.6084/m9.figshare.7716500.v4>⁷.

This dataset includes the following files:

- DCRSPSSFEB2016f10002.csv (dataset containing surgical information on all patients)
- data coding dacryocystorhinostomy article celis *et al.* docx (data dictionary)

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](#) (CC-BY 4.0).

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References

- Jin HR, Yeon JY, Choi MY: **Endoscopic dacryocystorhinostomy: creation of a large marsupialized lacrimal sac.** *J Korean Med Sci.* 2006; **21**(4): 719–23.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
- Karle M, Cabrera N, Naser A, *et al.*: **Dacriocistorrinostomía endoscópica: Experiencia de 4 años del Hospital Clínico de la Universidad de Chile.** *Rev Otorrinolaringol Cir Cabeza Cuello.* 2015; **75**(3): 220–226.
[Publisher Full Text](#)
- Massegur H, Trias E, Ademà JM: **Endoscopic dacryocystorhinostomy: modified technique.** *Otolaryngol Head Neck Surg.* 2004; **130**(1): 39–46.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Hernández-Ortiz A, Campos-Navarro LA: **Dacriocistorrinostomía endoscópica.** *An Orl Mex.* 2008; **53**(2): 91–99.
[Reference Source](#)
- Tsirbas A, Wormald PJ: **Endonasal dacryocystorhinostomy with mucosal flaps.** *Am J Ophthalmol.* 2003; **135**(1): 76–83.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Wormald PJ: **Powered endoscopic dacryocystorhinostomy.** *Laryngoscope.* 2002; **112**(1): 69–72.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Celis-Aguilar E: **Dacryocystorhinostomy dataset 2019.** *figshare.* Dataset. <http://www.doi.org/10.6084/m9.figshare.7716500.v3>
- Dave TV, Mohammed FA, Ali MJ, *et al.*: **Etiologic analysis of 100 anatomically failed dacryocystorhinostomies.** *Clin Ophthalmol.* 2016; **10**: 1419–22.
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- Onerci M, Orhan M, Ogretmenoglu O, *et al.*: **Long-term results and reasons for failure of intranasal endoscopic dacryocystorhinostomy.** *Acta Otolaryngol.* 2000; **120**(2): 319–322.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Ali MJ, Psaltis AJ, Bassiouni A, *et al.*: **Long-term outcomes in primary powered endoscopic dacryocystorhinostomy.** *Br J Ophthalmol.* 2014; **98**(12): 1678–80.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Yigit O, Samancioglu M, Taskin U, *et al.*: **External and endoscopic dacryocystorhinostomy in chronic dacryocystitis: comparison of results.** *Eur Arch Otorhinolaryngol.* 2007; **264**(8): 879–885.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Smirnov G, Tuomilehto H, Teräsvirta M, *et al.*: **Silicone tubing is not necessary after primary endoscopic dacryocystorhinostomy: a prospective randomized study.** *Am J of Rhinol.* 2008; **22**(2): 214–217.
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