

Article

TransCanalicular Endoscopic Diode Laser Dacriocystorhinostomy; Surgical Techniques and Clinical Outcomes

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Abstract: Background: Chronic dacryocystitis is an inflammatory condition of the lacrimal sac that develops as a result of nasolacrimal duct obstruction persisting for longer than six months. External dacryocystorhinostomy (DCR) has long been considered the standard treatment for chronic lacrimal obstruction. Transcanalicular dacryocystorhinostomy (DCR) using laser represents one of the latest minimally invasive alternatives in nasolacrimal surgery. **Objective:** The study aimed to analyze success rate, procedure time and complications for transcanaliculus DCR with a 980 nm diode laser in a series of 50 successive procedures. **Patients and Methods:** A prospective study was conducted at Al-Hilla General Teaching Hospital and Al-Salam Private Hospital between March 2023 and April 2026. The study included 50 patients, 18 males and 32 females, aged between 8 and 74 years who presented to the ENT department after referral from the ophthalmology department with a diagnosis of chronic dacryocystitis. **Results:** Most of patients in 41-50 years, more common in female resulting (male: female) ratio of (1:1.7). Most Common operated side was left, the overall success rate was 88%. **Conclusions:** The transcanalicular -DCR with bicanalicular intubation was a minimally invasive, quick procedure yielding results comparable to classic DCR, and better than endoscopic-DCR that can do local anesthesia and for pediatric patient. It enables fast patient recovery, a short procedure time and avoidance of skin scar.

Keywords: DCR, endoscopic, diode laser, chronic dacryocystitis, transcanalicular, nasolacrimal duct obstruction, surgical outcomes.

Introduction

Chronic dacryocystitis is an inflammatory condition of the lacrimal sac that develops as a result of nasolacrimal duct obstruction persisting for longer than six months. Chronic dacryocystitis may occur as a primary condition or develop secondary to anatomical abnormalities that impair normal tear drainage and cause tear stagnation [1]. Obstruction of the lacrimal drainage system is frequently associated with increased colonization by pathogenic microorganisms. In some cases, Primary Acquired Nasolacrimal Duct Obstruction may result from previously undetected low-grade dacryocystitis, which gradually causes inflammation, fibrosis, and eventual obstruction [2].

External dacryocystorhinostomy (DCR) has long been considered the standard treatment for chronic lacrimal obstruction and has traditionally been performed within the field of ophthalmology. External dacryocystorhinostomy (DCR) was first described by Toti in 1904 [3]. In this procedure, the lacrimal sac is exposed through a skin incision, and the medial wall of the sac is removed together with the adjacent lacrimal bone and nasal mucosa to create a direct drainage pathway between the sac and the nasal cavity [4]. Herrmann in 1958 described an endonasal microsurgical approach to dacryocystorhinostomy (DCR) using a binocular microscope. This technique avoided an external skin incision and preserved the bony architecture supporting the lacrimal canaliculi, thereby reducing disruption of the normal anatomical support structures while establishing drainage into the nasal cavity [5].

With the development of endoscopic systems in the late 1960s, Harold Hopkins stimulated major interest in endoscopic sinonasal techniques. The endoscope greatly improved visualization of the nasal cavity and paranasal sinuses, leading to continuous advances in technical equipment subsequently established endoscopic sinonasal surgery as a standard practice in otorhinolaryngology services worldwide [6]. Various techniques have been described with a shared goal of approaching the lacrimal sac by the endonasal route to allow permanent drainage through the fossa [7].

Transcanalicular dacryocystorhinostomy (DCR) using laser represents one of the latest minimally invasive alternatives in nasolacrimal surgery. Early developments demonstrated that fibre-optic technology could deliver laser energy through the lacrimal canaliculi, enabling creation of an osteotomy without the need for an external incision [8]. This innovation was later followed by refinement and standardization of the surgical technique, leading to wider clinical application in the management of nasolacrimal duct obstruction. The success of endoscopic and transcanalicular DCR with laser is highly variable and ranges between 60% and 90 %. This study aimed to analyze success rate, procedure time and complications for transcanalicular DCR with a 980 nm diode laser in a series of 50 successive procedures [9].

Methodology

A prospective study was conducted at Al-Hilla General Teaching Hospital and Al-Salam Private Hospital between March 2023 and April 2026. The study included 50 patients, 18 males and 32 females, aged between 8 and 74 years who presented to the ENT department after referral from the ophthalmology department with a diagnosis of chronic dacryocystitis.

All patients included in this study presented with epiphora lasting for more than six months. Some patients also reported associated symptoms such as swelling at the medial canthus, purulent discharge, and conjunctival redness. A comprehensive ophthalmological assessment was performed, including detailed history taking, clinical examination, probing, and lacrimal irrigation. Patients with significant nasal complaints or those suspected of having nasal septal deviation or other nasal pathologies were referred to an otolaryngologist for further evaluation. The ENT assessment included a detailed history and examination, with anterior rhinoscopy and rigid nasoendoscopy. Computed tomography (CT) of the nose and paranasal sinuses was requested for selected patients, particularly those with associated nasal symptoms, abnormal findings requiring prior intervention, or a history of nasal trauma to exclude structural deformities. Preoperative investigations, including routine blood tests for all patients, were additional investigations, such as chest X-ray, electrocardiography, and echocardiography, were requested in selected cases according to clinical indications. Written informed consent was obtained from all patients after explaining the planned surgical procedure, including the use of silicone stents, nasal packing, and the required follow-up.

A 980-nm diode laser delivered through a fiber-optic system was used for all procedures. This wavelength was selected because of its favorable absorption characteristics in water and oxyhemoglobin, providing effective tissue vaporization and coagulation with minimal intraoperative bleeding. The maximum laser power was set at 5 W.

The nasal cavity was visualized using a rigid nasal endoscope connected to a video monitoring system. Most procedures were performed under local anesthesia with lignocaine and intravenous

sedation. Patients were discharged on the same day with instructions to use Tobradex eye drops and perform regular nasal saline irrigation.

To achieve adequate nasal mucosal anesthesia and decongestion, gauze packs soaked in a solution of lignocaine and 0.01% xylometazoline were placed within the nasal cavity. The lower punctum was gently dilated using a punctal dilator to facilitate insertion of the fiber-optic probe. An intracanalicular endoscope was then introduced to evaluate the lacrimal canaliculi and lacrimal sac. The osteotomy site was identified using endoscopic visualization from both the lacrimal and nasal sides. The intracanalicular endoscope illuminated the lateral nasal wall adjacent to the lacrimal sac, while the nasal endoscope provided visualization of the middle meatus. The selected osteotomy site was located just anterior and inferior to the attachment of the middle turbinate.

The laser probe was introduced through the lower punctum into the lacrimal sac and probing until firm bony resistance was encountered. Under direct visualization with a 0° rigid nasal endoscope, the laser beam was accurately directed toward the target area. Osteotomy creation was performed using a continuous-contact mode diode laser (980 nm) delivered through a 0.5-mm optical fiber with a 0.36-mm core diameter.

The osteotomy was gradually enlarged to approximately 5 mm using controlled upward and downward movements of the laser probe. Following completion of the osteotomy, silicone stent intubation was performed in all patients. No postoperative nasal packing was required. Patency of the newly created passage was confirmed by irrigation with normal saline at the end of the procedure. Postoperative follow-up assessments were scheduled at 1 week, 4 weeks, 3 months, 6 months, and 12 months after surgery. Surgical success was determined by the maintenance of lacrimal passage patency during irrigation. The mean operative time was 20 minutes, ranging from 10 to 30 minutes.

Results

1. Patients age in study

Age of patients ranged between 8 and 74 years ; its mean was 38.7 years. Most of patients in 41-50 years aged group. (see Figure 1)

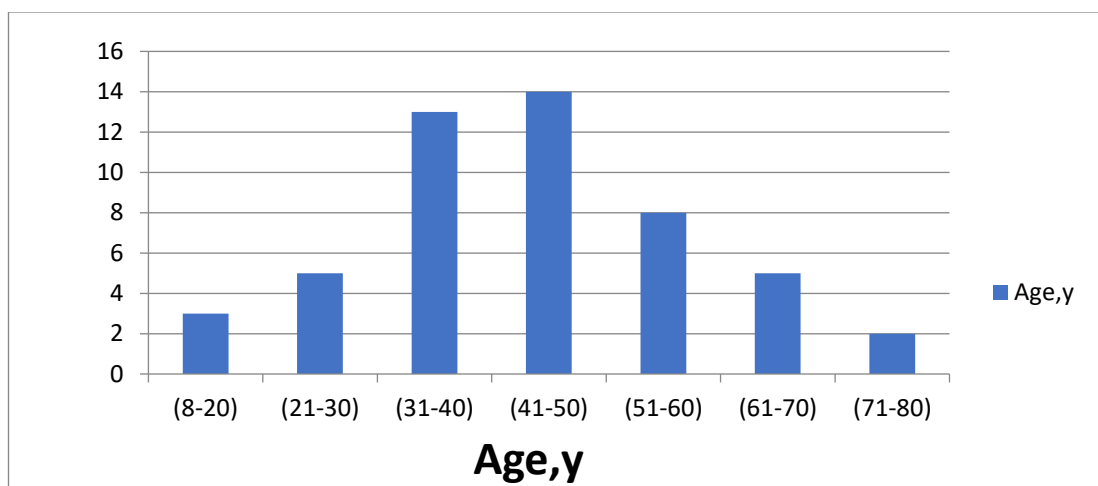


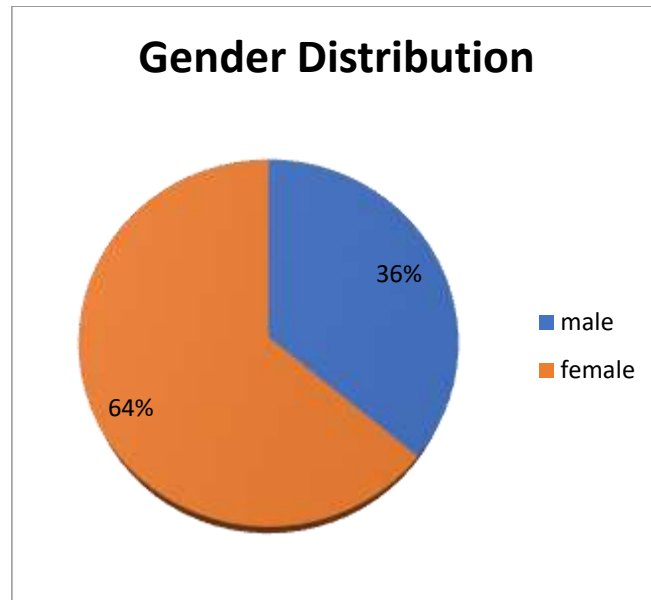
Figure 1. Age dispensing for patients in study.

2. Gender distribution

From 50 patients included in this study; 18 were male (36%) and 32 were female (64%), resulting (male: female) ratio of (1:1.7). As shown in (table 1 and figure 2) [10].

Table 1. Gender distribution.

Gender	Number	Percentage
Male	18	36%
Female	32	64%
Total	50	100%

**Figure 2.** gender distribution.**3. Symptoms duration.**

The duration of symptoms varied, it was ranging from 6 months to 12 years and patients were divided into 3 groups, the most group common was between 2-5 years and the mean 2.4 years.as in Table 2.

Table 2. Duration of symptoms.

Symptoms duration	Number	Percent.
(> 6 Months-2 Years)	18	36
(2-5 Years)	22	44
(> 5 Years)	10	20
Total	50	100

4. Operated side

Most Common operated side was left 33 (66%) while the right side was 17 (34%).

5. Operative time

The mean operative time was 20 minutes, ranging from 10 to 30 minutes.

6. Perioperative complications

No intraoperative complications, including cerebrospinal fluid (CSF) leak, orbital injury, or punctal laceration, were observed in any of the patients. Postoperative complications were assessed during the follow-up period [11]. Periorbital swelling was reported in 4 patients (8%), synechiae formation in 5 patients (10%), granuloma formation in 3 patients (6%)(1 case that need biopsy and histopathological examination because history of inverted papilloma to exclude recurrence), and acute

dacryocystitis in 7 patients (14%). No cases of nasocutaneous fistula, septal abscess, or epistaxis were recorded during the follow-up period [12].

7. Success Rate

During the follow-up period, patients were evaluated for both subjective and objective improvement. Subjective improvement was defined as satisfactory resolution of symptoms as reported by the patients [13]. Objective improvement was assessed by endoscopic evaluation of the newly created ostium and irrigation of the nasolacrimal drainage system. Surgical success was considered achieved when both subjective and objective criteria were met. In the present study, successful outcomes were observed in 44 of the 50 patients, while 6 patients continued to experience epiphora and were considered surgical failures [14]. Therefore, the overall success rate was 88%.

Discussion

External dacryocystorhinostomy (Ext-DCR) has long been regarded as the gold standard surgical procedure for the management of nasolacrimal duct obstruction. Despite its high success rate, the technique is associated with several drawbacks, including the presence of a facial scar, longer operative time, increased intraoperative bleeding [15]. To overcome these limitations, alternative minimally invasive approaches, such as endoscopic dacryocystorhinostomy and endoscopic laser dacryocystorhinostomy, have been developed. These techniques offer the advantages of avoiding an external scar, reducing tissue trauma, and preserving lacrimal pump function, while achieving success rates comparable to those reported for the external approach [16].

In our study, the mean age of the patients was 38.7 years, with an age range of 8–74 years. The highest incidence was observed among individuals older than 40 years. This finding may be attributed to age-related degenerative changes affecting the nasolacrimal drainage system, which increase the likelihood of obstruction with advancing age. The age distribution observed in our study is consistent with that reported in the literature [17].

Females represented the majority of patients in this study, accounting for 64% of the cases, while males constituted 36%. This finding is consistent with the results of most previous studies, which have reported a higher prevalence of chronic dacryocystitis among females. The observed female predominance may be attributed to anatomical differences, particularly the relatively narrower bony nasolacrimal canal in women, which predisposes them to nasolacrimal duct obstruction. In addition, hormonal and endocrine factors have been suggested to contribute to the development of chronic dacryocystitis. Therefore, the higher proportion of female patients in the present study is likely related to the combined effect of these anatomical and physiological factors, which has also been documented by several authors in the literature.

In our study, the left side was more commonly affected, with 33 cases (66%) compared to 17 cases (34%) on the right side. This finding is consistent with Antonio Martinez Ruiz-Coello and Remzi Dogan, who also reported a higher incidence of left-sided involvement. However, other studies, including those by Halil Ibrahim Yener and Abdulhameed A. Hassan, showed nearly equal distribution between both sides. The reason for this difference in laterality remains unclear.

The duration of symptoms in our study ranged from 6 months to 12 years, with the majority of patients presenting after 2–5 years of disease duration. The mean duration was 2.4 years. Rinky Saha reported a mean symptom duration of 1.4 ± 0.74 years for various indications.

Local anesthesia was used in most patients, while general anesthesia was used in children and uncooperative patients. Intraoperative bleeding was measured in milliliters and the bleeding ranged from mild to moderate that not need nasal packing in the most of cases. This was similar to other studies we compared with.

Duration of operations were calculated and the mean time of (20 min). This duration was within the range of studies.

During the periods of follow up, patients were checked for complications as well as the patency of stoma. Postoperative complications were assessed during the follow-up period. Periorbital swelling

was reported in 4 patients (8%) resolved before the first visit, synechiae formation in 5 patients (10%), granuloma formation in 3 patients (6%), and acute dacryocystitis in 7 patients (14%). No cases of nasocutaneous fistula, septal abscess, or epistaxis were recorded during the follow-up period. . No major complications were documented as other studies.

In this study, the success rate for endocanalicular laser DCR was 88 % after 9 months of follow up. The success in laser DCR it depends on size of stoma can be created as shown in figure 3. The surgery considered successful when subjective symptomatic improvement and objective ostium patency were documented. The success rate for endocanalicular laser DCR in multiple studies ranged from 72% to 93.75% with different period of follow up.^{10,16,17}



Figure 3. Endoscopic view of DCR stoma with laser and stent insertion.

Conclusion

This prospective study demonstrates that transcanalicular endoscopic diode laser dacryocystorhinostomy with bicanalicular silicone intubation is a safe, effective, and minimally invasive surgical technique for the management of chronic nasolacrimal duct obstruction. The procedure achieved an overall success rate of 88%, with a short mean operative time of 20 minutes and a low incidence of postoperative complications. Most complications were minor, self-limiting, and successfully managed during follow-up, while no major intraoperative complications were observed.

Compared with conventional external dacryocystorhinostomy, the transcanalicular laser technique offers several important advantages, including the absence of a facial scar, minimal intraoperative bleeding, rapid postoperative recovery, and the possibility of performing the procedure under local anesthesia in most adult patients. These characteristics also make the technique particularly suitable for selected pediatric cases and patients who may benefit from a less invasive surgical approach.

The findings of this study support the use of transcanalicular diode laser dacryocystorhinostomy as a reliable alternative to conventional external DCR, providing comparable surgical outcomes while reducing patient morbidity and improving cosmetic satisfaction. Further multicenter studies with larger patient populations and longer follow-up periods are recommended to evaluate long-term patency rates and optimize surgical techniques for different patient groups.

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