ENDONASAL ENDOSCOPIC LASER-ASSISTED DACRYOCYSTORHINOSTOMY

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Abstract- ***Endonasal endoscopic laser-assisted dacryocystorhinostomy has many advantages over conventional external dacryocystorhinostomy. This technique avoids a cutaneous scar and causes less surgical trauma and bleeding than that seen in conventional lacrimal surgery. A total of 20 endoscopic laser-assisted dacryocystorhinostomy in 16 patients were performed between 1998 and 1999. The procedure was successful in 90% of cases, with no major complications. This success rate is comparable with external dacryocystorhinostomy. Silicone tubing was applied in 11 cases. The difference of success rates between the two groups (with and without silicone tubing) was not significant. It seems that creating a patent rhinostomy plays a more important role to achieve desirable results. Endonasal endoscopic laser-assisted dacryocystorhinostomy provides a simple, bloodless, and incisionless alternative to external dacryocystorhinostomy in the majority of the patients suffering from symptoms of lacrimal obstruction.***
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Key Words: ***Dacryocystorhinostomy, endoscopy, endonasal, CO_2 laser, silicone tubing***

INTRODUCTION

Dacryocystorhinostomy (DCR) consists of diverting the lacrimal flow into the nasal fossa through an artificial opening made at the level of the lacrimal bone. The aim of a DCR is to obtain a patent unscarred rhinostomy in order to create a low-pressure lacrimal bypass system, and hence relieve epiphora, dacryocystitis, or mucocele (1). This standard practice can be carried out by an external or endonasal surgical approach (2). In 1904, Toti was the first who described external DCR for the treatment of chronic dacryocystitis, using skin sutures alone for wound closure after resecting the adjacent lacrimal sac and nasal mucosa with their intervening bone. In 1921, Dupoy-Dutemp and Bourguet directly sutured the cut edges of nasal and lacrimal sac mucosal flaps, with improved rates of successful fistulization (3,4). The success rates for external DCR have been approximately 90% (5-8). There are complications and limitations related to external DCR such as surgical scar, damage to surrounding tissues, and associated general anesthesia complications (9). The endonasal approach was introduced in 1893 by Caldwell, and was later modified by West and Halle (10,11). These techniques have been in limited use mainly because of the difficulty in visualizing the endonasal anatomy during the operation. The advent of the rigid endonasal endoscope and development of the functional endoscopic sinus surgery (FESS) awakened interest in endonasal DCR (11). The major advantages of endonasal DCR include the avoidance of a cutaneous wound and the limitation of tissue injury to the discrete fistula site without disruption of the medial canthal anatomy and function (9,10,12). Massaro, and colleagues described endonasal laser DCR using a high-energy argon laser and the operating microscope (3). Later, potassium titanyl phosphate (KTP) and CO_2 lasers were used (9). The CO_2 laser has had a history of successful use in the upper airway by Selkin (13). This infrared laser, at 10600 nm, affords excellent vaporization of tissue with little thermal spread, especially when used in the super pulse mode (9). In this study we report the results from 20 cases (16 patients), who were treated with endonasal endoscopic CO_2 laser-assisted DCR.

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MATERIALS AND METHODS

Case-series study was designed to evaluate the effectiveness of endonasal endoscopic treatment for creating DCR. We performed 20 endoscopic CO_2 laser-assisted DCRs between 1998 and 1999 on 16 patients. Of 16 patients, 12 (75%) were women and 4 (25%) men. The age range was 12 to 69 years with an average of 42.5. The most prevalent age period was 31-40 that consisted of 40% of the patients (Fig. 1). The most common symptoms and signs included simple epiphora in 13 cases (65%), purulent epiphora in 4 cases (20%), and acute dacryocystitis in three

cases (15%). Primary endoscopic DCR was performed in 12 cases (60%). Eight cases underwent revision procedures. Chief complaints of the patients were epiphora, purulent discharge, pain and bulging of the region of medial canthus (Fig. 2). Fourteen patients had previous procedures: 6 lacrimal probing and 8 external DCR. One of the patients had ipsilateral facial paresis. A patient had muscular dystrophy. Sixteen procedures were performed under local anesthesia and intravenous sedation. Four cases were operated under general anesthesia.

Surgical technique: After adequate intravenous sedation, pledgets saturated in 1:50000 epinephrine and 4% lidocaine were applied into the nasal passages. They remained in place for at least 10 minutes. After removal of the pledgets, 0.5 ml of 1:100000 epinephrine and 1% lidocaine solution was injected at the lateral nasal wall adjacent to the lacrimal sac. One drop of tetracaine was administered to the ipsilateral eye.

A 4-mm 0-degree nasal endoscope was used to examine the nasal cavity especially lateral nasal wall (Fig. 3). A modified 20-gauge fiberoptic light pipe was lubricated with antibiotic ointment, inserted through the inferior canaliculus, and advanced into the lacrimal sac so as to gain contact with the medial wall of the lacrimal sac fossa. With the endoscope, a discrete spot of transilluminated light from the light pipe could be seen, which marked the site of intended rhinostomy. To visualize this spot, the light from the endoscope was reduced to its lowest setting. If viewing of this area was not optimal with the 0-degree endoscope, a better view was possible by substituting the 30-degree endoscope. Because of the potential for ocular damage, appropriate laser safety precautions for the patient and the operating team were taken. The patient's eyes were covered with double layers of saline moistened gauzes.

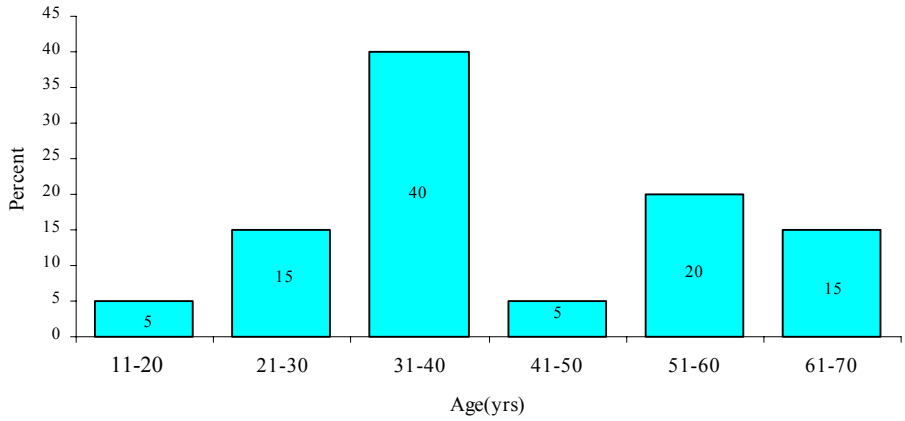

Fig. 1. Age distribution of the patients

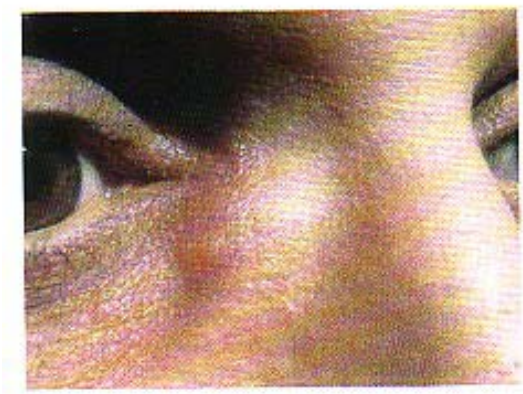

Fig. 2. This patient had epiphora, discharge, and intermittent dacryocystitis. Bulging of the medial canthus region is easily visible

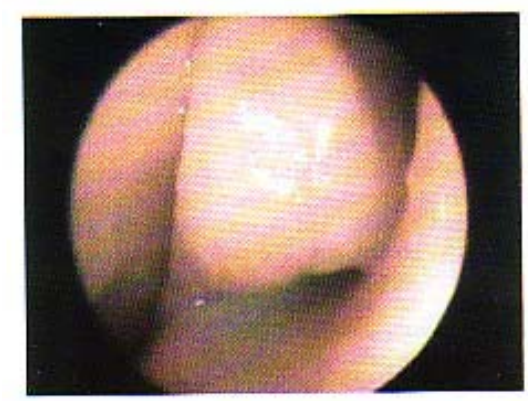

Fig. 3. Intransal endoscopic view. Middle turbinate lies at the center of the figure, lateral nasal wall is visible at the left and the septum at the right part of the figure

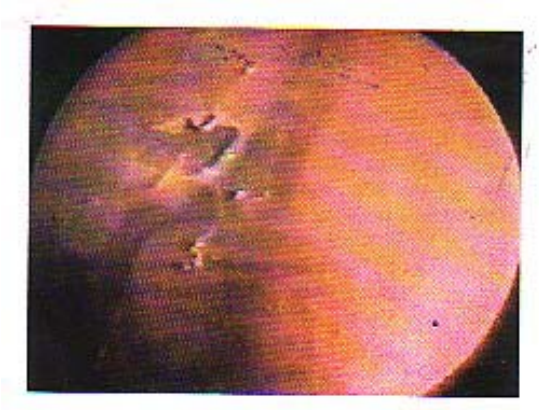

Fig. 4. Creating rhinostomy at the lateral nasal wall by CO_2 laser

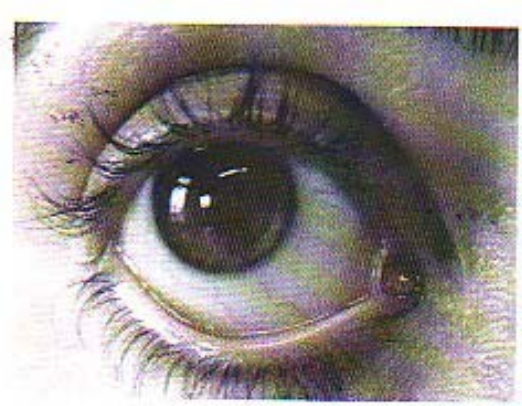

Fig. 5. Silicone tubing of the nasolacrimal system

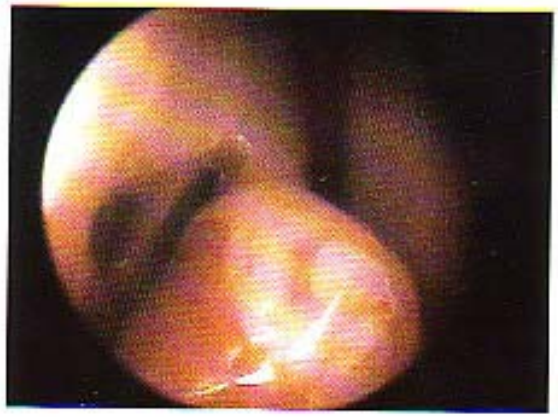

Fig. 6. Endoscopic examination of the patient 6 months postoperatively. Patent rhinostomy is observed

Laser rhinostomy was then performed. CO_2 laser energy of 5 W was delivered at a continuous mode to the mucosa covering the proposed rhinostomy (Fig. 4). Vaporization of tissue was performed to produce a 1 cm-rhinostomy over the area of the light pipe. Then the exposed lacrimal bone, which had been weakened by laser beam, was removed by an angled curette. Removal of the underlying lacrimal bone is more easily performed posteriorly where it is thinner but is more safely performed anteriorly to avoid the possibility of orbital disruption.

Then medial wall of the lacrimal sac was tented with a lacrimal probe. The medial wall of the sac was vaporized by laser, and in some cases, the purulent discharge gushed out. We created a lacrimal sac opening of approximately 1cm in diameter.

Once the endoscopic DCR was completed, patency was confirmed by lacrimal irrigation. Bicanalicular silicone tubing of the nasolacrimal system through the surgically created nasolacrimal fistula was then performed (Fig. 5). The ends of tubing were knotted so that there was one continuous loop through the inferior and superior canaliculi, common canaliculus, nasolacrimal sac, and intranasal ostium. No nasal packing was used.

The patients were discharged at the first day after surgery. At home, they used eye drops (ciprofloxacin and betamethasone) for a 7-day period. Nasolacrimal silicone tubing was removed 3 months following primary endoscopic DCR and 6 months following revision procedures.

The patients underwent nasal endoscopy at 2 weeks, 3, and 6 months postoperatively, and then at 6-month intervals (Fig. 6). At 2 weeks after surgery, crusts, if present, were gently removed.

RESULTS

Twenty endoscopic laser-assisted DCRs were performed on 16 patients, with four bilateral procedures. All procedures except four were accomplished under local anesthesia. Intraoperative complications occurred in two patients: one mild epistaxis that was easily controlled and one minor herniation of orbital fat that was intraoperatively managed.

Table 1. Outcomes of endoscopic laser-assisted DCR

	No.	Success	Failure
With silicone tubing	11	9(82%)	2(18%)
Without silicone tubing	9	9(100%)	0(0%)
All cases	20	18(90%)	2(10%)

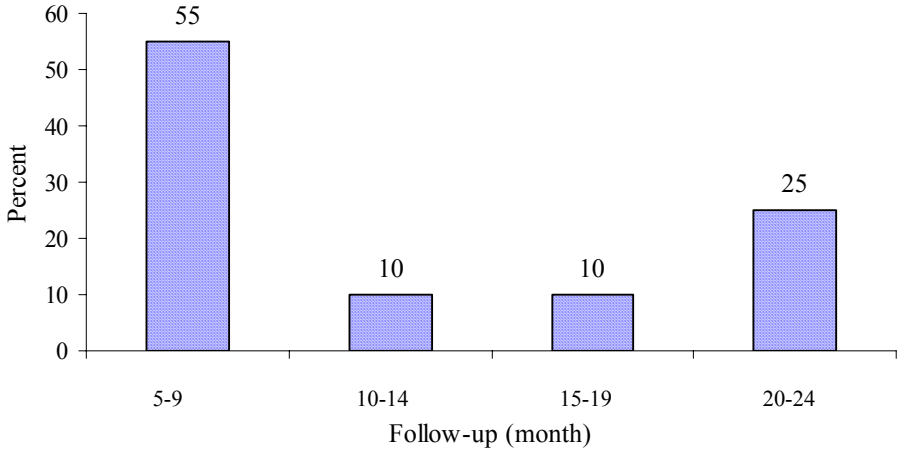

Fig. 7. Follow-up period of the patients.

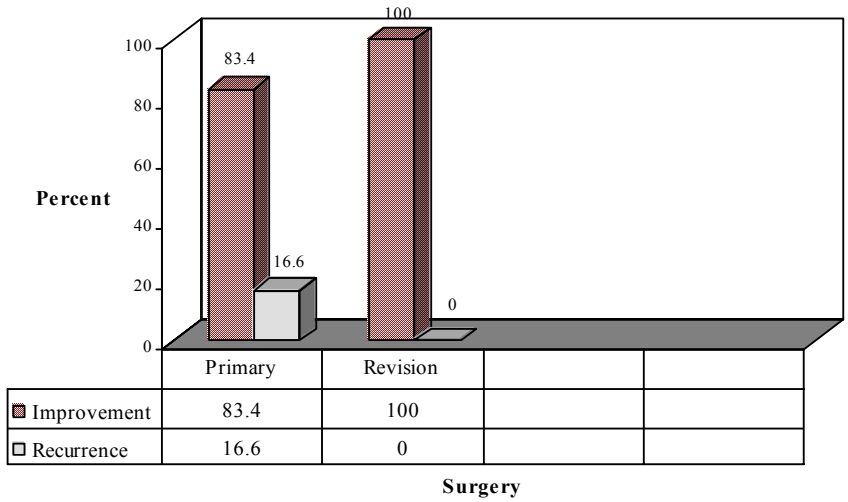

Fig. 8. Success rate according to primary or revision surgery

Failure defined by recurrence of symptoms was noted in two patients (10%). Failed endoscopic DCR procedures were characterized by an endoscopic appearance of concentric scarring and progressive ostium closure. Based on a 6 to 24 months follow-up (mean: 10.8±7.27; Fig. 7), 18 cases were free of any symptoms. The success rate was 90%. Recurrences were in the primary surgery group and no recurrences were observed in revision surgery group (Fig. 8). Silicone tubing was applied in nine cases and no complication occurred in this group (Table 1). Although two previously mentioned failures occurred in silicone tube group, there was not significant difference between two groups ($P > 0.05$). There were no diplopia, orbital hematoma, visual loss, or orbital emphysema after surgery.

DISCUSSION

The endonasal approach has several advantages over the external approach: 1) it is less traumatic; 2) a facial scar is avoided, which most patients do

prefer; 3) there is no disruption of the medial palpebral ligaments and of the angular facial vessels, thus the effect of lacrimal pump is preserved; 4) access to lacrimal sac is direct through lacrimal bone, avoiding double-sided dissection of the sac; 5) no nasal packing is required; and 6) it enables acute dacryocystitis unresponsive to the medical treatment to be drained into the nose; 7) bleeding and postoperative pain are decreased; and 8) most procedures are performed under local anesthesia (2,9,10,14). Contraindications to this technique include suspicion of lacrimal sac malignancy, severe bony deformity of the lacrimal sac fossa, which prevents accurate transillumination through the lacrimal bone, and lacrimal sac abscesses fistulized to the skin (9,15,16). Pearlman et al. (4), Woog et al. (10), Seppa et al. (17), and Cunningham and Woog (18) used silicone tubing to reinforce the likelihood of patency of created rhinostomy. We did not apply silicone tubing in 9 cases and observed no complications in this group (Table 1). It seems that the surgical technique to make a patent rhinostomy play more important role to achieve desirable results. In Sadiq et al. (1) study, the late failure rate without stenting was 9% that sounded acceptable at 1 year, but the late failure rate of 21%, despite stenting for 3 months, was not desirable. In our study, the success rate was 90%. This is a bit higher than other studies. Hartikainen et al. (11) and Pearlman et al. (4) reported 75% and 85% success rates respectively. The overall success rate in Woog et al series of 40 procedures was 82% (10). The success rate based on one or two attempts, was 80% in Boush et al study (16). Sadiq et al. achieved 79% rhinostomy patency in 50 cases (1). Our higher success rate seems to be due to effective creation of rhinostomy with minimal trauma to adjacent tissues and an effective postoperative control. There were no cases of diplopia, orbital hematoma, visual loss, or soft tissue infection following surgery. In one case minimal epistaxis occurred. In another patient, trivial herniation of orbital fat was seen. Adhesion of the middle turbinate to the lateral nasal wall and granuloma formation at the rim of the DCR stoma, have been reported (19). Yung and Hardman-Lea reported exposure of orbital fat in one patient (20).

In our study most of the patients were female (female: male = 12:4). Similar ratios are seen in other studies, including Seppa et al. 9:3 (17), Woog et al. 30:10 (10), Hartikainen et al. 23:9 (11), and Kong et al. 102:25 (21). It may be due to a special anatomical property of the lacrimal system in women that predispose them to the lacrimal obstruction. Endonasal endoscopic laser-assisted DCR is a new and effective procedure for the treatment of nasolacrimal duct obstruction. We achieved a success rate of 90%, with a mean follow-up of 11.85 months. This success rate is almost as high as those following external DCR. Endonasal endoscopic laser-assisted DCR has advantages over the external approach, e.g. it is a day-care procedure with a shorter operating time; it is performed under local anesthesia without the need for a skin incision. The science and technology of this procedure are undergoing a process of evolution, because a number of preoperative and intraoperative modifications are being introduced. As this process continues, the success rates in endonasal endoscopic laser-assisted DCR procedures are likely to improve, making this modality an increasingly attractive alternative to external DCR.

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