

Original Article

Endoscopic dacryocystorhinostomy using mucosal flaps for bilateral overlapping

Ahmad Rezaeian, Mojtaba Abtahi-Forooshani, Mohammad-Ali Ghanbari

Department of Otorhinolaryngology, Head and Neck Surgery, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran

Received September 25, 2019; Accepted December 28, 2019; Epub June 15, 2020; Published June 30, 2020

Abstract: Background: Recently, the use of posterior mucus flap has been introduced as a new technique for DCR, which has had a great success, as well as bone overlapping and minimal postoperative obstruction. Considering the need for these flaps to have a very good success, the purpose of this study was to examine the DCR endoscopic method using mucosal flaps for double-sided overlapping (as a new flap). Methods: In this clinical trial study, 60 patients undergoing DCR endoscopy referring to Amin and Al-Zahra hospitals during 1396 to 1398 entered the study. Patients were divided into two groups, which included endoscopic DCR by using mucosal flaps for double-sided and non-flip overlapping. The success rate of surgery, postoperative pain and its complications were studied in two groups. Results: Among the complications observed after surgery, hematoma (6.7 in each group), bleeding (3.3% in each group) and nasal secretion (10% in the intervention group and 6.7% in the control group) were observed. No tear and obstruction of tear ducts were seen in the two groups. There was no significant difference between the two groups based on the complications of postoperative pain and the success rate of surgery ($P>0.05$). Conclusion: Using the double-sided overlapping flap method, the results of the same operation were similar to using the non-flap method. Therefore, the use of both endoscopic DCR techniques with two-way overlapping flap and without using it were two effective methods with limited complications.

Keywords: Dacryocystorhinostomy, mucous flap, lacrimal duct obstruction

Introduction

Dacryocystorhinostomy (DCR) is the standard operation for acquired obstruction of the nasolacrimal duct (tear duct) [1]. This operation can be performed by an incision on the skin, which is known as external DCR. The other technique is done through the inner part of nose. In recent years, different techniques have been used for endoscopic treatment of nasolacrimal duct obstruction [2-6]. In comparison with other techniques like endoscopic technique with maintaining upper and lower nasal flap and external technique (commonly used in ophthalmology), endoscopic dacryocystorhinostomy (DCR) technique has some advantages including maintaining the lacrimal flap due to its ease of use, less time for surgery, no need for micro-motor and diamond drill bit and milling machine, and less learning time (easy learning of the surgeon) [7, 8].

The endonasal technique was first used by Mosher in 1921. However, this technique was forgotten due to technical problems and the inability in adequate access to the upper parts of the nose. In the last two decades, with advances in nasal endoscopy techniques and the development of advanced devices that provide a very good view in the upper nasal parts, and with increasing awareness about nasal anatomy and paranasal sinuses and the relation of nasolacrimal duct and lacrimal sac with it, endoscopic and endonasal DCR techniques were again proposed as alternatives to external DCR [9]. In recent years endonasal DCR has been performed with the following ways: 1- Endonasal Laser Assisted DCR (ENLDCR), 2- Endocanalicular Laser Assisted DCR (ENLDCR), 3- Mechanical Endonasal DCR (MEDCR).

The advantages of endoscopic DCR include: 1- This technique causes less damage to the tissues and does not damage the structure of the

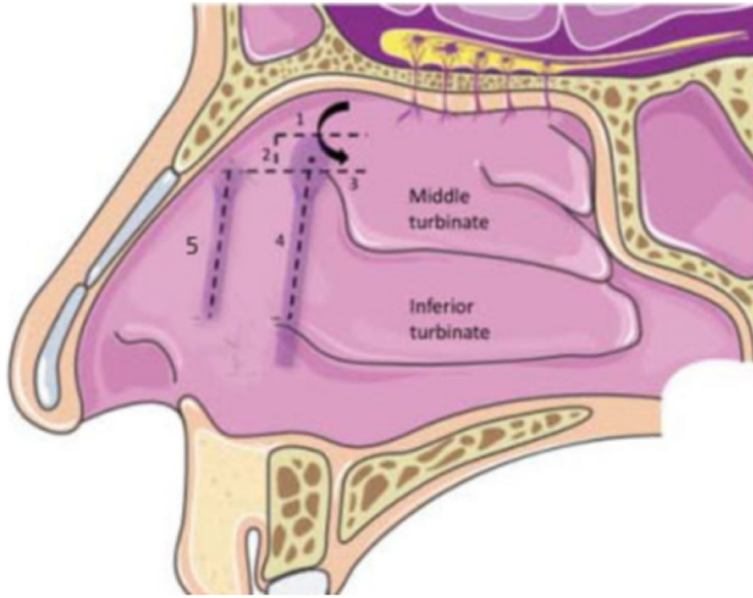


Figure 1. Surgical procedure of bilateral overlapping.

inner canthus, therefore the natural function of the lacrimal pump is maintained. 2- It does not need any incision of the skin and therefore does not have a skin scar and does not need wound dressing. 3- In many cases it does not lead to edema and ecchymosis around the orbit. 4- This technique causes less hemorrhage. 5- Although it is possible to treat intranasal diseases in the external technique, however, since in internal technique the operation is essentially done from the inside of the nose, therefore simultaneous treatment of intranasal diseases is easier. 6- The skilled surgeon operates the patient more quickly and therefore duration of surgery will be shorter. Endoscopic techniques have the following disadvantages: 1- Because of limitation of vision, the exact control of any hemorrhage is necessary and, despite the fact that this technique causes less hemorrhage, controlling hemorrhage is difficult. 2- The small intranasal space makes surgical maneuvers more difficult. 3- In comparison with the external technique, it needs more surgical instruments. 4- This technique is not appropriate in the malignancy of the lacrimal sac [10-12]. In a study, Simon et al (2005) compared external and endoscopic techniques. They concluded that endoscopic dacryocystorhinostomy surgery has better results than the external technique [13]. The study of Farahani et al (2006) showed that overall, in the endoscopic technique the postoperative complica-

tions are less and milder and with the increase of surgeons' experience in this area, the endoscopic technique can be a suitable substitute for the external technique [14]. Recently, the use of posterior mucosal flap has been introduced as a new technique for DCR, which has been very successful. Also this technique has been accompanied with bone overlapping and minimum postoperative obstruction [15]. Due to the fact that these flaps have been very successful, the purpose of this study was to examine endoscopic DCR technique using mucosal flaps for double-sided overlapping (as a new flap).

Materials and methods

In this clinical trial study, sixty patients with nasolacrimal duct obstruction who had indication of surgical intervention and had referred to teaching hospitals in Isfahan (Amin and Al-Zahra hospitals) from 2017 to 2019 were entered into the study. The criteria for entering the study included patients with nasolacrimal duct obstruction who had indication of surgical intervention, age above eighteen, lacrimal duct surgery for the first time, and satisfaction to participate in the study. Patients who were not under follow-up for six months or who had severe complications were excluded from the study. The demographic data of patients including age, gender, other illnesses such as asthma, allergy, history of smoking, history of sinus surgery, history of septoplasty surgery, treatments of these illnesses, and taking steroids were recorded. Patients were assigned to two parallel groups using random allocation software. Patients in the flap surgery group, using surgical procedures defined by the surgeon, using mucosal flaps for double-sided overlapping underwent surgery by endoscopic DCR technique (**Figure 1**). Patients in the control group underwent the usual endoscopic DCR surgery without removing the flap or its overlapping. After the surgery, patients were treated with antibiotics and were under follow-up monthly for up to six months. Recovery rate of

Dacryocystorhinostomy

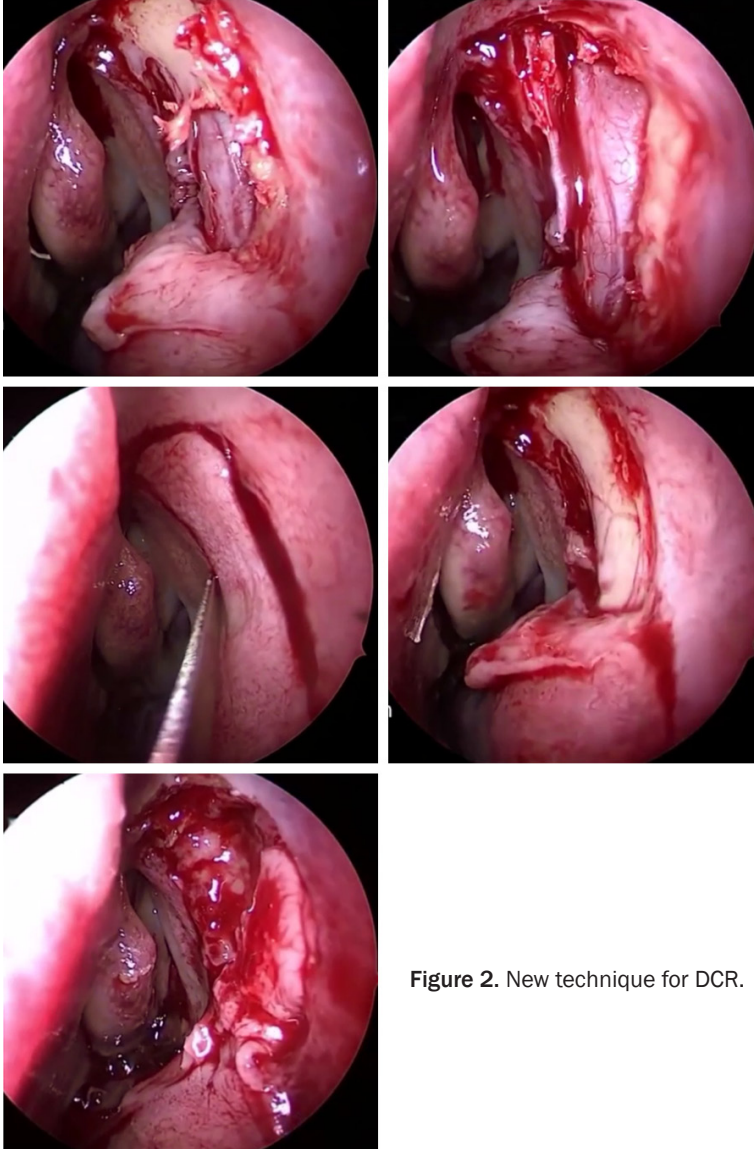


Figure 2. New technique for DCR.

the patients, and efficacy of surgical procedure with endoscope were studied in the sessions that doctor visited the patients. Also the side effects of this surgical procedure, such as hematoma, postoperative pain, and postoperative hemorrhage and nasal secretion were studied. The duration of operation and the rate of bleeding during the operation were studied. Patients were under follow-up for six months, and the frequency of tears and nasolacrimal duct obstruction was monitored. Postoperative pain was measured by patients according to VAS criteria, from one (lowest pain) to ten (most severe pain). Postoperative pain at recovery time, six, twelve and twenty-four hours after surgery was assessed.

Flap surgery technique (defined by the executor of the plan): using a zero to thirty degrees of endoscope, a mucosal flap was performed by five incisions. The first incision was in the upper side of the middle turbinate and parallel with it. The second incision was in continuation of the first incision with a ninety-degree angle, and the third and the fourth incisions were under the first incision. Then the fourth incision from the direction of the third incision was performed vertically to the bottom (perpendicular to the middle and inferior turbinate) and the fifth incision was performed parallel to and in front of the fourth incision. The flap was easily removed and osteotomy was performed. Then tear ducts were sutured to the mentioned flap. In the figures below, the incision technique is shown (Figures 1 and 2).

Data collected from this study were shown in the form of numbers and percentages for qualitative data, and in the form of mean and standard deviation for quantitative data. The success of the surgery was shown in the form of percentage according to the opinion of the surgeon. Hemorrhage amount was measured by differentiating the normal amount of consumed saline from the amount of suctioned blood.

the surgeon. Hemorrhage amount was measured by differentiating the normal amount of consumed saline from the amount of suctioned blood.

Z1 of the sample size was defined considering 95% confidence coefficient that is 1.96 and Z2 of the power factor of the test that is 0.84. S is an estimation of the standard deviation of the hemorrhage amount, which $S1=37.5$ and $S2=43.9$, and d is minimum difference of the average changes of each of the variables between the two groups, which showed a significant difference and was considered 29.6. Therefore, the sample size of thirty patients was considered for each group [16].

Dacryocystorhinostomy

Table 1. Demographic variables of patients in both groups

Variables	Intervention	Control	P-value
Age	47.86±12.63	48.43±13.37	0.86
Gender (M/F)	12/18	14/16	0.39
Asthma	2 (6.7%)	1 (3.3%)	0.50
History of allergy	2 (6.7%)	1 (3.3%)	0.50
Smoking	4 (13.3%)	3 (10%)	0.50
Received topical Steroid	6 (20%)	4 (13.3%)	0.36
Sinus surgery	4 (13.3%)	1 (3.3%)	0.17
Septoplasty	11 (36.7%)	14 (46.7%)	0.30

Table 2. The postoperative pain in both group

VAS	Intervention	Control	P-value
Recovery	3.36±1.03	3.76±0.93	0.14
6 h after surgery	2.10±0.99	2.13±0.81	0.90
12 h after surgery	1.20±0.76	1.30±0.65	0.62
24 h after surgery	0.43±0.56	0.33±0.47	0.53

Table 3. Complication of surgery in both groups

Complication	Intervention	Control	P-value
Hematoma	2 (6.7%)	2 (6.7%)	>0.99
Bleeding	1 (3.3%)	1 (3.3%)	>0.99
Discharge from the nose	3 (10%)	2 (6.7%)	0.50
Tearing	0	0	-
Lacrimal duct obstruction	0	0	-

Table 4. Duration of surgery and the success rate of surgery of both groups

Variables	Intervention	Control	P-value
Duration of surgery (min)	50.46±13.54	45.80±13.76	0.19
The success rate of surgery (%)	99.01±2.36	99.40±2.29	0.16

Data were entered into SPSS software version 24 and Chi-Square test, T-test and Mann-Whitney test were used for comparison of the two groups. Quantitative data were presented as mean and standard deviation and qualitative data were presented as frequency or percentage. P less than 0.05 were considered as significance level.

Results

In this study sixty persons entered randomly into intervention group (twelve men and eighteen women) and control group (fourteen men and sixteen women). There were no significant differences between the two groups based on age, gender, history of asthma, allergy, smoking, receiving topical steroid, sinus surgery and septoplasty surgery (P>0.05) (**Table 1**).

Postoperative pain during recovery was measured, six, twelve and twenty-four hours after surgery. There was no significant difference between the two groups based on postoperative pain during recovery, six, twelve and twenty-four hours after surgery (P>0.05) (**Table 2**).

Among the observed complications after surgery, hematoma (6.7% in each group), hemorrhage (3.3% in each group) and secretion from the nose (10% in the intervention group and 6.7% in the control group) were observed. No tears and nasolacrimal duct obstruction were seen in the two groups. There was no significant difference between the two groups based on postoperative complications (P>0.05) (**Table 3**).

Also, there was no significant difference between the two groups based on duration of the operation and success rate of the surgery (P>0.05) (**Table 4**).

Discussion

Based on the results of this study, the use of double-sided overlapping flap technique was

similar to technique of non-use of flap. Therefore, the uses of endoscopic DCR techniques with double-sided overlapping flap and without using it were two effective methods with limited complications. Also, the success rate of the two techniques was very high. In a study by Mueller et al who used bipediced interlacing mucosal flaps in endoscopic DCR, they concluded that using this technique has 100% improvement and no complication. Also, in this technique, the success rate was 96.4% during six months' follow-up. It was stated in this study that the use of this technique is a safe and effective way to repair nasolacrimal ducts without any complication [16]. The success rate of the technique used in our study was about 99%, which was more than the success rate of the study of Mueller.

Dacryocystorhinostomy

In the study of Tsirbas, which has used a new technique by a mucosal flap in DCR of the nose, the technique was that the flap and the ostium were created between the lacrimal sac and the nasal mucosa. The results of this study were as follows: among patients of the study 93% had epiphora, 33% had mucocele, 30% had history of septoplasty surgery, and 23% had history of endoscopic surgery of sinus. The anatomical success rate was 91%. Also, five out of thirty-nine patients had not successful operation. At the end of the study, it was stated that the use of this new technique in comparison with other used techniques was desirable due to the relatively high success rate, and its success rate was even similar to external DCR [15]. In our study, the success rate was about 99%. This higher success rate may be due to the fact that more flaps were used in our study and also the surgeon's skill was effective.

In a study that the patients were under follow-up for fifteen months, endoscopic DCR or endonasal DCR had the anatomical success rate of 100% and the functional success rate of 79%. The most common cause of failure of this surgery was due to damage to the ostium [17]. Therefore, although the most commonly used technique is external DCR and has a high success rate compared to the endonasal technique, but it has many side effects.

In another study that Jung et al used endoscopic DCR on 1083 patients with double-sided involvement of nasolacrimal ducts, The success rate of the surgery was 92.7%, and the endoscopic DCR was described as a successful surgical technique that can be used as a primary treatment for obstruction the nasolacrimal ducts [18].

Therefore, considering the results of other studies and the results of this study, endoscopic DCR is a useful and successful technique and the use of the technique of our study, the double-sided overlapping flap, yielded acceptable results and was not different from the usual endoscopic DCR, and also both methods were acceptable and had limited complications. Some limitations of our study are limited studies in this area, a relatively small sample size, and limited variables. Therefore, given the limitations of our study, we need studies with bigger sample size.

Disclosure of conflict of interest

None.

Address correspondence to: Ahmad Rezaeian, Department of Otorhinolaryngology, Head and Neck Surgery, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran. Tel: +98913315-6278; Fax: +983136688597; E-mail: dr.ahmadrezaeian@gmail.com

References

- [1] Toti A. Nuovo metodo conservatore di radicale delle suppurazioni croniche del sacco lacrimale (dacriocystorhinostomia). *Cli Mod Pisa* 1904; 10: 385-387.
- [2] McDonogh M and Meiring J. Endoscopic transnasal dacryocystorhinostomy. *J Laryngol Otol* 1989; 103: 585-587.
- [3] Önerci M, Orhan M, Öğretmenoğlu O and İrkeç M. Long-term results and reasons for failure of intranasal endoscopic dacryocystorhinostomy. *Acta Otolaryngol* 2000; 120: 319-322.
- [4] Smirnov G, Tuomilehto H, Terasvirta M, Nuutinen J and Seppä J. Silicone tubing is not necessary after primary endoscopic dacryocystorhinostomy: a prospective randomized study. *Am J Rhinol Allergy* 2008; 22: 214-217.
- [5] Demarco R, Strose A, Araújo M, Valera FC, Moribe I and Anselmo-Lima WT. Endoscopic revision of external dacryocystorhinostomy. *Otolaryngol Head Neck Surg* 2007; 137: 497-499.
- [6] Nussbaumer M, Schreiber S and Yung MW. Concomitant nasal procedures in endoscopic dacryocystorhinostomy. *J Laryngol Otol* 2004; 118: 267-269.
- [7] Neel U, Sukman K, Derek WS and Robert BD. Long-term results of endonasal laser dacryocystorhinostomy. *Otolaryngol Head Neck Surg* 2006; 135: 81-84.
- [8] Ajalloueyan M, Fartookzadeh M and Parhizgar H. Use of laser for dacryocystorhinostomy. *Arch Otolaryngol Head Neck Surg* 2007; 133: 340-343.
- [9] Metson R. Endoscopic surgery for lacrimal obstruction. *Otolaryngol Head Neck Surg* 1991; 104: 473-479.
- [10] Mannor GE and Millman AL. The prognostic value of preoperative dacryocystography in endoscopic intranasal dacryocystorhinostomy. *Am J Ophthalmol* 1992; 113: 134-137.
- [11] Cokkeser Y, Evereklioglu C and Er H. Comparative external versus endoscopic dacryocystorhinostomy: results in 115 patients (130 eyes). *Otolaryngol Head Neck Surg* 2000; 123: 488-491.
- [12] McMasters M, Messerli J and Wolfensberger M. Endonasal dacryocystorhinostomy: tech-

Dacryocystorhinostomy

- nique and results. *Schweiz Med Wochenschr* 2000; 116: 74-76.
- [13] Ben Simon GJ, Joseph J, Lee S, Schwarcz RM, McCann JD and Goldberg RA. External versus endoscopic dacryocystorhinostomy for acquired nasolacrimal duct obstruction in a tertiary referral center. *Ophthalmology* 2005; 112: 1463-1468.
- [14] Farahani F, Samavati M and Mani KH. Comparison of results and complications of external DCR with endoscopic DCR in primary nasolacrimal duct obstruction. *Iran J Otorhinolaryngol* 2006; 17: 183-8.
- [15] Tsirbas A and Wormald PJ. Endonasal dacryocystorhinostomy with mucosal flaps. *Am J Ophthalmol* 2003; 135: 76-83.
- [16] Mueller SK, Freitag SK, Lefebvre DR and Bleier BS. Endoscopic DCR using bipediced interlacing mucosal flaps. *Laryngoscope* 2018; 128: 794-797.
- [17] Hull S, Lalchan SA and Olver JM. Success rates in powered endonasal revision surgery for failed dacryocystorhinostomy in a tertiary referral center. *Ophthalmic Plast Reconstr Surg* 2013; 29: 267-271.
- [18] Kim DJ, Baek S and Chang M. Usefulness of the dacryoscintigraphy in patients with nasolacrimal duct obstruction prior to endoscopic dacryocystorhinostomy. *Graefes Arch Clin Exp Ophthalmol* 2019; 257: 1535-1540.