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Comparison of impact of four surgical methods on surgical outcomes in endoscopic dacryocystorhinostomy

Hyun Cheol Roh [a], Sehyun Baek [b], Hwa Lee [b], Minwook Chang [a, *]

[a] Department of Ophthalmology, Dongguk University Ilsan Hospital, Goyang, South Korea
[b] Department of Ophthalmology, Korea University College of Medicine, Seoul, South Korea

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ABSTRACT

Purpose: To evaluate differences in the surgical outcomes of endoscopic dacryocystorhinostomy (DCR) according to four different surgical methods.
Material and methods: This retrospective study included 222 patients who underwent endoscopic DCR from 2011 to 2013. All patients were assigned to one of four groups according to instruments for incision of nasal mucosa and the formation of mucosal flap: group 1, a sickle knife with mucosal flap; group 2, a sickle knife without mucosal flap; group 3, electrocautery with mucosal flap; and group 4, electrocautery without mucosal flap. The follow up period was at least 6 months.
Results: There were 33 eyes in group 1, 44 eyes in group 2, 49 eyes in group 3, and 97 eyes in group 4. There were no significant differences in success rate between groups ($P = 0.878$). Wound healing time was significantly different between groups ($P < 0.001$). In post hoc analysis, wound healing time was significantly shorter in group 1 and group 2 than in group 3 and group 4. The vertical ostium size and postsurgical complication were not significantly different between groups.
Conclusions: The use of cold instruments such as sickle knife may be more helpful and effective for shortening wound healing time rather than making mucosal flaps in endoscopic DCR.

1. Introduction

Dacryocystorhinostomy (DCR) has been a common operation for patients with acquired nasolacrimal duct obstruction (NLDO) for more than 100 years. DCR can be performed with transcutaneous or intranasal technique. The use of external DCR has been regarded as the gold standard treatment for acquired NLDO because of its high success rate.

With the introduction of nasal endoscopes, endoscopic DCR is frequently performed because of its many advantages, such as avoidance of an external scar, maintenance of the lacrimal pumping function, shorter operative time, shorter postoperative recovery time, little bleeding and fewer complications (Tsirbas et al., 2004; Ben Simon et al., 2005; Kupper et al., 2005). In previous studies, however, endoscopic DCR has shown lower success rates than external DCR (Dolman, 2003; Leong et al., 2010; Zaidi et al., 2011). To overcome the low success rate of endoscopic DCR, several methods have been tried, such as preservation of mucosal flap (Kansu et al., 2009), intraoperative mitomycin (Cheng et al., 2013), variable surgical instruments such as cold instruments and laser (Mickelson et al., 1997; Singh et al., 2012), and new surgical techniques (de Souza and Nissar, 2010).

In this study, we evaluated the surgical techniques and instruments for improved surgical outcome in endoscopic DCR. We accordingly evaluated differences in the surgical outcomes of endoscopic DCR according to four different surgical methods.

2. Material and methods

This retrospective study included 222 patients who underwent endoscopic DCR. The surgery was performed from 2011 to 2013 in the Department of Ophthalmology of Dongguk University Ilsan Hospital and Guro Hospital, Korea University, South Korea. This study was conducted in accordance with the tenets of the Declaration of Helsinki. Institutional review board approval was not required for this retrospective study.

* Corresponding author. Department of Ophthalmology, Dongguk University Ilsan Hospital, 27 Dongguk-ro, Ilsandong-gu, Goyang, South Korea. Tel.: +82 31 961 7396, +82 2 2626 1260; fax: +82 31 961 7977.
E-mail address: mdjacob@dumc.or.kr (M. Chang).

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All patients were evaluated by lacrimal probing and irrigation. The eyelid inspection focused on the location of the lacrimal punctum and the degree of lower lid laxity. Radiologic imaging with dacryocystography and dacryoscintigraphy were performed in each patient to identify the location of obstruction in the nasolacrimal duct. Endoscopic examination of the nasal cavity was conducted to check for any nasal abnormality. The patients with symptomatic epiphora and obstructed nasolacrimal duct confirmed by lacrimal irrigation and radiologic findings, which are indications for DCR, were included in this study. Exclusion criteria included common canalicular obstruction, punctal ectropion, epiphora from lower lid laxity, previous history of nasolacrimal surgery, trauma, and follow-up period of less than 6 months.

The medical records of all patients were retrospectively reviewed. All patients were assigned to one of four groups according to instruments for incision of nasal mucosa and the preservation of mucosal flap; group 1, sickle knife with mucosal flap; group 2, sickle knife without mucosal flap; group 3, electrocautery with mucosal flap; and group 4, electrocautery without mucosal flap.

Postoperatively, the patients underwent a routine ophthalmic examination weekly in the first month, then every 2 weeks in the second month, and then monthly. The silicone tube was removed at 3 months postoperatively. The anatomical and functional success, wound healing time, vertical ostium diameter, and postsurgical complication during follow-up period were investigated in each group. Surgical success was defined as both anatomical and functional success at 6 months after surgery. Anatomical success was defined as ostium patency on lacrimal irrigation and nasal endoscopy, and functional success was defined as improvement of epiphora and fluorescein dye disappearance test grade 0 or 1. Wound healing time was defined as the duration until exposed bare bone was completely covered by regenerated nasal mucosa. We also assessed postsurgical complications including granuloma formation, synechia, and tube induced inflammation at the follow-up visits.

2.1. Surgical procedure

All surgical procedures were carried out by the same single surgeon (C.M.W.). A gauze packing soaked in 0.01% epinephrine was placed anterior to the middle turbinate for at least 10 min. After removal of the packing, the nasal mucosa around the operculum of the middle turbinate was injected with a mixture of 1:100,000 epinephrine and 2% lidocaine hydrochloride.

Under general anesthesia, the surgery was performed using a 0°, 4-mm-diameter endoscope (Karl Storz Hopkins, Tuttlingen, Germany). A nasal mucosal flap was made anterior to the middle turbinate with sickle knife in groups 1 and 2, and with electrocautery in groups 3 and 4. Then the mucosal flap was lifted posteriorly from the underlying bone with the Freer elevator. The mucosal flap was preserved in groups 1 and 3. In groups 2 and 4, the mucosal flap was removed by ethmoid forceps. Using a Kerrison bony ronguer, the osteotomy of at least 5 mm was performed to expose the fundus of lacrimal sac. After the lacrimal sac was fully exposed, a Bowman probe was passed through the inferior canaliculus and tented the lacrimal sac, which was incised vertically using a sickle knife to create anterior and posterior flaps. In group 1 and 3 patients, the preserved nasal mucosal flap was trimmed and adjusted to anastomose the posterior lacrimal sac flap end to end on the lateral nasal wall. The resection of the medial wall of lacrimal sac was performed in group 2 and 4 patients.

After lacrimal irrigation with normal saline, the lacrimal system was intubated with a bicanalicular silicon tube, which was tied with 6-0 prolene and left in the nasal cavity. Postoperatively, all patients were treated with oral antibiotics for 1 week and with topical antibiotics, topical steroid, and nasal decongestants for 4 weeks.

2.2. Statistical analysis

All statistical analyses were performed with IBM SPSS version 20.0 (IBM Corp., Armonk, NY, USA). The continuous variables were tested for differences using the one-way analysis of variance and the categorical variables using chi-square analysis or the Fisher exact test. If there was a significant difference, Dunnett post-hoc analysis was performed for multiple comparisons between the groups. *P* values of less than 0.05 were considered significant.

3. Results

A total of 222 eyes were included in this study, of which 63 were male (28.4%) and 159 were female (71.6%). The mean age of the subjects was 61.3 ± 12.3 years, ranging from 17 to 94 years. There were 33 eyes in group 1, 44 eyes in group 2, 49 eyes in group 3, and 97 eyes in group 4. The mean follow-up duration was 12.2 months. There were no significant differences in sex, age, laterality, and follow-up duration between groups. Operation time was significantly shorter in group 3 than in other groups. Baseline characteristics of patients were shown in Table 1.

The overall success rate was 90.5%, and there were no significant differences among the 4 groups. The success rate was 93.9% in group 1, 90.7% in group 2, 91.8% in group 3, and 88.7% in group 4 ($P = 0.878$, Fisher exact test) (Table 2). The vertical diameter of bony ostium also showed no significant difference among the four groups.

There was a statistically significant difference among the groups in regard to wound healing time. The wound healing time was 33.0 ± 4.7 days, 35.0 ± 5.6 days, 44.2 ± 11.4 days, and 43.8 ± 5.4 days in groups 1 to 4, respectively. One-way analysis of variance with Dunnett post hoc comparison revealed that wound healing time was significantly shorter in groups 1 and 2, as compared with groups 3 and 4 (Table 3).

Table 1
Comparison of baseline characteristics among the four study groups.

	Group 1 (n = 33)	Group 2 (n = 43)	Group 3 (n = 49)	Group 4 (n = 97)	*P* value
Sex					
Male/female	5/28	14/29	19/30	25/72	0.105[a]
Age (y)					
Mean	60.5	59.7	61.7	62.0	0.754[b]
Range	43–84	26–94	33–85	17–86	
Laterality					
Right/left	19/14	21/22	22/27	40/57	0.419[a]
Follow-up (mo)	11.9 ± 6.6	11.9 ± 6.8	11.2 ± 3.2	11.4 ± 5.1	0.888[b]
Operation time (min)	29.0 ± 8.6	29.3 ± 10.1	22.7 ± 5.1	28.7 ± 6.9	<0.001[b]

[a] Chi-square test.
[b] One-way analysis of variance.