Turkish Archives of Otorhinolaryngology
Türk Otorinolarengoloji Arşivi

Turk Arch Otorhinolaryngol 2016; 54: 99-104

Comparison of Endoscopic and External Dacryocystorhinostomy Results and Analysis of Patients' Satisfaction

Battal Tahsin Somuk[1], Sait Alim[2], Emrah Sapmaz[1], Helin Deniz Demir[2], Burcu Taşkıran[2], Göksel Göktaş[1], Harun Soyalıç[3]

[1]Department of Otorhinolaryngology, Gaziosmanpaşa University School of Medicine, Tokat, Turkey
[2]Department of Ophtalmology, Gaziosmanpaşa University School of Medicine, Tokat, Turkey
[3]Department of Otorhinolaryngology, Ahi Evran University School of Medicine, Kırşehir, Turkey

Original Investigation

Abstract

Objective: Comparison of endoscopic and external dacryocystorhinostomy (DCR) results and evaluation of patients' satisfaction.

Methods: Forty six (35 females and 11 males) patients who underwent endoscopic DCR and 43 (37 females and six males) who underwent external DCR were included. Surgical success was objectively and subjectively assessed. The nasolacrimal duct was irrigated by a saline solution, and the saline solution was objectively visualized by endoscopy from the nose. Subjective assessment was performed asking the patients' epiphora. In addition to evaluating the success of the operation, satisfaction and result surveys were administered to the two groups.

Results: There was no statistically significant difference between the two groups in terms of age and sex (respectively p=0.486, p=0.23). However, the number of females was higher than the number of males in the two groups, and the difference was statistically significant (endoscopic-DCR p=0.01, external-DCR p=0.001). There was no statistically significant difference between the two groups in terms of postoperative bleeding and punctum damage. The success rate was 84.7% in the endoscopic DCR group and 90.6% in the external DCR group. There was no statistically significant difference in the success rate between the two groups (p=0.397). The survey results revealed that there was no statistically significant difference between the two groups in terms of patient satisfaction (p=0.397).

Conclusion: The results of many studies in the literature show operation success rates between the two groups that are similar to ours. Both techniques have advantages and disadvantages. Independent of the preferred procedure, our results show that functional success mainly determines patient satisfaction.

Keywords: Dacryocystitis, external dacryocystorhinostomy, endoscopic dacryocystorhinostomy

Introduction

Acquired nasolacrimal duct obstruction (ANDO) is one of the most common eye problems. It most commonly manifests itself as epiphora and dacryocystitis. The standard surgical procedure for the treatment of ANDO is dacryocystorhinostomy (DCR). The purpose of this surgery is to create a fistula between the lacrimal sac and the nasal cavity. Thus, the tear will flow directly from the lacrimal sac to the nasal cavity without using the lacrimal duct (1). Traditional external or transcutaneous DCR was first described by Toti, and endoscopic DCR (END-DCR), which is an alternative to external DCR (EXT-DCR), was described by Caldwell. The endonasal approach became popular after the use of endoscopy and lasers in nasal surgeries (2, 3).

Nowadays, DCR is performed both externally and endoscopically. In studies, the rate of success was reported as 80 to 95% (4-7) for EXT-DCR and 60 to 99% (8-10) for END-DCR. The most important concern of patients with EXT-DCR is the formation of scars on the skin (1). The supporters of END-DCR argue that no scar is formed on the skin and that the pumping function is preserved (11). On the other hand, the supporters of EXT-DCR claim to have higher success rates. Debates over which method is better have been continuing for years, and many studies comparing both these methods have been undertaken. While END-DCR can be performed by both otorhinolaryngologists and ophthalmologists, EXT-DCR is a procedure performed only by ophthalmologists

Address for Correspondence:
Battal Tahsin Somuk
E-mail: btahsin@hotmail.com

Received Date: 18.05.2016
Accepted Date: 02.10.2016

DOI: 10.5152/tao.2016.1722

(1). There are a limited number of studies comparing both methods in which END-DCR is performed by an otorhinolaryngologist and EXT-DCR is performed by an ophthalmologist (12).

In our study, END-DCR was employed by an otorhinolaryngologist and EXT-DCR was performed by an ophthalmologist. The aim is to evaluate the patient satisfaction through the applied questionnaire form in addition to comparing the results of both these methods.

Methods

Patients in whom END-DCR was performed in the Department of Otorhinolaryngology and EXT-DCR in the Department of Ophtalmology between the years 2010 and 2015 and who were under follow-up were included in this study. The ethics committee approval of the study was received from the local ethics committee (2016/03, 16-KAEK-016). After receiving their written informed consents, 46 (35 female and 11 male) patients in whom END-DCR was performed and 43 (37 female and 6 male) patients in whom EXT-DCR was performed were included in the study. The age of the END-DCR group ranged from 21 to 83 years (mean: 52.54±17.23 years) and the age of the EXT-DCR group ranged from 10 to 80 years (mean: 50±17.06 years).

The diagnosis of the cases was made by the Department of Ophthalmology through lacrimal irrigation, biomicroscopic examination, and lipiodol dacryocystography. All the patients who underwent END-DCR operation in the ENT clinic were directed by the Ophthalmology Department of our hospital. The EXT-DCR option was also presented to all the patients who underwent END-DCR operation. In both these methods, silicone tubes were placed in all the patients and all the operations were performed under general anesthesia. Postoperatively, all the patients were given antibiotic drops and pomade, decongestant nasal spray, oral paracetamol tablet as pain reliever, and amoxicillin oral tablets as prophylactic antibiotic.

Patients' silicone tubes were removed in the 3rd month at the earliest. After this removal, the patients were called for the controls in the 1st, 3rd, and 6th month and in the 1st year, and their epiphoras were evaluated. The success of the surgery was evaluated objectively and subjectively. Objectively, nasolacrimal canal opening was assessed on the basis of the view of the fluid that was given through the punctum with an injector in the endoscopic nasal examination. Subjective evaluation was made by querying about their epiphoras during the control examination of the patients. The patients included in the study were those who had been followed-up for at least 12 months.

In addition to the objective evaluation of the success of the surgery, an outcome evaluation and satisfaction questionnaire was employed for both the groups of patients. In this questionnaire, the patients were asked questions under two main headings. The first was evaluating the "functional and esthetic satisfaction" of the patient and the second was evaluating the status of "recommending the operation to relatives/acquaintances." The questionnaire was applied face to face or via telephone.

Surgical Technique

END-DCR: The operation was started with a zero-degree rigid nasal endoscope. Further, 1/100,000 adrenalin lidocaine was injected into the middle concha insertion of the root of the concha on the lateral nasal wall and maxillary line. With the help of a sickle knife and elevator, approximately 1 cm^2 of the mucosal flap starting from the front of the middle concha insertion site and extending to the caudal was elevated together with the periosteum, cut, and removed. After the frontal projection of the lacrimal bone and maxillary bone was exposed, a bone window of approximately 1 cm^2 was formed by means of Kerrison or gouge forceps. Special attention was paid to create the bone window superiorly. After the medial wall of the lacrimal sac became visible, the medial wall of the sac was pushed with a metal probe through the lower punctum and was made convex, and then the caudal end of the sac was incised vertically with a sickle knife. The medial wall of the sac was taken out with the help of a sickle knife and cutting forceps. Subsequently, silicone stents were inserted through the lower and upper puncta and the silicone tips were connected. The operation site was washed with physiological saline solution and the process was terminated.

EXT-DCR: The operation was started by dilating the upper and lower puncta under general anesthesia. A 10-15-mm skin and subcutaneous incision was made above the upper part of the medial canthal ligament insertion site, starting from a distance of 8-10 mm from the medial canthus, parallel to the root of the nose. Periosteum was reached with blunt dissection. The periosteum was dissected using a periosteum elevator. Then, the lacrimal sac was taken out of the lacrimal fossa. Osteotomy was initiated by breaking the anterior base of the lacrimal fossa. A 16×14 mm bone window was created using Kerrison forceps. Flaps were formed from the lacrimal sac and nasal mucosa. The single-flap technique was employed. While the upper flaps were made longer, the lower flaps were cut and removed. Silicone tubes were passed through the upper and lower puncta and connected; the tips of the tubes remained in the nose. The flaps of the lacrimal sac and nasal mucosa were sutured with 6/0 Vicryl. The skin and subcutaneous tissue were continuously sutured with 6/0 Vicryl and the operation was terminated.

Statistical analysis

Statistical Package for the Social Sciences 20 (SPSS Inc.; Chicago, Illinois, USA) was used for the statistical analysis. When the data did not meet the parametric assumptions, the groups were compared using the Mann–Whitney U-test, which is a non-parametric test, and the chi-square test. Here $p<0.05$ was considered to be statistically significant.

Results

The demographic data, postoperative outcomes, and complications for both the groups are summarized in Table 1.

Endoscopic group: In this group, there were a total of 46 patients, three of whom were bilateral and 43 were unilateral. Simultaneous nasal surgery (septoplasty in four patients, septoplasty + endoscopic sinus surgery in one patient) was performed in five patients with END-DCR. The mean follow-up period of the patients was 26.06±8.09 months (12-40 months). In three patients, there was postoperative mild nasal bleeding that was controlled with a conservative method. In two patients, laceration occurred in the lower punctum, which did not lead to a functional problem in the patients. At the end of the follow-up period, it was found that the complaints of epiphora completely recovered in 39 (84.7%) patients who underwent END-DCR, but the complaints still continued in seven (15.3%) patients. The results of the outcome evaluation and satisfaction questionnaire prepared for END-DCR are presented in Table 2.

External group: In this group, there were a total of 43 patients, two of whom were bilateral. The mean follow-up period of the patients was 30.86±13.14 months (ranging from 12 to 48 months). There was postoperative mild bleeding in one patient and laceration in the lower punctum in another. Punctum rupture did not cause a functional problem. At the end of the follow-up period, it was found that the complaints of epiphora completely recovered in 39 (90.6%) patients who underwent EXT-DCR, but the complaints still continued in 4 (9.4%) patients. The results of the outcome evaluation and satisfaction questionnaire prepared for EXT-DCR are presented in Table 2.

Table 1. Demographic data, postoperative results, and complications

	Endoscopic (46)	External (43)	p
Age (years), mean, and standard deviation	52.54±17.23	50±17.06	0.486
Gender (Female / Male)	35/11	37/6	0.23
Follow-up duration (month), mean, and standard deviation	26.06±8.09	30.86±13.14	0.04
Epiphora	7	4	0.397
Postoperative bleeding	3	2	0.532
Punctum damage	2	1	0.526
Synechia	1	-	0.517

Comparison of the results of the END-DCR and EXT-DCR groups: There was no statistically significant difference between the two groups in terms of age and gender. However, the number of female patients was higher than the number of male patients in both the groups, and this was statistically significant (p=0.01 in the END-DCR group and p=0.001 in the EXT-DCR group). There was no statistically significant difference between the two groups in terms of postoperative bleeding and punctum damage (p=0.532 for postoperative bleeding and p=0.526 for punctum damage). While the success rate was 84.7% in the END-DCR group, it was 90.6% in the EXT-DCR group; however, there was no statistically significant difference between the two groups (p=0.397).

In the results of the questionnaire directed to both groups, there was no significant difference between the groups in terms of overall satisfaction rate with the operation (p=0.397). When we questioned about the importance of postoperative scarring, while the percentage of patients who thought that the scar was significant was (46/46) 100% in the END-DCR group, it was (14/43) 32.5% in the EXT-DCR group (Table 2). To the question of "Which surgical option do you recommend to your relatives?", while 39 patients (84.7%) responded as END-DCR and 6 patients (13.9%) as EXT-DCR in the END-DCR group, 1 patient (2.3%) remained undecided; further, 13 patients (30.3%) responded as EXT-DCR and 30 patients (69.7%) stated that they were undecided in the EXT-DCR group.

In response to the question "Have you been offered other surgical options?", all the patients (46/46) in the END-DCR group gave the answer "yes" and all the patients (43/43) in the EXT-DCR group gave the answer "no" (Table 2).

In response to the question "Would you have thought about another surgical option if you had been offered?", all the patients in the EXT-DCR group gave the answer "yes" (Table 2). This question was asked since the EXT-DCR option had already been offered to the entire END-DCR group.

Table 2. Comparative survey results of END-DCR and EXT-DCR

Questions	END-DCR (46)		EXT-DCR (43)		p
	Yes	No	Yes	No	
Do you have watering of eyes?	7 (15.3%)	39 (84.7%)	4 (9.4%)	39 (90.6%)	0.397
Are you satisfied with the operation in general?	39 (84.7%)	7 (15.3%)	39 (90.6%)	4 (9.4%)	0.397
Is postoperative scarring important for you?	46 (100%)	0 (0%)	14 (32.5%)	29 (67.5%)	0.00
Did the surgery leave a scar that disturbs you?	46 (100%)	0 (0%)	1 (2.3%)	42 (97.7%)	-
Was the endoscopic DCR option offered?	-	-	0 (0%)	43 (100%)	-
Would you have thought about if the endoscopic DCR option had been offered to you?	-	-	43 (100%)	0 (0%)	-

END-DCR: endoscopic dacryocystorhinostomy; EXT-DCR: external dacryocystorhinostomy

Discussion

EXT-DCR has been accepted as the gold standard for 100 years in the treatment of nasolacrimal duct obstruction (1). However, it is an undeniable fact that the interest in END-DCR has increased over the years (13, 14). The debate over which method is better has been going on for years. The supporters of the EXT-DCR method claim to have higher rates of success and patient satisfaction (5). One of the greatest disturbances of patients in this method is the possibility of scarring on their faces. However, experienced surgeons think that wound healing in this area is excellent and there is a scar formation that does not disturb the patient (4, 5, 15, 16). In the study in which they evaluated the scar formation after EXT-DCR, Devoto et al. (15) reported that the scar could not be seen with the naked eyes in 44% of patients after 6 months, a minimal scar remained in 47% of patients, a moderate scar remained in 9% of patients, no large scar was formed in any of the patients, and all the patients were satisfied with the appearance of their scars. In another study, Davies et al. (16) reported that in their series of 72 patients, only 4.2% of the patients had visible scars, no remarkable scar was formed in any patients, and none of the patients were unhappy with his/her scar. In a meta-analysis, 554 EXT-DCR procedures were evaluated and the unacceptable rate of scarring for the patient was found to be 10.8% (6). In our study, it was reported that no visible scarring remained in (37/43) 86.1% of the patients who underwent EXT-DCR and a very small scar remained in (6/43) 13.9% of the patients. However, none of the patients expressed dissatisfaction. As a result of our survey, it was noted that the young population (age range: 20-55), constituting 32.5% of the patient group, stated that it was important not to have postoperative scarring. When our study was evaluated besides the general publications, it is noteworthy that the rate of scarring that would lead to patient dissatisfaction is very low. However, we think that END-DCR may be recommended to avoid this risk, particularly in the younger population with the fear of scarring.

Bleeding and infection that are among postoperative complications can be seen in both surgical options. While Çokkeser et al. (13) observed no signs of postoperative bleeding in the END-DCR group, they reported the rate of postoperative bleeding as 18% in the EXT-DCR group. In another study, it was reported to be 4.6% in the EXT-DCR group and 5.5% in the END-DCR group (4). In this study, the author stated that they employed a packing, which was removed after one day in the patients. Gauba (17) reported no difference in either group in terms of postoperative bleeding. It was reported that there was no statistically significant difference between the two methods in terms of postoperative bleeding in a review of the studies comparing the two methods (18). In our study, while the postoperative bleeding was 6.5% in the END-DCR group, it was 4.6% in the EXT-DCR group. These findings were similar to the literature. Routine nasal packing was not used in either group in our study.

Other postoperative complications are infection, synechiae, ectropion, and punctum damage. The risk of infection is quite low in both groups (1). Dolman (4) reported that no infection was observed in the END-DCR group, and it was encountered at the rate of 1.3% in the EXT-DCR group. In our study, infection was not seen in either group. However, the lower punctum was damaged due to the tension of the silicone tube in one patient in each group. Synechiae (between the middle concha and the lateral nasal wall) occurred in one (2.1%) patient in the END-DCR group. This situation made it difficult to remove the silicone tube in the postoperative period and the problem was resolved by opening the synechiae under local anesthesia. Allen et al. (19) reported that there was synechiae in three cases after END-DCR in their study of 242 cases. Fayet et al. (20) reported that only two patients had synechiae in their series of 300 cases. In the literature, very rare complications such as retrobulbar hemorrhage, orbital emphysema, medial rectus paresis, and orbital fat herniation have been reported for both approaches (4, 21). None of the patients had such complications in our study.

Regardless of which surgical technique is chosen, the primary objective of the surgery is to correct the patient's symptoms without any complications. The correction of epiphora and the prevention of dacryocystitis episodes can be considered as the success criteria in DCR. Very different success rates have been reported in the literature for both methods (4-9). In a study, the authors suggested that the reason for such varying success rates was that there were no standard and objective methods to measure the results. It has also been emphasized in this article that the elimination of symptoms and the anatomical patency of the ostium were evaluated as success criteria in many studies (21). However, the patient's interpretation is subjective in symptom questioning and symptomatic relief may not always be warranted in patients who have anatomical patency of the ostium, which is presented as an objective evaluation (1). In our study, the success of the operation was similarly evaluated with the examination of the patency of the ostium by performing lavage through the punctum and with questioning the patient's epiphora.

While the success rate in our study was 84.7% in the END-DCR group, it was 90.6% in the EXT-DCR group, and no statistically significant difference was found between the two groups. The success rate in EXT-DCR has been reported to be between 85% and 99% in some studies in the literature (22-24). The success rates of END-DCR range from 80% to 94% (13, 24-26). In their study in which a silicone tube was not used, Ünlü et al. (25) reported that the success of END-DCR was the same as that in patients in whom the tube was placed. However, there are studies reporting that the placement of the tube increases the success rate (27). Syed et al. (28) reported that they achieved a success rate of (31/33) 94% in END-DCR in which they used a silicone tube and a success rate of (25/30) 83% in END-DCR in which no silicone tube was used; however, this difference was not statistically significant. In our study, silicone tubing was employed in all the patients in both groups, and the tubes were removed in the third month at the earliest. Kong et al. (29) reported that the removal of the silicone tubing earlier than 2 months had a positive effect on the success rate. There are also studies reporting that the granulation tissues around the tube depending on keeping the silicone tube for longer than 3 months are among the causes that increase

failure (30). In a study emphasizing that the surgical experience is another factor affecting the success rate, it was reported that the success rate with experienced surgeons was over 94% and it fell down to 58% with inexperienced surgeons (31). Mannor and Millman (32) reported that the success rate in cicatrized sacs was reduced to 29%.

In the questionnaire we employed, it was observed that the rate of overall satisfaction with the operation was correlated with the functional success rate in both groups. While there was a correlation between the success rate and the responses to the question of "Which surgery option would you recommend to your relatives/acquaintances?" in the END-DCR group, 69.7% patients in the EXT-DCR group remained undecided. We attribute this to the fact that the END-DCR option was not presented to the EXT-DCR group. This is because all patients in the EXT-DCR group stated that they could think about if they had been given the option of END-DCR. In our study, the subject of "recommendation to friend" was found high (96%) in the END-DCR group, which is in accordance with the study of Ozer and Ozer (12). These results show us the importance of presenting alternative surgical techniques to patients. However, one of the weaknesses of our study was that laser DCR was not presented to the patients because the current hospital facilities did not offer it.

Conclusion

As in many publications in the literature, the success rates of both surgical methods are similar. Both of these techniques have advantages and disadvantages. It is also true that in recent years, there has been an increased interest in END-DCR, particularly in patients with the fear of scarring. Despite the small number of our patients in comparison with the studies in the literature, the functional success at the end of the surgery is the main factor determining patient satisfaction, no matter which method is preferred. We believe that it would be more appropriate to leave the preference to the patient after offering both surgical options to the patients who have operation indication.

Ethics Committee Approval: Ethics committee approval was received for this study from the local ethics committee (2016/03, 16-KAEK-016).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author contributions: Concept - B.T.S., E.S.; Design - B.T.S., S.A.; Supervision - H.D.D.; Resource - G.G., B.T.; Materials - G.G., B.T.; Data Collection and/or Processing - B.T.S., E.S.; Analysis and/or Interpretation - E.S.; Literature Search - H.D.D., H.S.; Writing - B.T.S., S.A.; Critical Reviews - H.S.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

1. Grob SR, Campbell A, Lefebvre DR, Yoon MK. External versus endoscopic endonasal dacryocystorhinostomy. Int Ophthalmol Clin 2015; 55: 51-62. [CrossRef]
2. Bartley GB. The pros and cons of laser dacryocystorhinostomy. Am J Ophthalmol 1994; 117: 103-6. [CrossRef]
3. Savino G, Battendieri R, Traina S, Corbo G, D'Amico G, Gari M, et al. External vs. endonasal dacryocystorhinostomy: has the current view changed? Acta Otorhinolaryngol Ital 2014; 34: 29-35.
4. Dolman PJ. Comparison of external dacryocystorhinostomy with nonlaser endonasal dacryocystorhinostomy. Ophthalmology 2003; 110: 78-84. [CrossRef]
5. Tarbet KJ, Custer PL. External dacryocystorhinostomy. Surgical success, patient satisfaction, and economic cost. Ophthalmology 1995; 102: 1065-70. [CrossRef]
6. Huang J, Malek J, Chin D, Snidvongs K, Wilcsek G, Tumuluri K, et al. Systematic review and meta-analysis on outcomes for endoscopic versus external dacryocystorhinostomy. Orbit 2014; 33: 81-90. [CrossRef]
7. Mekonnen W, Adamu Y. Outcome of external dacryocystorhinostomy in Ethiopian patients. Ethiop Med J 2009; 47: 221-6.
8. Mantynen J, Yoshitsugu M, Rautiainen M. Results of dacryocystorhinostomy in 96 patients. Acta Otolaryngol Suppl 1997; 529: 187-9. [CrossRef]
9. Ben Simon GJ, Joseph J, Lee S, Schwarcz RM, McCann JD, Goldberg RA. External versus endoscopic dacryocystorhinostomy for acquired nasolacrimal duct obstruction in a tertiary referral center. Ophthalmology 2005; 112: 1463-8. [CrossRef]
10. Çukurova I, Özkul D, Arslan İB, Ciğer E, Aydın M. Endoskopik dakriyosistorinostomi sonuçlarımız. Turk Arch Otorhinolaryngol 2005; 43: 28-31.
11. Whittet HB, Shun-Shin GA, Awdry P. Functional endoscopic transnasal dacryocystorhinostomy. Eye (Lond) 1993; 7: 545-9. [CrossRef]
12. Ozer S, Ozer PA. Endoscopic vs external dacryocystorhinostomy-comparison from the patients' aspect. Int J Ophthalmol 2014; 7: 689-96.
13. Cokkeser Y, Evereklioglu C, Er H. Comparative external versus endoscopic dacryocystorhinostomy: results in 115 patients (130 eyes). Otolaryngol Head Neck Surg 2000; 123: 488-91. [CrossRef]
14. Massaro BM, Gonnering RS, Harris GJ. Endonasal laser dacryocystorhinostomy. A new approach to nasolacrimal duct obstruction. Arch Ophthalmol 1990; 108: 1172-6. [CrossRef]
15. Devoto MH, Zaffaroni MC, Bernardini FP, de Conciliis C. Postoperative evaluation of skin incision in external dacryocystorhinostomy. Ophthal Plast Reconstr Surg 2004; 20: 358-61. [CrossRef]
16. Davies BW, McCracken MS, Hawes MJ, Hink EM, Durairaj VD, Pelton RW. Tear trough incision for external dacryocystorhinostomy. Ophthal Plast Reconstr Surg 2015; 31: 278-81. [CrossRef]
17. Gauba V. External versus endonasal dacryocystorhinostomy in a specialized lacrimal surgery center. Saudi J Ophthalmol 2014; 28: 36-9. [CrossRef]
18. Lee DW, Chai CH, Loon SC. Primary external dacryocystorhinostomy versus primary endonasal dacryocystorhinostomy: a review. Clin Experiment Ophthalmol 2010; 38: 418-26. [CrossRef]
19. Allen KM, Berlin AJ, Levine HL. Intranasal endoscopic analysis of dacrocystorhinostomy failure. Ophthal Plast Reconstr Surg 1988; 4: 143-5. [CrossRef]
20. Fayet B, Racy E, Assouline M. Complications of standardized endonasal dacryocystorhinostomy with unciformectomy. Ophthalmology 2004; 111: 837-45. [CrossRef]

21. Karim R, Ghabrial R, Lynch T, Tang B. A comparison of external and endoscopic endonasal dacryocystorhinostomy for acquired nasolacrimal duct obstruction. Clin Ophthalmol 2011; 5: 979-89. [CrossRef]
22. Becker BB. Dacryocystorhinostomy without flaps. Ophthalmic Surg 1988; 19: 419-27.
23. Hehar SS, Jones NS, Sadiq SA, Downes RN. Endoscopic holmium:YAG laser dacryocystorhinostomy-safe and effective as a day-case procedure. J Laryngol Otol 1997; 111: 1056-9. [CrossRef]
24. Duwal S, Saiju R. Outcomes of external dacryocystorhinostomy and endoscopic endonasal dacryocystorhinostomy in the management of nasolacrimal duct obstruction. Nepal J Ophthalmol 2015; 7: 39-46. [CrossRef]
25. Unlu HH, Toprak B, Aslan A, Guler C. Comparison of surgical outcomes in primary endoscopic dacryocystorhinostomy with and without silicone intubation. Ann Otol Rhinol Laryngol 2002; 111: 704-9. [CrossRef]
26. Toplu Y, Balbaba M, Kalcioglu MT, Ozcan K. Our results of endoscopic dacryocystorhinostomy and bicanalicular silicone tube intubation surgery. Kulak Burun Bogaz Ihtis Derg 2012; 22: 136-40. [CrossRef]
27. Metson R, Woog JJ, Puliafito CA. Endoscopic laser dacryocystorhinostomy. Laryngoscope 1994; 104: 269-74. [CrossRef]
28. Syed MI, Head EJ, Madurska M, Hendry J, Erikitola OC, Cain AJ. Endoscopic primary dacryocystorhinostomy: are silicone tubes needed? Our experience in sixty three patients. Clin Otolaryngol 2013; 38: 406-10. [CrossRef]
29. Kong YT, Kim TI, Kong BW. A report of 131 cases of endoscopic laser lacrimal surgery. Ophthalmology 1994; 101: 1793-800. [CrossRef]
30. Tas E, Dogan M, Eren Y, Vural S, Gürsel AO. Endoskopik Endonazal Dakriosistorinostomi Sonuçlarımız. KBB-Forum 2004; 3: 80-5.
31. Onerci M. Dacryocystorhinostomy. Diagnosis and treatment of nasolacrimal canal obstructions. Rhinology 2002; 40: 49-65.
32. Mannor GE, Millman AL. The prognostic value of preoperative dacryocystography in endoscopic intranasal dacryocystorhinostomy. Am J Ophthalmol 1992; 113: 134-7. [CrossRef]