Outcome of External Dacryocystorhinostomy with Bicanalicular Silicone Tube Stenting

Eksternal Dakriosistorinostomi Ameliyatlarında Silikon Tüp Entubasyonu'nun Etkinliği

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ABSTRACT

Objective: To evaluate the clinical outcomes of patients with nasolacrimal duct obstruction treated with external dacryocystorhinostomy and bicanalicular silicone intubation stenting.

Methods: The patients were grouped as follows: Group 1, complicated cases with intubation; Group 2, complicated cases without intubation; Group 3, non-complicated cases with intubation; and Group 4, non-complicated cases without intubation. Cases without epiphora, demonstrated with free-flow lacrimal irrigation, were deemed as successful cases. Failure was defined as lack of any improvement of the symptoms. Complications related to the surgical procedure were also investigated.

Results: In total, 223 external dacryocystorhinostomy procedures were performed on 201 patients. In the evaluation of complicated cases, the success rates in Groups 1 (silicone tube stenting group) and 2 (non-stenting group) were 90.9% and 77.8%, respectively ($p<0.05$). In the evaluation of non-complicated cases, the success rates in Groups 3 (silicone tube stenting group) and 4 (non-stenting group) were seen to be 96.2% and 98.9%, respectively ($p>0.05$). In 15 (13.8%) out of 108 cases who had had bicanalicular silicone tube intubation, stent displacement was observed. Lower and upper punctal synechiae developed in 1 of 6 cases with punctal complications. In 14 failed cases, successful results were obtained with external DCR and bicanalicular silicone stent intubation.

Conclusion: Stenting in complicated cases increases the success rates of dacryocystorhinostomy significantly. However, we detected that in complicated cases, especially in the absence of anterior flaps, stenting does not increase success rates, contrary to posterior flap loss. No effect of stenting in non-complicated cases on surgical success rates could be demonstrated. *(JAREM 2014; 4: 88-92)*

Key Words: Dacryocystorhinostomy, nasolacrimal duct obstruction, stenting, bicanalicular silicone intubation, complicated, non-complicated

ÖZET

Amaç: Bikanaliküler silikon tüp entubasyonunun (BSE), Eksternal dakrisistorinostomi (Eksternal DSR) ameliyatlarının başarısındaki etkinliğini değerlendirmek.

Yöntemler: Nazolakrimal kanal tıkanıklığı nedeniyle Eksternal DSR uygulanan 201 hastanın 223 gözü sonuçları retrospektif olarak incelendi. Olgular 1. Grup; komplike + silikon stent konan (n: 55 göz), 2. Grup; komplike olup silikon stent konmayan (n: 27 göz), 3. Grup; nonkomplike + silikon stent konan (n: 53 göz) ve 4. Grup; nonkomplike olup silikon stent konmayan (n: 88 göz) olmak üzere dört gruba ayrıldı. Lakrimal kesesi küçük veya yapışıklıkları olan, lipidollu grafide dolma defekti olan, peroperatif flep yokluğu olan ve nüks olgular komplike olarak kabul edildi. Eksternal DSR ameliyatları Dupuy-Dutemps tekniğine uygun olarak yapıldı. Silikon stentler 2. ayda çekildi. Takiplerde epifora varlığı sorgulanıp lakrimal irrigasyon yapıldı. Ortalama takip süresi 1,7 yıl idi (6 ay-3 yıl).

Bulgular: Hastaların 129'u kadın, 72'si erkekti. Yaş ortalaması 51.3 (9-73) idi. Komplike olguları aldığımız birinci grupta %90,9 başarı görülürken, ikinci grupta %77,8 başarı görüldü ve aralarındaki fark anlamlı bulundu. ($p>0,05$) Nonkomplike olguları aldığımız üçüncü grupta %96,2 başarı görülürken, dördüncü grupta %98,9 başarı görüldü ve aralarındaki fark anlamlı bulunmadı ($p<0,05$).

Sonuç: Silikon tüp entubasyonu lakrimal kanal cerrahisinde önemli bir yere sahiptir. Özellikle komplike vakalarda silikon stent uygulaması başarıyı artırmaktadır. Komplike olmayan olgularda ise başarı üzerine etkisi olmadığı görülmüştür. *(JAREM 2014; 4: 88-92)*

Anahtar Sözcükler: Eksternal dakriosistorinostomi, silikon, bikanaliküler stent entubasyonu, stent, komplike, nonkomplike

INTRODUCTION

Dacryocystorhinostomy (DCR) has been the treatment of choice for patients with chronic stenosis and obstruction of the nasolacrimal duct for more than 100 years. External dacryocystorhinostomy (EXT-DCR) was first described in 1904 by Addeo Toti, who described exposure of the sac via a small skin incision and absorption of that part of the sac adjacent to the canaliculi into the nasal cavity (1). In 1921, Dupuy-Dutemps and Bourget modified this technique by advocating an edge-to-edge anastomosis between the lacrimal sac and the nasal mucosa (via flaps) over the bony margins of the formed ostium, thus constructing an epithelium-lined tract (2). With the exception of minor alterations, EXT-DCR is still performed in much the same way.

The success rate of DCR has improved over the years as a result of better preoperative assessment, including radiological investigation of the nasolacrimal system, absorbable and less irritating suture materials, and improved instruments and anesthetic procedures. To increase the success rate of DCR techniques, silicone

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intubation has been brought to the agenda. In 1950, Henderson described the use of 1-mm-diameter polyethylene tubing in the treatment of strictures of the lacrimal canaliculi, in combination with Toti-style EXT-DCR (3). Huggert was the first to describe bicanalicular intubation in 1959, albeit using polyethylene tubing, with tubes being secured in the nose and bridging the gap between upper and lower punctae in the standard modern fashion (4). The success of EXT-DCR has been variable in the literature, with most series having a rate of greater than 90% (5, 6). However, there are a variety of reasons that account for the differences in success rates, including surgical technique in different centers, patient selection, demographics, definitions of success, and the etiology of nasolacrimal dysfunction.

The present study aimed to prospectively evaluate the clinical outcomes of patients with nasolacrimal duct obstruction treated with bicanalicular silicone intubation stenting.

MATERIALS AND METHODS

Study Design

The study was approved by the appropriate ethics authority. Written informed consent was obtained from all subjects or a legal surrogate, or the requirement for written informed consent was waived by the ethics committee. The records of EXT-DCR procedures that were performed were retrospectively studied. The patients' main symptoms were moderate to severe epiphora. Lacrimal system irrigation was applied for all patients presenting with complaints of epiphora. The diagnosis was supported by dacryocystograms obtained after instillation of 480 mg/mL radioopaque iodine into the sac. Otorhinolaryngological preoperative assessment included full endoscopic examination of the nasal cavities, looking for evidence of mucosal disease, including polyps, particularly in the middle meati. Inclusion criteria were cases with acquired nasolacrimal sacs and duct obstructions, chronic dacryocystitis, lacrimal sac mucocele, traumatic dacryostenosis, and congenital nasolacrimal duct obstruction unrelieved by probe and silicone tube intubation. Patients with acute dacryocystitis, suspicion of malignancy, and previous radiation therapy were excluded from the study. Cases with the presence of small lacrimal sac or intrasaccular adhesions, preoperative absence of anterior or posterior flap, fistulous dacryostenosis, recurrent dacryostenosis, posttraumatic dacryostenosis, and common canalicular stenosis were accepted as *complicated*. Cases with the presence of lacrimal sacs larger than 10-15 mm and preoperative anterior and/or posterior flap loss were accepted as non-complicated. The patients were grouped as follows: Group 1, complicated cases with intubation (55 eyes); Group 2, complicated cases without intubation (27 eyes); Group 3, non-complicated cases with intubation (53 eyes); and Group 4, non-complicated cases without intubation (88 eyes).

Surgical Procedure

All patients had surgery under general anesthesia. We performed external dacryocystorhinostomy by using the Dupuy-Dutemps and Bourguet technique (2). Lower and upper puncta were dilated. Lacrimal irrigation was performed. Nasal packing was done with gauze socked in 2% lidocaine and 1/100.000 adrenaline. Proper packing of the nasal cavity helped in anesthetizing the mucosa, achieving good hemostasis, and providing good exposure of the nasal mucosa during surgery. A 10-15-mm-long, slightly oblique skin incision was performed lateral to the angular vessels, 8-10 mm away from internal canthal ligament, parallel to the nasal root. After approaching the periosteum with blunt dissection, fiber orbicular muscles on the periosteum were separated. A fixation suture with 6/0 vicryl was placed on the internal canthal ligament, and the ligament was dissected. The periosteum was dissected using a periosteal elevator. The lacrimal sac was exposed and dissected away from the lacrimal fossa. A 14-16-mm-sized bone window with regular contours was created on the lacrimal bone using a Universal brand dental burr. "H" shaped anterior and posterior flaps of the nasal mucosa and lacrimal sac were formed. The posterior flaps of the nasal mucosa and lacrimal sac were stitched together with 6/0 vicryl sutures. Bicanalicular silicone tubes were inserted and secured with a sleeve. The anterior flaps of the nasal mucosa and lacrimal sac were stitched. The dissected internal canthal ligament was re-sutured in situ on the periosteum. The skin incision was closed with three 6/0 vicryl sutures.

Postoperative Follow-up

The patients were monitored on postoperative day 1, week 1, months 1 and, and then every 3 months. Sutures were removed on the 7th day. Silicone stents were withdrawn at postoperative month 1. At 1 week postoperatively, oral antibiotherapy (amoxycillin+clavulanic acid 1000 mg b.i.d), analgesics, anti-inflammatory drugs (naproxen sodium 550 mg b.i.d), and topical tobramycin pomade x5/d were used. To avoid potential development of allergic conditions against silicone tube and to prevent obstruction of the osteotomized area with inflammatory lesions triggered by allergic reactions, topical steroids (fluorometholone acetate 0.1% x4/d) were used up to the removal of the silicone tube. Antiallergic treatment was employed for cases with allergic conjunctivitis and rhinitis for 3 months. To avoid possible side effects, such as cataract, and glaucoma, fluorometholone group steroids were preferred.

Outcome Measures

Only patients who were followed up for >2 months after the removal of the silicone tube(s) were included in this study. At each physical examination, lacrimal irrigations were performed, and the patients were interrogated as to the presence of epiphora. We evaluated age, gender, the operated side, and the effects of silicone intubation on the surgical results. Objective outcome measures were obtained by patency testing after lacrimal system irrigation. Cases without epiphora, demonstrated with free-flow lacrimal irrigation, were deemed successful cases. Failure was defined as lack of any improvement in the symptoms. Complications related to the surgical procedure were also investigated.

Statistical Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) software (version 10.0 for Windows). All differences associated with a chance probability of .05 or less were considered statistically significant. Chi-square and Mann-Whitney U-tests were performed on nominal data.

RESULTS

In total, 223 EXT-DCR procedures were performed on 201 patients. The patients, 129 (64.2%) females and 72 (35.8%) males, ranged in age from 9 to 73 years (mean 51.3±10.7). Age, sex,

Table 1. Demographic variables among groups

	Group 1 (n=55)	Group 2 (n=27)	Group (n=53)	Group 4 (n=88)
Age (mean±SD)	45.86±15.7	42.96±18.02	51.3±20.1	48.2±16.1
Gender (M/F)	25/30	15/12	29/24	40/48
Side (R/L)	21/34	10/17	27/26	47/41

M: male; F: female; R: right; L: left

Table 2. Success and recurrence rates among groups

	Group 1	Group 2	Group 3	Group 4
Achieved patency	50/55 (91%)	21/27 (77.8%)	51/53 (96.2%)	87/88 (98.9%)
Recurrence of epiphora	5/55 (9.0%)	6/27 (22.0%)	2/53 (3.7%)	1/88 (1.1%)
p value	p<0.05	p>0.05		

Table 3. Postoperative complications among groups

	Group 1	Group 2	Group 3	Group 4
Loss of the silicone tube	6/55 (10.9%)	-	8/53 (15.0%)	-
Punctal erosion	5/55 (9.4%)	-	1/53 (1.8%)	-
Granulation tissue	3/55 (5.4%)	4/27 (14.8%)	1/53 (1.8%)	1/88 (1.1%)
Intranasal synechia	2/55 (3.6%)	2/27 (7.4%)	1/53 (1.8%)	-
Dacryocystitis	1/55 (1.8%)	2/27 (7.4%)	1/53 (1.8%)	-
Epistaxis	3/55 (5.4%)	2/27 (7.4%)	1/53 (1.8%)	1/88 (1.1%)
Total	20/55 (36.3%)	10/27 (37.0%)	13/53 (24.5%)	2/88 (2.2%)

and side were found to have no statistical significance among groups (p≥0.05). The distribution of case characteristics among the 4 study groups are shown in Table 1. The mean follow-up period was 21 (range 6 to 36) months.

Functional success was assessed as described earlier. In the evaluation of complicated cases, success rates in Groups 1 (silicone tube stenting group) and 2 (non-stenting group) were 90.9% and 77.8%, respectively. The difference between groups was statistically significant (p<0.05). In the evaluation of non-complicated cases, success rates in Groups 3 (silicone tube stenting group) and 4 (non-stenting group) were seen to be 96.2% and 98.9%, respectively. The difference between groups was not statistically significant (p>0.05) (Table 2).

In Group 1, absence of posterior and anterior flaps was detected in 21 (38.1%) and 4 cases (7.2%), respectively. In this group, all cases (100%) without anterior flaps recurred. Only 1 case (4.8%) out of 21 cases without posterior flaps demonstrated recurrence.

In Group 2, absence of posterior and anterior flaps was detected in 12 (44.4%) and 5 (18.5%) cases, respectively. All cases without anterior flaps recurred. Three cases (25%) without posterior flaps manifested recurrences. Recurrence rates in cases without anterior flaps were statistically significant when compared with those without posterior flaps (p<0.05).

Postoperative complications, such as loss of the silicone tube, punctal erosion, granulation tissue, intranasal synechiae, dacryocystitis, and epistaxis, are presented in Table 3. In 15 (13.8%) out of 108 cases who had had bicanalicular silicone tube intubation, stent displacement was observed. Silicone tubes of 13 cases were repositioned because of the development of corneal irritation. Silicone stents were re-intubated in 2 cases who had removed their silicone tubes. Lower and upper punctal synechiae developed in 1 of 6 cases with punctal complications. This case underwent synechiotomy operation. In a total of 5 cases (2.2%), synechiae formed on the ostial region, between the ostium and middle concha. We thought that this synechia developed because of traumatic manipulations during silicone tube intubation. In 14 failed cases, successful results were obtained with external DCR and bicanalicular silicone stent intubation.

DISCUSSION

The aim of the present study was to prospectively evaluate the clinical outcome of patients with nasolacrimal duct obstruction treated with bicanalicular silicone intubation stenting. The demographic characteristics of our patient population were similar to those described by others. Nasolacrimal outflow obstruction is much more common in women than in men and is associated with advanced age. In the present study, we analyzed 201 surgically treated cases of lacrimal drainage system disorders. From the general data, the majority of treated patients (64.2%) were female, and 35.8% was male. A similar female preponderance was also shown by Mortimore et al. (7) (74%), Unlu et al. (8) (76%), and Soler Machin et al. (9) (73.91%). The mean age of the patients was 51.3±10.7 years (range 9 to 73 years). Mortimore et al. (7) reported that the mean age of their patients was 34 years, Unlu et al. (8) reported a mean age of 34 years, and Soler Machin et al. (9) reported a mean age of 65 years.

Stenting of the nasolacrimal drainage system with a silicone tube has been used in conjunction with DCR in cases expected to carry a higher risk of failure. The purpose of the stent in the nasolacrimal system is to prevent adhesion of the mucosal lining of the channels during the healing process and to maintain long-term patency after removal. Despite these advantages of silicone stents, complications, such as peripunctal granulation, erosions of puncta and canaliculi, chronic nasal irritation, corneal erosion, canalicular laceration, interpunctal symplepharon, inflammatory mass, and pyogenic granuloma formation, have been reported (10). In addition to these complications, some articles indicating that silicone stents induce formation of granulation tissue on the anastomotic site, decreasing the success rate of DCR operations, have been published. During their intranasal endoscopic examinations, Allen et al. (11) detected granulation tissue on the anastomotic site secondary to intranasal tube placement. They reported that these granulomas that form around the mucosal opening might be related to microtraumas induced by silicone tube. In their study, they reported failure rates of 14.5% in 110

eyes intubated with silicone tubes and 5% in 79 non-intubated eyes. R Saiju et al. (12) reported a 90% success rate in 44 cases intubated with silicone tubes and 87% in non-intubated eyes. In another comparative study performed with intubated and non-intubated cases, respective success rates of 93% and 92% were reported (10). In both studies, a statistically significant difference was not found between intubated and non-intubated cases. Various studies evaluating the effectiveness of stents in complicated cases, such as fibrotic contracted sac in nasolacrimal duct obstruction, previously failed DCR operation, inadequate mucosal flaps, and contracted nasal cavity, have been found. Sodhi et al. (13) achieved a 76% success rate in 25 complicated cases and indicated that silicone tube intubation increased success rates in complicated cases. In their study encompassing 388 cases, Walland and Rose implanted (14) silicone tubes in patients with saccular inflammation or small lacrimal sacs, and canalicular disease and compared them with a non-intubated uncomplicated group, but they could not find any difference between the success rates of both groups.

Baig et al. (15) reported a success rate of 87.09% out of 62 procedures of external dacryocystorhinostomies with silicone tube intubation. Delaney and Khooshabeh (16) reported a success rate of 90% out of 50 cases with acquired partial nasolacrimal obstruction in adults treated by dacryocystorhinostomy with silicone intubation. McLachlan et al. (17) reported a success rate of 94% out of 291 dacryocystorhinostomies. Mortimore et al. (7) reported a success rate of 98.14% in 54 dacryocystorhinostomies. Kim et al. (18) reported a success rate of 95% out of 40 dacryocystorhinostomies with silicone intubation. In the present study, in the evaluation of complicated cases, success rates in Groups 1 (silicone tube stenting group) and 2 (non-stenting group) were 90.9% and 77.8%, respectively. In the evaluation of non-complicated cases, success rates in Groups 3 (silicone tube stenting group) and 4 (non-stenting group) were seen to be 96.2% and 98.9%, respectively. We agree with reports that silicone intubation is not always necessary and may predispose one to primary DCR failure by inciting granuloma formation in the nose and lacrimal fossa (11, 19). Silicone tubing should be reserved for patients at higher risk of DCR failure, such as those with co-existing canalicular disease or a small, contracted, or scarred lacrimal sac (19, 20).

Silicone tubes should be left in situ for 2-8 months. However, the optimal duration is still debatable. Rebeitz et al. (21) stated that tubes should be left in situ for 4-6 months, while Kong et al. (22) suggested removal of tubes before the 8th week so as to prevent formation of granulation. However, Haüsler et al. (23) retained the tubes for 9 months. In our study, silicone tube implantation was performed for all patients, and their tubes were removed 2 months later.

Baldeschi et al. (24) performed and compared 3 different patterns of mucosal flap design in external DCR. They performed conservative anterior and posterior flaps in 1 group, extended anterior with posterior flaps, and only anterior flaps in the other 2 groups. They measured the length of unsutured mucosal margins and stated that the length did not influence the success rates among 3 groups differing in flap design. Serin et al. (25) compared the outcomes of 2 different flap designs in a similar study, 1 involving the anastomosis of both anterior and posterior mucosal flaps and the other with excision of the posterior flaps. No difference was reported in the success rates between the groups after an 11-month follow-up period. In the present study, we divided the studied population into 2 groups as non-complicated and complicated and aimed to investigate the effectiveness of silicone stenting in both groups. Technically, since we sutured anterior and posterior flaps, we included posterior flap loss into the group with complicated cases. We thought that posterior flap loss constitutes a risk factor.

In conclusion, stenting in complicated cases increases the success rates of dacryocystorhinostomy significantly. However, we have detected that in complicated cases, especially in the absence of anterior flaps, stenting does not increase success rates, contrary to posterior flap loss. Any effect of stenting in non-complicated cases on surgical success rates could not be demonstrated.

This study aimed to evaluate the clinical outcome of patients with nasolacrimal duct obstruction treated with external dacryocystorhinostomy and bicanalicular stenting. The patients were grouped as follows: Group 1, complicated cases with intubation; Group 2, complicated cases without intubation; Group 3, non-complicated cases with intubation; and Group 4, non-complicated cases without intubation. Success rates in Groups 1 and 2 were 90.9% and 77.8%, respectively. Success rates in Groups 3 and 4 were seen to be 96.2% and 98.9%, respectively.

Ethics Committee Approval: Ethics committee approval was received for this study from Department of Ophthalmology, Istanbul Training and Research Hospital, Istanbul, Turkey (20.03.2011, 78).

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

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