



Original research

Conjunctival bacterial flora in fellow eyes of patients with unilateral nasolacrimal duct obstruction and its changes after successful dacryocystorhinostomy surgery

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Abstract

Purpose: To evaluate the results of conjunctival culture in fellow eyes of patients with unilateral nasolacrimal duct obstruction (NLDO) and its changes after successful dacryocystorhinostomy (DCR) surgery.

Methods: In this prospective study, 71 adult patients with unilateral NLDO and 41 age and sex-matched controls without NLDO were evaluated. The patients were divided into 2 groups based on clinical examination; group A with purulent regurgitation and group B without purulent regurgitation. They all underwent DCR. Before DCR surgery, microbiologic specimens were taken bilaterally from the conjunctiva of both eyes. Postoperative conjunctival sampling was continued weekly until the culture became negative or the colony count reached to the range of the control group.

Results: There were 38 and 33 patients in groups A and B, respectively. Silicone tube was inserted for 17 patients (23.9%). The culture was positive for bacterial growth in 56 fellow eyes (79%). The conjunctival culture in the control group was positive in 17 eyes (41.4%). The mean count of colonies in a sample unit was 624.73 ± 2412.31 , 195.75 ± 407.56 , and 9.5 ± 1.5 for group A, group B, and controls, respectively. The mean time of normalization of specimens was 1.43 ± 0.69 weeks (range 1–4). Higher colony count at baseline and presence of silicone tube in infected eye were significantly associated with longer normalization time for fellow eye ($P < 0.001$ and $P = 0.003$ respectively).

Conclusions: This study suggests that after successful DCR surgery, a waiting period of 4 weeks is needed for conjunctival bacterial cultures to become negative or reach the level of the normal eyes, in the fellow eyes of patients with unilateral NLDO.

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Keywords: Nasolacrimal duct obstruction; Bacteria; Dacryocystorhinostomy

Introduction

Nasolacrimal duct obstruction (NLDO) is a major clinical problem in ophthalmic practice.^{1,2} Apart from disturbing symptoms, NLDO causes a major shift in the composition of the conjunctival residing flora and overgrowth of normal and

pathologic bacteria.^{3–9} The risk of postoperative endophthalmitis increases in eyes with dacryocystitis, and the intraocular surgery should be postponed until relief of obstruction^{10–12}. Previous studies have shown that a waiting period of several weeks is needed before normalization of the conjunctival flora after successful dacryocystorhinostomy (DCR) surgery in eyes with NLDO.^{13,14}

The bacteriologic study of the conjunctival samples from both eyes of subjects with normal nasolacrimal drainage systems has shown that the bacteria of a given type were 2–10 times more likely to be cultivated from one eye if they were

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present in the fellow eye.¹⁵ In a comprehensive search in PubMed database, we could not find any study evaluating the change in the conjunctival bacterial flora in the fellow eyes of patients with unilateral NLDO. The purpose of this study was to evaluate the bacteriologic changes in the conjunctival flora in the fellow eyes of patients with unilateral NLDO and to assess the normalization time after successful DCR.

Methods

In this prospective observational study, a total of 71 adult patients with complaint of unilateral epiphora secondary to NLDO with or without pus reflux were included. The study protocol was approved by the Ethics Committee of the Farabi Eye Hospital and informed consents were obtained. Exclusion criteria were acute dacryocystitis and any extraocular disease leading to ocular infection including significant eyelid disorders, history of surgery for nasolacrimal drainage system, use of topical medications, systemic immunosuppression, and active symptomatic infection in other sites of the body. Also patients with history of epiphora in the normal fellow eyes were excluded. A complete ophthalmic examination including evaluation of lacrimal drainage system was performed. Patients were divided in 2 groups based on clinical examination. Group A were the patients with purulent reflux. Group B were the patients with NLDO without pus reflux. All patients had unilateral nasolacrimal system obstructions. A control group of 41 cataract surgery candidates, without any past ocular history and with normal ophthalmic examination except for cataract was prepared.

Standard external DCR was performed for all patients by a single surgeon (B.E.). Silicone intubation was performed in patients with upper lacrimal drainage system stenosis and when the lacrimal sac or nasal mucosal flap was inadequate for successful anastomosis. Postoperative systemic antibiotic (cephalexin 500 mg every 6 h for 5 days) and topical antibiotic (chloramphenicol 0.5% every 6 h for 10 days) were prescribed. Conjunctival specimens were obtained bilaterally from the eyes of all patients preoperatively and from 1 side of the control group. The culture procedure was according to the previously described method.¹³ Briefly, samples were obtained

by rolling a dry sterile swab against the lower conjunctival sac with great care to avoid the contact with eyelid margin and eyelashes. Each swab was immediately placed in a tube containing 1 ml thioglycollate medium. After 3 hr. of incubation, the blood agar, chocolate agar, and eosin methylene blue agar plate were inoculated with 0.1 ml incubated medium for aerobic and anaerobic cultures. After the incubation period of 48 h, colonies were differentiated and enumerated by standard bacteriologic laboratory techniques. Postoperative conjunctival specimens were obtained weekly until the result of the culture became negative or reached to the range of control group. The maximum colony count in the control group was 60 colonies of *Staphylococcus epidermidis* or *Staphylococcus saprophyticus* specimen in a sample unit which was considered as normal colonizing populations of flora. The surgery was considered successful when the regurgitation was absent and the patency of lacrimal drainage system was confirmed by free fluid passage to the nasal cavity. Patients with surgical failure were excluded. In patients in whom the cultured organisms were similar to the control group (*S. epidermidis* or *S. saprophyticus*), the normalization time was considered as the interval between DCR surgery and the time that the culture results were below the range of control group (60 colonies in a sample unit). In others, the bacterial normalization time was defined as the interval between DCR surgery and the time that the culture results were negative. Data analyzed using a SPSS software (version 16, SPSS Inc., Chicago, IL, U.S.A.). Student t-test, Mann–Whitney test and chi-square test were used for analysis. $P < 0.05$ was considered significant.

Results

Forty-seven women and 24 men with a mean age of 51.41 ± 15.56 years underwent DCR surgery. Purulent regurgitation was found in 38 eyes (53.5%). Silicone tube was inserted for 17 patients (23.9%). The culture was positive for bacterial growth in the fellow eyes in 56 patients (79%) and 46 patients (65%) have abnormal bacterial growth in the fellow eyes. Table 1 summarizes the results of the cultures obtained from the conjunctival sac of the fellow eyes.

Table 1
Isolated organisms and the colony count in fellow eyes of patients with unilateral nasolacrimal duct obstruction at baseline and the normalization time after dacryocystorhinostomy surgery.

	No. patients	No. and type of isolated organisms in fellow eye (%)	Mean \pm SD of colony count in a sample unit	Normalization time (wk)
Cases with purulent regurgitation (group A)	38 (53.5%)	<i>Staphylococcus epidermidis</i> 16 (42.1%) <i>Streptococcus viridans</i> 3 (7.9%) Further <i>As Staphylococcus aureus</i> 2 (5.3%) <i>Klebsiella</i> 1 (2.6%) <i>Diphtheroids</i> 3 (7.9%) <i>Staphylococcus saprophyticus</i> 3 (7.9%) <i>Bacillus cereus</i> 1 (2.6%) <i>Haemophilus</i> 1 (2.6%) No growth 8 (21.1%)	624.73 \pm 2412.31	1.54 \pm 0.81
Cases without purulent regurgitation (group B)	33 (46.5%)	<i>S. epidermidis</i> 13 (39.4%) <i>S. viridans</i> 5 (15.2%) <i>S. aureus</i> 3 (9.1%) <i>Diphtheroids</i> 1 (3%) <i>S. saprophyticus</i> 3 (9.1%) <i>S. pneumoniae</i> 1 (3%) No growth 8 (21.2%)	195.75 \pm 407.56	1.30 \pm 0.47
<i>P</i>			0.101	0.35

The control group was age and sex-matched with the patients ($P = 0.8$ and $P = 0.2$, respectively). The conjunctival culture in the control group was positive in 17 eyes (41.4%). The cultured organisms were *S. epidermidis* (88%) and *S. saprophyticus* (12%). The mean count of colonies obtained from conjunctival sac of the control group was 9.5 ± 1.5 (range 0–60) bacteria in a sample unit.

Colony count and type of bacteria were significantly different between fellow eye and the control group (both $P = <0.001$). In all cultured-positive patients, the cultured organism was the same before and after the surgery. The mean time of normalization of specimens was 1.43 ± 0.69 weeks. This time was 1.54 ± 0.81 weeks (range 1–4 weeks) in group A and 1.30 ± 0.47 weeks (range 1–2 weeks) in group B. The difference between the 2 groups was not statistically significant ($P = 0.35$). The time for normalization of specimens was not statistically related to the age and gender ($P = 0.98$ and $P = 0.84$, respectively); however, it was significantly related to the colony count ($P = 0.02$). The normalization time was 1.31 ± 0.52 weeks in patients with colony counts <1000 , and 2.14 ± 1.07 weeks among patients with colony counts of ≥ 1000 . This time was 1.28 ± 0.46 weeks for normal colonizing populations of flora (*S. epidermidis* or *S. saprophyticus*) and 1.62 ± 0.86 weeks for pathogenic bacterial growth ($P = 0.19$). The normalization time was 2.00 ± 0.95 and 1.23 ± 0.43 weeks with and without the silicone tube, respectively ($P = 0.003$).

Discussion

Several studies have reported that the bacterial composition of the normal human ocular surface mainly consists of *S. epidermidis*, *Staphylococcus aureus*, and *Diphtheroids*.^{16–18} Also, an increase in the rate of isolation of potentially pathogenic species such as gram-negative bacteria and anaerobes has been reported in patients with dacryocystitis.^{4,6,19,20} In our study, we found that bacterial growth was positive in 41.4% of the control eyes and limited to *S. epidermidis* and *S. saprophyticus*. This rate was 79% in normal eyes of patient with unilateral NLDO. Also, the type of bacteria and the colony count were significantly different from control eyes. This is in contrast to the findings of Owji and Khalili,¹³ who observed similar bacterial growth in normal fellow eyes of 40 patients with unilateral NLDO and 40 control eyes (positive cultures in 82.5% of controls and 97.5% of normal fellow eyes). As in real clinical situations, topical and systemic antibiotics were used after DCR surgery, in the current study we did the same, in order to have applicable results in routine clinical setting.

We previously reported the results of conjunctival culture of the involved eyes of patients with unilateral NLDO and its changes after successful DCR surgery.¹⁴ The findings are summarized in Table 2. In those patients in whom the cultured organisms were similar to the control group (*S. epidermidis* or *S. saprophyticus*), the normalization time was considered as the interval between DCR surgery and the time that the culture results were below the range of control group (60 colonies in a

Table 2

Culture results and normalization time in eyes with unilateral nasolacrimal duct obstruction, normal fellow eyes and normal controls.

	Control group	Healthy eye (patients)	Involved eye (patients) ^a
Colony count (mean \pm SD)	9.5 \pm 1.5	425.35 \pm 1788.36	3220.5 \pm 3902
Normalization time (weeks) (mean \pm SD)	NA	1.43 \pm 0.69	3.3 \pm 1.3
Bacterial growth (Number (%))	17 (41.46)	56 (79)	71 (100)
Abnormal bacterial growth (Number (%))	NA	46 (65)	71 (100)
Organism (Number (%))			
<i>Staphylococcus epidermidis</i>	15 (36.6)	29 (40.8)	24 (33.8)
<i>Staphylococcus saprophyticus</i>	2 (4.9)	6 (8.4)	4 (5.6)
<i>Staphylococcus aureus</i>	—	5 (7.3)	9 (12.6)
<i>Streptococcus viridans</i>	—	8 (11.2)	16 (22.5)
<i>Diphtheroids</i>	—	4 (5.6)	5 (7.3)
<i>Klebsiella</i>	—	1 (1.4)	4 (5.6)
<i>Bacillus cereus</i>	—	1 (1.4)	3 (4.2)
<i>Haemophilus</i>	—	1 (1.4)	1 (1.4)
<i>Streptococcus pneumoniae</i>	—	1 (1.4)	1 (1.4)
Mix	—	—	4 (5.6)
No Growth	24 (58.5)	15 (21.1)	—

^a Data extracted from our previous study.¹⁴

sample unit). In eyes with other organisms, even 1 organism was considered pathologic. Therefore, in this subset of patients, the normalization time was defined as the interval between DCR surgery and the time that the culture results were negative. We found a mean normalization time of 3.3 ± 1.3 weeks (range 1–7 weeks) for the conjunctival cultures of the involved eyes in patient with NLDO. Also, pathogenic bacterial growth, higher colony counts, the presence of silicone tube, and purulent regurgitation were significantly associated with longer normalization time. In the current report, the normalization time was 1.43 ± 0.69 weeks (range 1–4 weeks) for normal fellow eyes. Moreover, normalization time was significantly longer with higher colony counts at baseline and presence of silicone tube. The bacterial type and purulent regurgitation did not affect the normalization time.

Although biofilms on the surface of the lacrimal stents is a well-known phenomenon and may increase the probability of infection,^{21–23} in the presence of the biofilms the culture may be negative.^{24,25} Murphy J and colleagues reported that biofilm was present in nasolacrimal stents after 4 weeks, however we suggested that it's better to postpone the intraocular surgery until the removal of silicone tube.

This study has several limitations. The sample size was small. Also, we did not perform diagnostic tests for the asymptomatic fellow eyes to ensure complete patency of nasolacrimal system. Despite these limitations, we showed that the cultures were being negative in fellow eyes of patients with NLDO within 4 weeks after DCR. It seems reasonable to postpone intraocular surgery in the normal fellow eyes at least one month after successful DCR.

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