Bacterial Flora of the Conjunctiva One Year after Dacryocystorhinostomy

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Abstract:

PURPOSE: The purpose of this study was to evaluate the changes of conjunctival bacterial flora 1 year after successful dacryocystorhinostomy (DCR).

METHODS: Seventy-two consecutive adult patients with successful DCR were enrolled in this study. We obtained conjunctival cultures from the operated eyes, fellow eyes, and nasal mucosa of the operated side 1 year after the operation. After the period of incubation, further evaluation was performed using standard laboratory techniques.

RESULTS: In the conventional media, positive bacterial growth was detected in 48 (66.7%) of the 72 operated eyes and in 31 of the 72 normal fellow eyes (43.1%). Nasal specimens were positive for bacterial growth in 65 (90.3%) patients. Isolation rate was significantly different between the operated and the fellow (nonoperated) eyes (P = 0.0074). Colony count, type, and frequencies of bacterial isolation from the operated eyes were similar to nonoperated eyes.

CONCLUSION: One year after DCR, conjunctival bacterial isolation rate increased compared with the normal fellow eyes. Remote DCR may be considered as a local risk factor for developing postoperative endophthalmitis.

Keywords: Bacterial flora, conjunctiva, dacryocystorhinostomy

Introduction

Nasolacrimal duct obstruction (NLDO) is a common ophthalmic problem leading to stasis and alterations in bacterial flora of the conjunctiva.[1‑3] Obstructed nasolacrimal duct is treated by making a direct connection of lacrimal sac to the nasal cavity by dacryocystorhinostomy (DCR).

Almost 3–8 weeks is needed for the conjunctival flora to become normal after successful DCR.[1] However, there is a report stating the change of conjunctival flora 1 year after conjunctivodacryocystorhinostomy (CDCR).[4] To the best of our knowledge, there is not any published evidence evaluating conjunctival flora long time after DCR.

The purpose of this study was to determine the possible changes in bacterial flora of the conjunctiva, and whether the patients with previous DCR were more likely to have conjunctival bacteria, which might increase the risk of postoperative endophthalmitis.

Methods

This study was approved by the Ethics Committee of Poostchi Eye Research Center, Shiraz University of Medical Sciences, Shiraz, Iran. Eighty consecutive patients who underwent external DCR were reevaluated at least 1 year after the surgery. Seventy-two patients with patent nasolacrimal duct in both operated and nonoperated sides (based on the irrigation test) were included. Six patients were excluded due to secondary NLDO in operated side and two patients were excluded due to positive irrigation test in nonoperated side. No signs of active conjunctival infection and/or inflammation
were detected. The patients did not receive any topical or systemic antibiotics for at least 2 weeks.

Three sterile cotton swabs were used to collect the specimens. One swab was thoroughly rubbed over the lower fornix of the operated eyes from the lateral to the medial side. The other swab was simultaneously used to collect the specimen from the nonoperated eyes as the control group. The third swab was used to obtain a sample from the nasal mucosa of the operated side. Conjunctival sampling was done without topical anesthetic instillation. The specimens were collected and sealed in tubes containing 1 mL thioglycollate medium and were sent to the laboratory immediately after collection to perform bacteriological cultures. After 3 h of incubation, blood agar, chocolate agar, and eosin methylene blue agar plates were inoculated with 0.1 mL transport media for aerobic and anaerobic cultures. Following the incubation period, colonies were differentiated and enumerated by standard bacteriological laboratory techniques.

Chi-square and Fisher’s exact tests were used to analyze the results. \( P < 0.05 \) was considered statistically significant.

**Results**

The patients’ age ranged from 25 to 65 years (mean age: 44 years). Forty-six (64%) patients were women and 26 (36%) were men.

In the conventional media, positive bacterial growth was detected in 48 (66.7%) of the 72 operated eyes and in 31 (43.1%) of the 72 nonoperated control eyes. Nasal specimens were positive for bacterial growth in 65 (90.3%) patients. The results of bacteriological analyses of conjunctival and nasal specimens are presented in Table 1.

Bacterial isolation rate was significantly different between the operated eyes and the fellow (nonoperated) eyes \( (P = 0.0074) \). Types and frequencies of bacterial isolation from the operated eyes did not show any statically significant different with the fellow eyes \( (P > 0.05) \).

In 38% of the patients, conjunctiva of the nonoperated side and nasal mucosa had positive growth simultaneously. In 63% of the patients, conjunctiva of the operated side and nasal mucosa had positive growth results simultaneously. The difference in this parameter was statistically significant \( (P = 0.0046) \).

The mean colony count in the operated eyes was 2501. In the nonoperated eyes, the mean colony count was 4730 and in nasal specimens there were 12925 colonies. While there was no statistically significant difference among the mean number of colonies between the operated and the nonoperated eyes, the differences between the eyes and the nasal specimens in colony count were statistically significant \( (P = 0.001) \).

**Discussion**

NLDO comprises about 3% of all ophthalmic outpatient visits.[3] Stagnation and pooling lead to acute or chronic dacryocystitis with epiphora and purulent discharge. Few studies report the microbial characteristics of NLDO in adults. Changes in bacterial flora of conjunctiva in both type and quantity of microorganism were reported. The bacterial spectrum of conjunctiva in both dacryocystitis and NLDO were Gram-positive organisms in most studies.[2,3,5-9] Some other studies revealed a dominancy of Gram-negative organisms.[10,11]

Our former study showed both increase in rate of isolation and quantity of conjunctival bacteria in adult patients with NLDO. Gram-positive bacteria were predominant in our patients. Almost 3–8 weeks after successful DCR, conjunctival flora changed to normal status.[1] This can be attributed to the washing out of the abnormal bacteria after bypassing of the obstructed nasolacrimal duct shortly after DCR.

DCR makes a direct connection from the lacrimal sac to the nasal cavity. Positive pressure in the nasal cavity during sneezing or nose blowing may cause retrograde flow. Therefore, spillage of microorganisms from the nasal cavity and contamination of ocular surface is possible after successful DCR, especially in patients with incompetent Rosenmuller valve. Chronic spillage may change the flora of the conjunctiva to the nasal mucosal flora.

Can et al.[4] evaluated the changes of conjunctival flora 1 year after CDCR in twenty patients. They found that operated conjunctival flora became similar to nasal flora. Bacterial growth was detected in 80% of the operated eyes, 55% of the nonoperated eyes, and 100% of nasal mucosa. The frequencies of Gram-positive bacterial
isolation from the operated eyes were different from the nonoperated eyes and were very close to the isolation rate of the nasal specimens.

In our study, positive bacterial growth was detected in 48 (66.7%) of the 72 operated eyes and in 31 (43.1%) of the 72 nonoperated eyes. Nasal specimens were positive in 65 (90.3%) patients. The total isolation rate of bacteria increased in the operated eyes compared with the healthy eyes. However, in contrast to what has been reported after CDCR, types and frequencies of bacterial isolation were not altered significantly in the operated eyes and were similar to nonoperated eyes. Jones tube used during CDCR may lead to more spillage of nasal cavity secretion toward the conjunctiva compared with what occurs after DCR.

Bacteriology of the conjunctiva and its changes in various conditions are important issues in ophthalmology. Many published studies have evaluated the microorganisms of ocular surface. The results showed that variety of normal conjunctival flora was attributed to age, geographical area, climatic condition, and professional background.[12]

The bacterial isolation rate in normal conjunctiva ranged from 15% to 100%. Coagulase-negative staphylococci and diphtheroids are considered commensal organisms and are the main components of the normal conjunctiva. Potential pathogen bacteria such as Staphylococcus aureus, Streptococcus pneumoniae, Haemophilus influenzae, Pseudomonas sp, and Escherichia coli grow with lower frequency.[17-20]

Normal flora of the conjunctiva is known as the main source of contamination after intraocular surgery.[21,22] As previously mentioned, coagulase-negative staphylococci are nonpathogenic bacteria on the ocular surface, but are the main microorganisms recovered in postoperative endophthalmitis. They have been the causes of endophthalmitis in approximately 70% of reported postoperative endophthalmitis.[23] It is not surprising, because these microorganisms are the most frequent bacteria in the conjunctival flora and the reports showed that they grow in up to 78% of conjunctival cultures preoperatively.[24]

Patients with certain local or systemic diseases are at higher risk for developing postoperative endophthalmitis. Such conditions increase the risk by the following four mechanisms: increasing the isolation rate of conjunctival bacterial culture, increasing the colony count of conjunctival bacteria, increasing the pathogenic microorganisms on the ocular surface, and appearance of multi-resistant bacteria on the conjunctiva.

Chronic blepharitis, conjunctivitis, ectropion, and NLDO are considered as local risk factors. Patients with diabetes mellitus, old age, immunodeficiency, skin disorders, asthma, and patients who take immunosuppressant are considered as having systemic risk factors. Corticosteroids use, diabetes mellitus, old age, inadequate immunity, and blepharitis are associated with a higher bacterial isolation rate.[25-35] In NLDO, both isolation rate and colony count of bacteria will increase. In addition, pathogenic microorganisms grow more frequently.[1,5-6] Patients with chronic blepharitis, conjunctivitis, and those with systemic risk factors such as diabetes mellitus, immunodeficiency, or those taking immunosuppressant medications harbor multi-resistant organisms.[36] According to the findings of the present study, remote DCR by increasing the rate of isolation of conjunctival bacteria could be categorized as local risk factor for postoperative endophthalmitis. The surgeons should keep this finding in mind when considering intraocular surgery. More intense antibiotic therapy may be needed before intraocular operation in patients with remote DCR surgery.

According to the results of our previous report[11] and the results of this study, we can describe the changes of conjunctival flora in patients with NLDO as following: Stagnation of the lacrimal flow secondary to NLDO causes contamination of conjunctiva secondary to overgrowth of bacteria and appearance of pathogenic bacteria. DCR leads to direct connection of conjunctival sac to the nose. Shortly after DCR, wash out of the conjunctiva changes the flora toward normal, but with passing time spillage of microorganisms from the nasal cavity toward the conjunctiva may gradually contaminate it.

There are several limitations in the current study that should be noted. We did not evaluate other microorganisms such as fungi. Antibiogram was not performed in our study. Evaluation of drug resistance might reveal possible changes in the population of multiple drug-resistant bacteria in the operated eyes compared with the nonoperated eyes. Small number of samples in bacterial subgroups may preclude a good evaluation in this category. Study with larger samples may enable the evaluation of pathogenic bacteria and possible changes long time after DCR. We did not confirm direct contamination of conjunctiva by nasal mucosa microorganisms. Use of molecular methods such as restriction fragment length polymorphism in future study can provide accurate matching of the isolates from the conjunctiva and nasal flora to confirm the possible contamination of the ocular surface by nasal bacteria. Other limitations are that in this study, we evaluated the conjunctival flora using a cross-sectional study design 1 year after DCR. It does not clear that the changes are permanent effect or alter with time. Further
studies should be conducted to evaluate the changes of conjunctival flora during the months after DCR by serial culture.

**Conclusion**

One year after successful DCR, isolation rates of conjunctival bacteria were significantly higher than isolation rates of conjunctival bacteria in normal eyes. The higher detection rate of bacteria in such patients could be considered as one of the local risk factors for developing endophthalmitis when intraocular surgery is done. Surgeons are recommended to keep this finding in mind when considering intraocular surgery, even long time after DCR.

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**Conflicts of interest**

There are no conflicts of interest.

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