Am J Transl Res 2021;13(8):9377-9382
www.ajtr.org /ISSN:1943-8141/AJTR0130940

Original Article

The application of lacrimal duct endoscopy in the diagnosis and treatment of lacrimal canaliculitis and obstructive diseases of the nasolacrimal duct

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Received January 27, 2021; Accepted February 25, 2021; Epub August 15, 2021; Published August 30, 2021

Abstract: Objective: To explore the clinical effectiveness and value of lacrimal duct endoscopy in lacrimal canaliculitis and nasolacrimal duct obstruction diseases. Methods: We retrospectively analyzed 241 patients with lacrimal canaliculitis and nasolacrimal duct obstructions admitted to our hospital from January 2019 to June 2020. Among them, 165 patients underwent routine diagnosis and treatment and 76 patients underwent lacrimal duct endoscopy. The propensity score matching 1:1 nearest neighbor matching method was used to match 50 patients from each of the two methods to create a control group and an experimental group, respectively. We compared the two groups' effective treatment rates, incidences of adverse reactions, diagnostic accuracy, and IL-6, IL-8, and CRP expression levels. Results: in contrast with the control group, we observed a significantly higher effective treatment rate in the experimental group ($P<0.05$). The experimental group had a significantly better reactions rate than the control group ($P<0.05$). In terms of the diagnostic accuracy rate, the experimental group's results were much better ($P<0.05$). The IL-6, IL-8, and CRP expression levels in the experimental group were much lower in the comparison with the control group ($P<0.05$). Conclusion: Lacrimal duct endoscopic diagnosis and treatment can significantly enhance the treatment efficiency and diagnostic accuracy in lacrimal canaliculitis and nasolacrimal duct obstruction patients and can help reduce adverse reactions and the IL-6, IL-8, and CRP expression levels during the treatment. Therefore, lacrimal duct endoscopy has a high clinical effectiveness in lacrimal canaliculitis and nasolacrimal duct obstruction patients.

Keywords: Lacrimal duct endoscopy, lacrimal canaliculitis, nasolacrimal duct obstruction, application effect, inflammatory cytokines

Introduction

Lacrimal canaliculitis refers to the inflammation of the human lacrimal canaliculus due to a decline in the body's immune function, and a significant upward trend in the inflammatory cytokine levels. Bacterial infections are the chief cause of lacrimal canaliculitis. The clinical manifestations mainly include increased ocular secretions, eye pain, and ocular polyp hyperplasia, and the disease has a great impact on the patient's daily life. If lacrimal canaliculitis occurs, prompt treatment can effectively prevent the disease from worsening [1-3]. Obstructive diseases of the nasolacrimal duct include various diseases caused by the obstruction of the nasolacrimal duct. The main population is middle-aged and elderly women, who are prone to relapse after treatment, and surgery is required in severe cases [4-6]. Studies have reported that lacrimal duct endoscopy can effectively diagnose and treat lacrimal canaliculitis and nasolacrimal duct obstructive diseases. A lacrimal duct endoscope can directly observe the lacrimal canaliculus and nasolacrimal duct conditions and provides a good view of the inflammation in the canaliculus and the obstruction of the nasolacrimal duct. In addition, lacrimal duct endoscopy also has a good therapeutic effect in patients with lacrimal canaliculitis and nasolacrimal duct obstructive diseases [7-9]. In order to study the application of lacrimal duct endoscopy in lacrimal canaliculitis and nasolacrimal duct obstructive diseases, this article retrospectively analyzed different diagnosis and treatment methods by comparing and analyzing the clinical effectiveness, the adverse reactions, the diagnostic accuracy, and

Table 1. Comparison of the general data ($\bar{x} \pm s$)

Groups	Experimental group	Control group	t/X^2	P
Sex (male/female)	20/30	21/29	0.04	0.84
Age	38.55±5.38	38.27±5.66	0.25	0.80
Height (cm)	166.31±9.05	166.33±9.68	0.01	0.99
Weight (kg)	63.87±5.57	63.44±5.41	0.39	0.70
Medical history (month)	3.37±0.31	3.46±0.54	1.02	0.31
Smoking (years)	6.71±1.56	6.80±1.98	0.25	0.80
Drinking (years)	10.20±2.21	10.08±2.06	0.28	0.78
Diabetes (cases)	3	2	0.21	0.65
Hypertension (cases)	4	5	0.12	0.73
Hyperlipidemia (cases)	0	1	1.01	0.32

the patients' inflammatory cytokine expression levels. The specific research report is as follows.

Data and methods

General data

We retrospectively analyzed 241 patients with lacrimal canaliculitis and nasolacrimal duct obstructions admitted to our hospital from January 2019 to June 2020. Among them, 165 patients underwent routine diagnosis and treatment and 76 patients underwent lacrimal duct endoscopy. The propensity score matching 1:1 nearest neighbor matching method was used to match 50 patients from each of the two methods to create the control group and the experimental group, respectively. The two groups' general data were similar (P>0.05). See **Table 1**.

Inclusion/exclusion criteria

Inclusion criteria: ① Patients who had clinical manifestations of lacrimal canaliculitis and nasolacrimal duct obstructive disease. ② Patients over 18 years old. ③ Patients with no other organic diseases. ④ Patients with no history of drug allergies, drug abuse, or bad habits. ⑤ The study was approved by the hospital ethics committee, and all the patients voluntarily participated in the study and signed an informed consent.

Exclusion criteria: ① Patient who had undergone corneal replacement surgery. ② Patients who had recently undergone surgical treatment or who had been treated with anesthetic drugs. ③ Patients with congenital diseases.

Methods

The patients in the control group underwent routine diagnosis and treatment methods. Routine examinations were used to diagnose lacrimal canaliculitis and nasolacrimal duct obstructions, and appropriate treatments for the different diseases were administered.

The patients in the experimental group underwent lacrimal duct endoscopic diagnosis and treatment. The patients were placed in a supine position. A microendoscope (Manufacturer: Shanghai Precision Instrument Co., Ltd.; batch number: National Food and Drug Administration (Import) number 2008 no. 3222545; specification: EG-3870CIK) was used for the examination and to administer local anesthesia to each patient using 0.75% bupivacaine. The endoscopic probe was inserted into the patient's lacrimal duct through the patient's punctum, the lacrimal canaliculus was flushed through the lacrimal duct, and the lacrimal canaliculus was moved along to check whether there were any abnormalities in the lacrimal canaliculus, nasolacrimal duct, lacrimal sac, common lacrimal duct, etc. Any abnormalities detected by the endoscope, e.g., polyps, stones, etc., were removed by laser, and once the lacrimal canaliculus, nasolacrimal duct, etc. were unobstructed and there was no abnormality, then the endoscope was slowly withdrawn from the lacrimal duct.

Observation indexes

The effective rate of treatment, the incidences of adverse reactions, the diagnostic accuracy, and the IL-6, IL-8, and CRP expression levels were compared and classified in the two groups. Significantly effective: The clinical manifestations of the patient disappeared completely or almost completely disappeared, and no adverse reactions appeared. Effective: the patient's clinical manifestations disappeared significantly, and only minor adverse reactions occurred. Ineffective: The patient's clinical manifestations did not significantly disappear, and serious adverse reactions occurred.

Table 2. Comparison of treatment efficiency between the two groups

Groups	Significantly effective	Effective	Ineffective	Total effective rate (%)
Experimental group	33	13	4	92%
Control group	15	20	15	70%
X^2				7.86
P				0.005

Table 3. Comparison of the incidence of adverse reactions between the two groups

Groups	Eyelid edema	Tearing	Recurrence	Total incidence (%)
Experimental group	3	3	0	12%
Control group	10	8	4	44%
X^2				12.70
P				<0.001

Accuracy = number of cases detected by lacrimal duct endoscopy/number of cases detected by pathology × 100%.

The normal CRP value is 800-8000 μg/L, the normal IL-6 value is 56.37~150.33 pg/ml, and the normal IL-8 value is 0.26~0.38 ng/ml [10-12].

Statistical processing

The data processing software selected in this research was SPSS 20.0, and GraphPad Prism 7 (GraphPad Software, San Diego, USA) was used to plot the graphs. The measurement data were represented by ($\bar{x} \pm s$) and t-tests were performed. The count data were represented by [n (%)], and chi-square tests were performed. P<0.05 indicated that a difference was statistically significant.

Results

Comparison of the treatment efficiency between the two groups

The treatment efficiency of the two groups was compared, and the results showed an observably higher treatment efficiency in the experimental group (P<0.05). See **Table 2**.

Comparison of the incidences of adverse reactions between the two groups

The adverse reactions that occurred during the treatment of the patients included eyelid edema, tearing, and recurrence. In comparison with the control group, the experimental group's results showed a much lower incidence of adverse reactions (P< 0.05). See **Table 3**.

Comparison of the diagnostic accuracy between the two groups

Our comparison of the diagnostic accuracy in the two groups determined that the accuracy of the lacrimal duct endoscopic diagnostic method in the experimental group was remarkably better than the conventional diagnostic method in the control group (P<0.05). See **Figure 1**.

Comparison of the IL-6, IL-8, and CRP expression levels between the two groups

A comparison of the IL-6, IL-8, and CRP expression levels was conducted. It showed that the IL-6, IL-8, and CRP expression levels in the experimental group were significantly lower than they were in the control group. See **Figures 2-4**.

Discussion

A lacrimal endoscope contains three devices: a lighting and imaging device, a flushing device, and a laser, so the endoscope is used for lighting and imaging, flushing, and laser treatment [13-15]. In the diagnosis and treatment of patients with lacrimal canaliculitis and nasolacrimal duct obstructive diseases, the lacrimal endoscope enters the lacrimal duct through the patient's punctum, and then passes through the lacrimal duct to reach the lacrimal canaliculus, nasolacrimal duct, lacrimal sac, etc., in order to detect abnormalities in each part [16-18]. Lacrimal canaliculitis is a relatively common ocular disease. If it is not treated promptly, it may affect the patient's vision and daily life. However, clinical experiments have shown that the misdiagnosis and missed diagnosis rates of the commonly used diagnostic methods are high, so the patient's treatment can be delayed to a certain extent. Nasolacrimal duct obstructive disease refers to a disease in which the nasolacrimal duct is blocked by polyps, stones, etc., which makes it difficult for the nasolacrimal duct to function. This

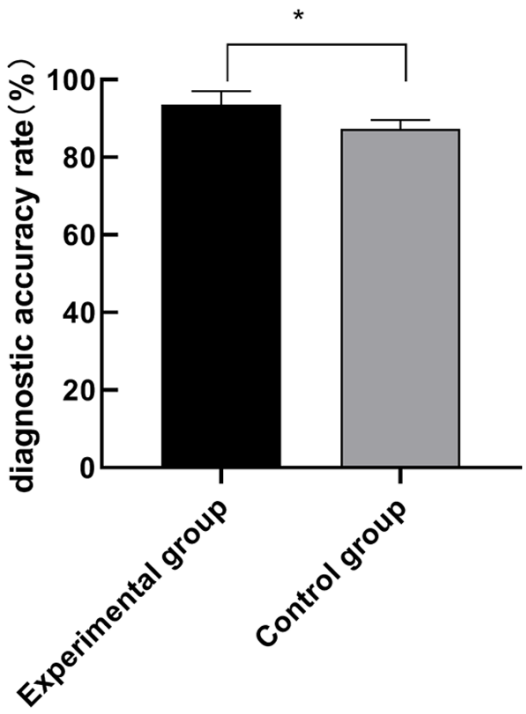

Figure 1. Comparison of diagnostic accuracy between the two groups. Note: The abscissa represents the experimental group and the control group from left to right, and the ordinate represents the diagnostic accuracy rate. * indicates that the diagnostic accuracy rate in the experimental group (93.65±3.37)% was significantly different from the diagnostic accuracy rate in the control group (87.26±2.33)% (t=11.03, P<0.001).

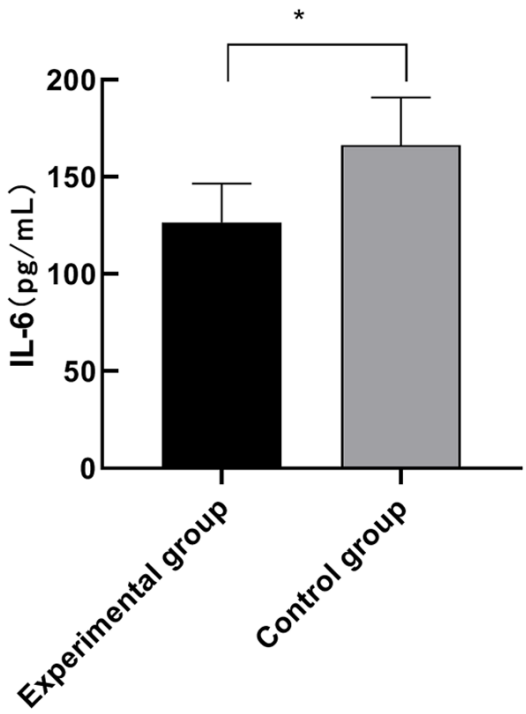

Figure 2. Comparison of the IL-6 expression levels between the two groups. Note: The abscissa represents the experimental group and the control group from left to right, and the ordinate represents the IL-6 expression level. * indicates that the IL-6 expression level in the experimental group (126.54±20.11) pg/ml was significantly different from the IL-6 expression level in the control group (166.39±24.58) pg/ml (t=8.87, P<0.001).

disease often requires surgical treatment to alleviate the clinical manifestations, and the recurrence rate after surgical treatment is high [19]. In order to study the clinical effectiveness of lacrimal duct endoscopy in lacrimal canaliculitis and nasolacrimal duct obstructive disease, this article involved a cohort of patients with lacrimal canaliculitis and nasolacrimal duct obstructive disease and applied different diagnostic and treatment methods to two groups of patients. Lacrimal duct endoscopy was used for the patients in the experimental group, and for patients in the control group, routine diagnosis and treatment was administered. The treatment efficiency, adverse reactions, diagnostic accuracy, and inflammatory cytokine expression levels in the two groups were compared after the treatment.

The results showed an apparent higher treatment efficiency and diagnostic accuracy in the experimental group than in the control group (P<0.05). This shows that the diagnosis and treatment using lacrimal duct endoscopy can not only greatly improve the clinical effectiveness and prognosis, but it can also markedly increase the diagnostic accuracy, reduce the occurrence of misdiagnoses and missed diagnoses, speed up the patient's treatment time to a certain extent, and minimize the negative impact on the patient. A notably lower adverse reaction rate and IL-6, IL-8, and CRP expression levels in the experimental group than the control group were seen (P<0.05). This indicates that the lacrimal duct endoscopy can significantly reduce the adverse reactions during the treatment. The inflammatory cytokine levels in the patients increased sharply, and there was inflammation in the patient. If the inflammation is not alleviated for a long time, the patient's immune function will decline, and other complications may occur. The results show that the patients' inflammatory cytokine

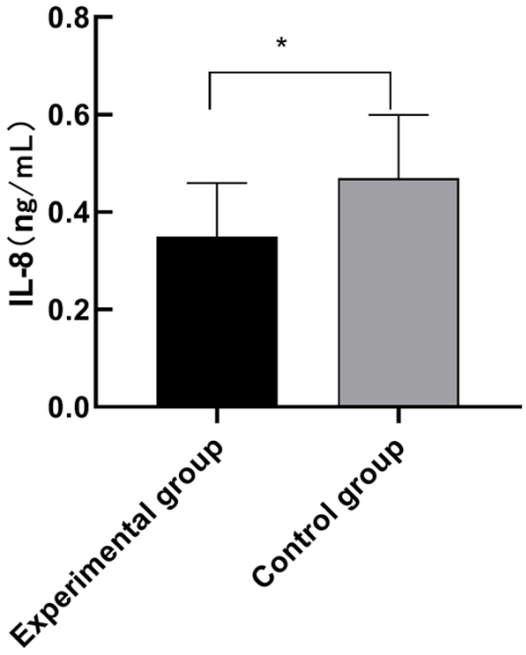

Figure 3. Comparison of the IL-8 expression levels between the two groups. Note: The abscissa represents the experimental group and the control group from left to right, and the ordinate represents the IL-8 expression level. * indicates that the IL-8 expression level in the experimental group (0.35±0.11) ng/ml was statistically different from the IL-8 expression level in the control group (0.47±0.13) ng/ml (t=4.98, P<0.001).

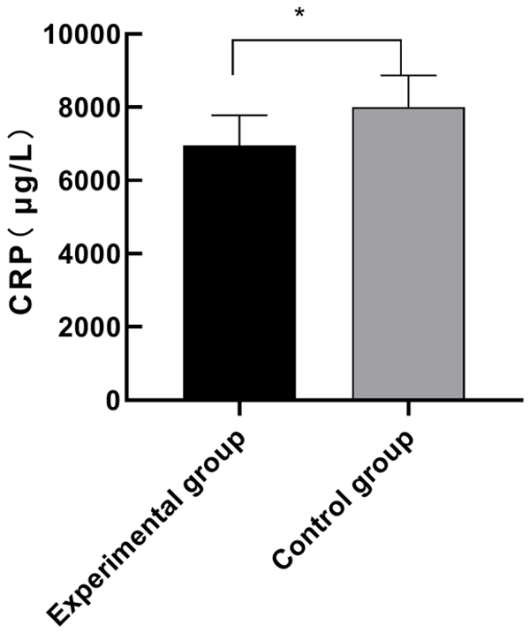

Figure 4. Comparison of the CRP expression levels between the two groups. Note: The abscissa indicates the experimental group and the control group from left to right, and the ordinate indicates the expression level of CRP. * indicates the CRP expression level in the experimental group (6952.41±827.33) μg/ml was statistically different from the CRP expression level in the control group (8004.78±868.79) μg/ml (t=6.20, P<0.001).

levels after they undergo lacrimal endoscopic treatment are noticeably lower than in patients undergoing the conventional treatment, indicating that lacrimal endoscopic treatment is able to greatly alleviate the patients' inflammatory manifestations. Gaofeng et al. [20] proposed in the study that lacrimal duct endoscopy is able to improve the diagnostic accuracy of lacrimal canaliculitis to a great extent, and it can increase the accuracy of the inspection of patients with lacrimal canaliculitis and nasolacrimal duct obstructive disease. Their conclusion is consistent with the results of this study and fully proves the scientific and reliable conclusions of this study.

In summary, lacrimal duct endoscopy is able to improve the treatment efficiency and diagnostic accuracy of patients with lacrimal canaliculitis and nasolacrimal duct obstructions and help reduce the adverse reactions and the IL-6, IL-8, and CRP expression levels during the treatment. Therefore, the lacrimal duct endoscopy has a high clinical effectiveness in patients with lacrimal canaliculitis and nasolacrimal duct obstruction, so it is worthy of clinical promotion and application.

Acknowledgements

This study was supported by the Hebei Provincial Health Commission.

Disclosure of conflict of interest

None.

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