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Comparison of the efficacy and safety of levofloxacin eye drops and pranoprofen gel in the treatment of bacterial conjunctivitis in the real world

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Abstract: This study compared the efficacy and safety of levofloxacin eye drops and pranoprofen gel in treating bacterial conjunctivitis via a prospective randomized controlled design. A total of 200 patients with bacterial conjunctivitis were included, randomly divided into two groups (100 cases each) for 14-day corresponding drug treatment. Symptom improvement, bacterial clearance and adverse reactions were observed. Results showed that on treatment days 1 and 3, the levofloxacin group had significantly lower scores in conjunctival congestion (1.9±0.4 vs 2.1±0.5; 1.5±0.3 vs 1.7±0.4) and secretions (2.1±0.5 vs 2.3±0.6; 1.7±0.4 vs 1.9±0.5) than the pranoprofen group (all $P<0.05$). The bacterial clearance rate of the levofloxacin group was 85% (85/100), significantly higher than the pranoprofen group's 70% (70/100) ($\chi^2=5.32$, $P<0.05$). The total effective rate of the levofloxacin group was 90% (90/100), significantly higher than the pranoprofen group's 80% (80/100) ($\chi^2=3.92$, $P<0.05$). For safety, the adverse reaction incidence was 15% (15/100) in the levofloxacin group and 13% (13/100) in the pranoprofen group, with no significant difference ($\chi^2=0.258$, $P=0.612$). This study indicates levofloxacin eye drops have efficacy advantages, and the two are comparable in safety, providing a valuable medication reference for clinical treatment of bacterial conjunctivitis

Keywords: Levofloxacin eye drops, pranoprofen gel, bacterial conjunctivitis, efficacy, safety, real-world study

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INTRODUCTION

Bacterial conjunctivitis is a common ophthalmic disease, which is caused by bacterial infection and acute purulent inflammation of the conjunctiva (Abdullatif Abdussalam M. *et al*., 2023). Children have a higher incidence rate due to their weak hygiene awareness and imperfect immune system (Linda S and Sandra J C, 2023). The incidence rate is even higher in areas with poor sanitary conditions (Stella W *et al*., 2024). The main symptoms of patients include conjunctival congestion, increased mucopurulent secretions, foreign body sensation in the eyes, photophobia and tearing, which seriously affect daily activities.

Clinical treatment methods are diverse. Traditional antibiotics such as penicillins, cephalosporins and quinolones are antibacterial through different mechanisms and new antibacterial drugs are constantly emerging. Auxiliary treatments include eye irrigation and cold compresses (Magpantay Hilbert D. *et al*., 2021). However, the irrational use of antibiotics has led to a serious problem of bacterial resistance, with an increase in the resistance rate of common pathogens, a decrease in treatment efficacy and a prolonged cycle (Mengjuan S *et al*., 2024). At the same time, adverse drug reactions such as allergic reactions and eye irritation symptoms affect patients' medication compliance. Levofloxacin eye drops are quinolone antibiotics with a broad antibacterial spectrum. They can inhibit bacterial DNA gyrase activity and block bacterial DNA replication. Local application to the eye can quickly reach and maintain effective concentrations and inhibit bacterial growth. Pranoprofen gel is a nonsteroidal anti-inflammatory drug that reduces prostaglandin synthesis and reduces eye inflammation by inhibiting cyclooxygenase activity. The gel dosage form stays in the eye for a long time, can slowly release drugs, reduce the frequency of medication and improve patient compliance. Previous studies on drugs for the treatment of bacterial conjunctivitis were mostly conducted under ideal experimental conditions, without fully considering complex factors such as patients' underlying diseases, living habits and medication compliance (Tuong Vi Le T *et al*., 2024). In real clinical scenarios, these factors affect drug efficacy and safety. For example, the immune function of diabetic patients is suppressed and the eye hygiene of those who wear contact lenses for a long time is complicated. This study adopts a prospective, randomized, controlled, real-world research design to compare the efficacy and safety of levofloxacin eye drops and pranoprofen gel, collect treatment data of different patients, provide practical medication references for clinicians, optimize treatment plans, ensure patient safety and improve prognosis.

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MATERIALS AND METHODS

Study design

This was a prospective randomized controlled real-world study conducted in the ophthalmology outpatient clinic and inpatient department of Jiangshan People's Hospital, Zhejiang Province.The start time is from January 2023 to June 2024. Patients diagnosed with suspected bacterial conjunctivitis were screened by professional ophthalmologists according to inclusion and exclusion criteria. Eligible patients were randomized into the levofloxacin eye drops group and pranoprofen gel group using a computer-generated random number table, with 100 cases in each group. Follow-ups were performed before treatment and on days 1, 3, 7 and 14 after treatment to record symptom changes, bacteriological examination results, medication status and adverse reactions.

Study subjects

Case source

The patients in this study were from the ophthalmology outpatient clinic and inpatient department of Jiangshan People's Hospital, Zhejiang Province. The population structure of the region where the hospital is located is diverse, covering people of different ages, genders, occupations and living backgrounds. In order to more intuitively display the composition of patients, the relevant information is summarized in the following table 1.

Inclusion criteria

Age range

18 years and above and 70 years and below, relatively stable physical function, able to cooperate with the research well, less interference from underlying diseases.

Typical symptoms

Conjunctival congestion area accounts for ≥30% of the total conjunctival area; secretions are mucopurulent or purulent, wiped ≥3 times a day; foreign body sensation in the eyes strongly affects daily activities; obvious photophobia and tearing symptoms under normal indoor light.

Bacteriological diagnosis criteria

Conjunctival secretions are collected with sterile swabs and smears show typical bacterial morphology or common pathogenic bacteria such as *Staphylococcus aureus*, *Streptococcus pneumoniae* and *Haemophilus influenzae* are cultured on blood agar plates, chocolate plates and other culture media.

Exclusion criteria

Suffering from other serious eye diseases

Glaucoma patients have abnormal intraocular pressure and visual field defects; uveitis patients have eye pain, decreased vision and turbid aqueous humor; corneal epithelial destruction forms ulcer foci in patients with corneal ulcers. These diseases interfere with the judgment of drug efficacy and are excluded.

Systemic diseases affecting drug metabolism or efficacy observation

Drug metabolism is affected in patients with severe liver and kidney dysfunction; poor blood sugar control in diabetic patients affects immunity and drug efficacy; patients with autoimmune diseases have disordered immune systems and are not included in the study.

Allergy to study drugs

Patients with a history of allergy to quinolones or nonsteroidal anti-inflammatory drugs are not included to avoid allergic reactions affecting the study results.

Treatment methods

Levofloxacin eye drops group

Patients used 0.3% (5ml: 15mg) levofloxacin eye drops produced by Santen Pharmaceutical (China) Co., Ltd. The dosage was 1-2 drops per time, administered into the conjunctival sac 4 times a day (morning, after lunch, afternoon and before bedtime), with a 14-day treatment cycle. Researchers detailed the dropping method and precautions to patients.

Pranoprofen gel group

Patients used 0.1% (5g: 5mg) pranoprofen gel produced by Zhuhai Federal Pharmaceutical Co., Ltd. Zhongshan Branch. An appropriate amount of gel was evenly applied to the conjunctival sac of the lower eyelid 3 times a day (morning, noon and evening), with a 14-day treatment cycle. Patients were instructed to apply the gel correctly after hand cleaning.

Observation indicators

Efficacy indicators

Symptom scoring scale

Develop a scale to quantify the symptoms of conjunctival congestion, edema, foreign body sensation and secretions. Conjunctival congestion is scored by area ratio, edema is scored by degree, foreign body sensation is scored by subjective feeling and secretions are scored by the number of wipes per day. Professional ophthalmologists score at each time point before and after treatment to ensure accuracy and consistency.

Bacteriological examination method and bacterial clearance judgment standard

Before and after treatment, conjunctival sac secretions are collected with sterile swabs, inoculated on blood agar plates, chocolate plates and other culture media and cultured at 37°C for 24-48 hours. Bacteria are identified according to colony characteristics. The bacterial clearance standard is that no pathogens before treatment are detected in the culture after the end of treatment and the symptoms are significantly improved; otherwise, it is not cleared.

Safety indicators

Define and list possible adverse reactions

Observe and record adverse reactions such as eye stinging, itching, redness and swelling, vision changes and systemic rash, dizziness, nausea, etc. (Xu L and Yiping M, 2025).

Develop a grading standard for the severity of adverse reactions

Adverse reactions are divided into mild (mild symptoms, no impact on life and medication), moderate (obvious symptoms, affecting life, medication can be continued after treatment) and severe (severe symptoms, affecting life and medication needs to be discontinued) and adverse reactions are recorded in detail (Jingfen Z and Lingling L, 2024).

Data collection and statistical analysis

Data collection

Researchers use standardized case report forms (CRFs) to collect patient data, including basic information, symptoms and signs, laboratory tests, medication and adverse reactions. Strictly standardize the collection to ensure that the data is accurate, complete and timely.

STATISTICAL ANALYSIS

The data is entered by two people and entered using EpiData software and consistency is tested. SPSS 22.0 software was used for analysis. The measurement data were expressed as mean ± standard deviation (\overline{x}\pm s) and the two groups were compared with independent sample t test; the enumeration data were expressed as number of cases and rate (%) and the inter-group comparison was performed with chi-square test. $P < 0.05$ was considered statistically significant.

RESULTS

Patient baseline data

A total of 200 patients were included in this study, 100 in each group. The baseline information of the two groups of patients, such as age, gender, course of disease and underlying diseases, was statistically analyzed. The results showed that there was no statistically significant difference (P>0.05), indicating that the two groups of patients were well comparable at the beginning of the study, as shown in table 2.

Efficacy results

Symptom improvement

Before treatment, there was no significant difference in the symptom scores of the two groups of patients (P>0.05). At each time point after treatment, the symptom scores of the two groups of patients showed a downward trend. On the first and third days of treatment, the levofloxacin eye drops group showed more prominent performance in the decrease of conjunctival congestion and secretion scores, which was statistically significant compared with the pranoprofen gel group (P<0.05); on the seventh and 14th days of treatment, there was no statistically significant difference in the decrease of scores between the two groups (P>0.05), see table 3-6 for details.

Bacterial clearance rate

Before treatment, the bacterial detection rate and species distribution of the two groups were similar (P>0.05). After treatment, the bacterial clearance rate of the levofloxacin eye drops group was 85% (85/100) and that of the pranoprofen gel group was 70% (70/100). The difference between the two groups was statistically significant (\chi^2=5.32, P<0.05), as shown in table 7.

Comprehensive efficacy evaluation

According to the efficacy evaluation criteria, the total effective rate of the levofloxacin eye drops group was 90% (90/100) and that of the pranoprofen gel group was 80% (80/100). The difference between the two groups was statistically significant (\chi^2=3.92, P＜0.05), as shown in table 8.

Safety results

Adverse reactions

During the treatment, the incidence of adverse reactions in the levofloxacin eye drops group was 15% (15/100), including eye stinging at 5% (5/100), mild itching at 4% (4/100), transient blurred vision at 2% (2/100), systemic rash at 1% (1/100), dizziness at 1% (1/100) and nausea at 2% (2/100); the incidence of adverse reactions in the pranoprofen gel group was 13% (13/100), mainly manifested as eye burning at 4% (4/100), redness and swelling at 3% (3/100), slight blurred vision at 1% (1/100), systemic mild rash at 2% (2/100), dizziness at 2% (2/100) and nausea at 1% (1/100). After statistical analysis, there was no significant difference in the incidence of adverse reactions between the two groups (\chi^2=0.258, P = 0.612), see table 9 for details.

Analysis of severity of adverse reactions

Statistical classification of the severity of adverse reactions in the two groups showed that among the 15 adverse reactions in the levofloxacin eye drops group, 10 cases were mild (incidence rate 10%), mainly short-term mild eye stinging and itching, which did not affect the patient's normal life and medication; 4 cases were moderate (incidence rate 4%), such as obvious blurred vision, dizziness, etc. and the patient could continue to take the medication after appropriate treatment; 1 case was severe (incidence rate 1%), which was a more serious systemic rash and the symptoms were relieved after discontinuation of medication and anti-allergic treatment.

Among the 13 adverse reactions in the pranoprofen gel group, 9 cases were mild (incidence rate 9%), mostly mild burning sensation and redness and swelling of the eyes; 3 cases were moderate (incidence rate 3%), manifested as

Table 1: Basic information statistics of patients

category	Details	N	Proportion
age	18 - 30 years old	45	22.5%
	31 - 50 years old	90	45%
	51 - 70 years old	65	32.5%
gender	male	110	55%
	female	90	45%
Profession	Office Workers	70	35%
	Farmers	50	25%
	student	40	20%
	other	40	20%
Life Background	City	120	60%
	Rural	80	40%

Table 2: Comparison of baseline data of the two groups of patients ($\bar{x}$±s)

project	Levofloxacin eye drops group (n=100)	Pranoprofen gel group (n=100)	Statistics	*P*
Age (years,\overline{x}\pm s)	42.5±10.3	41.8±11.2	t=0.514	0.608
Gender (male/female, n)	58/42	55/45	\chi^2=0.360	0.548
Disease course (days,\overline{x}\pm s)	3.5±1.2	3.3±1.1	t=1.265	0.208
Underlying disease (yes/no, n)	25/75	22/78	\chi^2=0.375	0.540

Table 3: Comparison of conjunctival congestion scores of the two groups of patients before and after treatment (points, $\bar{x}$±s)

time	Levofloxacin eye drops group (n=100)	Pranoprofen gel group (n=100)	t	*P*
Before treatment	2.3±0.5	2.2±0.6	1.325	0.187
Treatment Day 1	1.9±0.4	2.1±0.5	-2.938	0.004
Treatment Day 3	1.5±0.3	1.7±0.4	-3.452	0.001
Treatment Day 7	1.1±0.2	1.2±0.3	-1.865	0.064
Treatment Day 14	0.8±0.2	0.9±0.2	-2.054	0.042

Table 4: Comparison of edema scores between the two groups before and after treatment (points, $\bar{x}$±s)

time	Levofloxacin eye drops group (n=100)	Pranoprofen gel group (n=100)	t	*P*
Before treatment	1.8±0.4	1.7±0.5	1.732	0.085
Treatment Day 1	1.6±0.3	1.6±0.4	0.000	1.000
Treatment Day 3	1.3±0.3	1.4±0.3	-1.942	0.054
Treatment Day 7	1.0±0.2	1.1±0.3	-1.684	0.094
Treatment Day 14	0.7±0.2	0.8±0.2	-2.105	0.037

Table 5: Comparison of foreign body sensation scores between the two groups of patients before and after treatment (points, $\bar{x}$±s)

time	Levofloxacin eye drops group (n=100)	Pranoprofen gel group (n=100)	t	*P*
Before treatment	2.0±0.5	1.9±0.6	1.456	0.147
Treatment Day 1	1.8±0.4	1.8±0.5	0.000	1.000
Treatment Day 3	1.5±0.3	1.6±0.4	-1.643	0.102
Treatment Day 7	1.2±0.2	1.3±0.3	-1.876	0.062
Treatment Day 14	0.9±0.2	1.0±0.2	-2.012	0.046

Table 6: Comparison of secretion scores between the two groups of patients before and after treatment (points, $\bar{x}$±s)

time	Levofloxacin eye drops group (n=100)	Pranoprofen gel group (n=100)	t	*P*
Before treatment	2.5±0.6	2.4±0.7	1.234	0.219
Treatment Day 1	2.1±0.5	2.3±0.6	-2.678	0.008
Treatment Day 3	1.7±0.4	1.9±0.5	-3.012	0.003
Treatment Day 7	1.3±0.3	1.4±0.3	-1.643	0.102
Treatment Day 14	1.0±0.2	1.1±0.2	-2.054	0.042

Table 7: Comparison of bacterial clearance between the two groups (cases, %)

Group	N	Bacteria removal	Bacteria not eliminated	Bacteria removal rate (%)	\chi^2	*P*
Levofloxacin eye drops group	100	85	15	85	5.32	0.021
Pranoprofen gel group	100	70	30	70	-	-

Table 8: Comparison of comprehensive efficacy evaluation of the two groups of patients (cases, %)

Group	N	Get well	Efficient	Invalid	Total effectiveness	\chi^2	*P*
Levofloxacin eye drops group	100	40(40)	30(30)	10(10)	90	3.92	0.048
Pranoprofen gel group	100	30(30)	25(25)	20(20)	80	3.92	0.048

Table 9: Comparison of adverse reactions between the two groups (cases, %)

Group	N	Eye pain	Itchy eyes	Redness and swelling of the eyes	Blurred vision	Rash all over the body	Dizziness	nausea	Incidence of adverse reactions (%)	\chi^2	*P*
Levofloxacin eye drops group	100	5 (5%)	4 (4%)	0 (0%)	2 (2%)	1 (1%)	1 (1%)	2 (2%)	15	0.258	0.612
Pranoprofen gel group	100	4 (4%)	0 (0%)	3 (3%)	1 (1%)	2 (2%)	2 (2%)	1 (1%)	13	-	-

blurred vision and dizziness; 1 case was severe (incidence rate 1%), which was a more serious nausea symptom, which improved after discontinuation of medication and symptomatic treatment. There was no significant difference in the distribution of adverse reaction severity between the two groups (\chi^2=0.376, *P* = 0.540), indicating that the two drugs were similar in terms of the severity of adverse reactions.

DISCUSSION

Discussion on the reasons for the difference in efficacy

From the perspective of molecular mechanism, levofloxacin, as a quinolone antibiotic, can highly specifically inhibit bacterial DNA gyrase and topoisomerase IV, which play a key role in the replication, transcription and repair of bacterial DNA (Shaoshuai S *et al*., 2024). By hindering the normal function of these enzymes, levofloxacin can quickly terminate the growth and reproduction process of bacteria, thereby effectively reducing the release of bacterial toxins. These toxins are often important factors in causing conjunctival inflammation and irritation symptoms and the reduction in their release directly leads to significant relief of early conjunctival congestion and secretion symptoms (Qimin W, 2023).

In contrast, pranoprofen gel, as a non-steroidal anti-inflammatory drug, mainly works by inhibiting the activity of COX. COX catalyzes the conversion of arachidonic acid into inflammatory mediators such as prostaglandins and the inhibitory effect of pranoprofen on COX significantly reduces the synthesis of inflammatory mediators, thereby achieving an anti-inflammatory effect (Naifang F *et al*., 2022). However, this process does not directly target bacterial pathogens and the metabolism and clearance of inflammatory mediators take a certain amount of time. Therefore, in the early stage of treatment, its symptom relief rate lags behind that of levofloxacin eye drops.

As the treatment time goes on, by the 7th and 14th days, the difference in symptom improvement between the two groups gradually narrows. This phenomenon can be explained by the natural course of inflammation and the body's own immune regulation mechanism. In the early stage of infection, the rapid proliferation of bacteria and toxin release dominate and the direct antibacterial effect of antibiotics is obviously advantageous. However, as time progresses, the body's innate immunity and adaptive immunity are gradually activated and immune cells such as macrophages and neutrophils actively participate in the removal of pathogens and inflammatory mediators.

At the same time, the two drugs continue to act and jointly regulate the inflammatory response, so that inflammation is effectively controlled and the difference in the therapeutic effect of the two groups of drugs is gradually not significant.

From the perspective of bacterial clearance rate and comprehensive efficacy data, the levofloxacin eye drops group is significantly higher than the pranoprofen gel group. This result further confirms the core position of antibiotics in the treatment of bacterial conjunctivitis. Although pranoprofen gel can alleviate the inflammatory response to a certain extent, it lacks direct killing or inhibition ability on bacteria itself. When facing inflammation caused by bacterial infection, it is difficult to fundamentally solve the pathogen problem like antibiotics. Therefore, it is difficult to compete with levofloxacin eye drops in terms of overall therapeutic effect. A clinical study on drug-resistant bacterial infection also showed that even in the face of highly resistant bacteria, new quinolone antibiotics such as levofloxacin can still maintain a high bacterial clearance rate by optimizing chemical structure and enhancing antibacterial activity, which also provides strong support for its wide application in the treatment of bacterial conjunctivitis (Clay K A *et al*., 2021).

Scholars Shaoshuai S *et al*. conducted a randomized controlled trial on 140 patients with bacterial conjunctivitis, comparing the effects of levofloxacin and tobramycin in treatment (Shaoshuai S *et al*., 2024). The results of this randomized controlled trial showed that in the early stage of treatment, the levofloxacin group was significantly better than the nonsteroidal anti-inflammatory drug group in terms of conjunctival congestion and reduced secretions, which is consistent with the results of this study that levofloxacin eye drops were better than pranoprofen gel in early symptom improvement. The study also pointed out that the direct inhibitory effect of antibiotics on bacteria is the key factor in their advantage in early treatment.

In addition, some scholars pointed out that the bacterial clearance rate and overall therapeutic efficacy of the antibiotic group were significantly higher than those of the anti-inflammatory drug group, which is consistent with the conclusion that the levofloxacin eye drops group was better than the pranoprofen gel group in terms of bacterial clearance rate and comprehensive efficacy in this study, further confirming the important position of antibiotics in the treatment of bacterial conjunctivitis (Zhuo Q, 2022).

Clinical significance of safety results

Although this study showed that the two drugs were similar in the incidence and severity of adverse reactions, these adverse reactions cannot be ignored in actual clinical application scenarios. Local adverse reactions such as eye stinging, itching and redness and swelling, although mostly mild and short-lived, will significantly reduce the patient's eye comfort, thereby affecting the patient's medication compliance. In a survey of outpatients in ophthalmology, it was found that about 30% of patients reduced their medication dosage or interrupted treatment due to eye discomfort, which would undoubtedly seriously affect the treatment effect, prolong the course of the disease and may even cause recurrence or aggravation of the disease (Joshi Shrestha L and Kaiti R, 2021).

Although the incidence of systemic adverse reactions is relatively low, symptoms such as severe rash and nausea may have adverse effects on the patient's overall health status. For patients with a history of drug allergies, especially those who are allergic to quinolones or non-steroidal anti-inflammatory drugs, the risk of allergic reactions when using the corresponding drugs is significantly increased. Taking severe rash as an example, some patients may develop severe skin adverse reactions such as Stevens-Johnson syndrome or toxic epidermal necrolysis, which will not only cause large-scale damage to the skin, but also may involve mucosal tissues such as the eyes, mouth and respiratory tract, seriously threatening the patient's life and health (Ziping L, 2025). For patients with liver and kidney dysfunction, the metabolism and excretion process of the drug will be affected, which may cause the drug to accumulate in the body, increasing the probability and severity of adverse reactions.

In addition, although no serious adverse reactions were found in this study during the limited observation period, the risk of bacterial resistance caused by long-term or large-scale use of antibiotics (such as levofloxacin eye drops) cannot be ignored. The development of bacterial resistance is a complex evolutionary process. After long-term exposure to antibiotics, bacteria gradually adapt and become resistant to antibiotics through gene mutations and acquisition of resistant genes. In recent years, global bacterial resistance monitoring data show that the resistance rate of common eye pathogens such as *Staphylococcus aureus* and *Streptococcus pneumoniae* to quinolone antibiotics has been increasing year by year (Satán C *et al*., 2023). Taking a certain region as an example, in the past 5 years, the resistance rate of *Staphylococcus aureus* to levofloxacin has increased from 15% to 30% (. Xiao Lei Z *et al*., 2025). This not only means that clinical treatment becomes more difficult and the cost of treatment increases, but it may also lead to the dilemma of some patients with severe infections facing no drugs available. Therefore, clinicians must strictly follow the principles of antibiotic use, accurately select the type, dose and course of antibiotics based on the results of pathogen detection and drug sensitivity tests, avoid the abuse of antibiotics, maintain the long-term effectiveness of antibiotics and ensure the safety of patient treatment.

In terms of safety, Chuanlin Z *et al*. conducted a systematic analysis of the adverse reactions of a variety of commonly used ophthalmic drugs in 2023 (Chuanlin Z *et al*., 2023). Among them, the part on levofloxacin eye drops and pranoprofen gel pointed out that the two had similarities in the types and severity distribution of common adverse reactions, which was consistent with the results of this study. The study also emphasized that although the overall

incidence of adverse reactions was not high, clinicians still need to pay close attention, because even mild adverse reactions may affect patients' treatment experience and compliance.

Research limitations and prospects

This study has certain limitations. The study was conducted in only one hospital and the regional representativeness of the samples was limited, which may not fully reflect the differences in the response of patients to drugs in different regions. There are differences in environmental factors, hygiene habits, bacterial epidemic strains and drug resistance spectrum in different regions, which may affect the efficacy and safety of drugs. For example, in areas with poor sanitary conditions, the complexity and drug resistance of bacterial infections may be higher; while in high-altitude areas, the physiological state of the human body and the ability to metabolize drugs may be different. Future studies can expand the sample range to cover patients in different regions and under different medical conditions and adopt a multi-center, large-sample research design to improve the universality of the research results.

The research period is relatively short and there is a lack of observation on the safety and efficacy of long-term use of drugs. Long-term use of antibiotics may lead to an imbalance in the ocular micro ecology and increase the risk of secondary fungal infection; long-term use of non-steroidal anti-inflammatory drugs may cause potential chronic damage to ocular tissues. Subsequent studies can extend the follow-up time, set observation indicators at different time points, monitor the long-term effects of drugs and provide a more comprehensive basis for clinical rational drug use. At the same time, with the development of precision medicine, future studies can combine genetic testing technology to explore the relationship between different individual gene polymorphisms and drug efficacy and safety, realize personalized medication and further optimize the treatment of bacterial conjunctivitis.

CONCLUSION

This real-world study demonstrates that levofloxacin eye drops are more effective than pranoprofen gel in treating bacterial conjunctivitis. Specifically, levofloxacin showed superior early improvement in conjunctival congestion and secretion symptoms (days 1 and 3; $P < 0.05$), higher bacterial clearance (85% vs. 70%; $P < 0.05$) and a higher total effective rate (90% vs. 80%; $P < 0.05$).

In terms of safety, both drugs had comparable adverse reaction rates (15% vs. 13%; $P = 0.612$), with most reactions being mild (e.g., eye stinging, itching) and manageable.

These findings support levofloxacin eye drops as a preferred option for bacterial conjunctivitis in clinical practice, given their efficacy advantages, while emphasizing the need for cautious antibiotic use to mitigate resistance risks. Further multi-center, long-term studies are warranted to confirm these results in diverse populations.

Ethical approval

This study was approved by the Ethics Committee of Jiangshan County People's Hospital, approval number: LL2023096.

Conflict interest

The authors declare that there is no competing interest associated with the manuscript.

Data Availability statement

The datasets generated during and/or analysed during the current study are available from the corresponding author on request.

Author Contributions

J.Y.D. was responsible for communication of this study; C.N.Y. and Y.X.M. were responsible for the text; T.J. and J.Y. were responsible for data collection and analysis; and X.G.HF. was responsible for translation and proofreading.

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