Effect of gatifloxacin in the treatment of ophthalmological diseases and continuous nursing intervention

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Abstract: Gatifloxacin is a fourth-generation antibiotic and its antibacterial activity is better. It can play an obvious antiseptic effect in gram-positive bacteria, mycobacterium, mycoplasma, anaerobes and chlamydia. This study analyzed the treatment of the foreign body of the cornea by gatifloxacin eye drops. The results showed that gatifloxacin has a high bacterial clearance rate, which can reach 96.1%. The clinical effect is accurate and the adverse reaction is less. Compared with the control drug levofloxacin, its efficacy and safety were not statistically significant. Moreover, MIC determination of bacteria isolated from the study showed that gatifloxacin had stronger antibacterial activity. At the same time, it can be seen that nursing intervention can effectively improve the satisfaction of the treatment, before the operation, the patient's eye abnormalities, the psychological status of the patient, and the suitability of drug allergy should be evaluated.

Keywords: Gatifloxacin, bacterial clearance rate, drug resistance level, nursing intervention, levofloxacin.

INTRODUCTION

Fluoroquinolones have become important and commonly used antibacterial agents in internal medicine and surgical treatment (Claassen *et al.,* 2012; Bruno *et al.,* 2016). Quinolones have the activity of anti gram negative aerobic bacteria and is used for the treatment of urinary tract infection. In order to get broad spectrum active and practical drugs, the development of these drugs has been ongoing (David *et al.,* 2004). Fluoroquinolones commonly used in the ophthalmology include ciprofloxacin, ofloxacin, norfloxacin, and lomefloxacin, and other quinolones such as levofloxacin, sparfloxacin, gatifloxacin, moxifloxacin, pefloxacin, and tofloxacin (Espinel *et al.,* 2015). Gatifloxacin is a new generation of fluoroquinolone synthetic antibacterial agents. Compared with similar drugs, it has wider antimicrobial spectrum, stronger antibacterial activity and better safety (Ethan *et al.,* 2013; Isorni *et al.,* 2015).

Gatifloxacin is a fourth generation of antiseptic drug, which inhibits the activity of DNA spiral enzyme and bacterial topoisomerase, and thus effectively inhibits the synthesis and replication of bacterial DNA, resulting in the apoptosis of bacteria. Its antibacterial activity is good, and can play an obvious antibacterial role in Gram-positive bacteria, mycobacteria, mycoplasma, anaerobes and chlamydia (Khera *et al.,* 2015). The main component of gatifloxacin eye drops is gatifloxacin, which can play an obvious effect in bacterial conjunctivitis, and has a rapid release rate of drug force, also can play a lubrication effect, have high bioavailability, and have a special point of persistent efficacy (Heer *et al.,* 2015). There are studies on the treatment of levofloxacin and gatifloxacin in patients with bacterial conjunctivitis, and compare them, and evaluate their safety and effect (Li *et al.,* 2015). It was found that although there was no statistical difference in the bacterial clearance rate and clinical efficacy of the two drugs for bacterial conjunctivitis, the clinical symptoms of the patients were better than levofloxacin after gatifloxacin was treated, and the tolerance score was higher than that of the patients treated with levofloxacin (Lv *et al.,* 2015; Galasso *et al.,* 2015). It was found that the minimum inhibitory concentration of gatifloxacin was significantly lower than that of levofloxacin after gatifloxacin, and the effectiveness of gatifloxacin was confirmed (Emir *et al.,* 2014). Based on this, we analyzed the role of continuous nursing intervention in the treatment of ophthalmic diseases with fluoroquinolones.

MATERIALS AND METHODS

260 cases of corneal foreign bodies were selected from ophthalmology outpatients from 2015 to 2016. The corneal foreign bodies were located in the elastic layer of the corneal epithelium, the matrix layer, the foreign body in 184 cases and the non metal foreign body in 76 cases. After corneal foreign body removal, the corneal foreign bodies were divided into two groups. The test group was gatifloxacin group and the control group was Helen group. Inclusion criteria: the patient met the corneal foreign body diagnosis; the course was within 5 days; the age was 16~60 years old; the antibiotic eye drops were not used within 48 h before the treatment. All patients were approved by ethics committee of Liaocheng City People's Hospital, ethical approval number as 2016ACTPHI2 and all patients signed on the informed consent.

The patients were randomly divided into gatifloxacin group and levofloxacin group, each group of 130 people, the test group used gatifloxacin eye drops, and the control group used left ofloxacin eye drops. The conjunctival sac

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was washed with physiological saline after the bacterial culture of the corneal foreign body and the rust part of the cornea. After 3 times the surface anaesthesia of tetracaine, the foreign bodies and rust were removed under the fissure microscope. The experimental group was treated with gatifloxacin eye drops eye drops, 2 drops each time, 2 h 1 times a day, 6 times a day. The control group was treated with left ofloxacin eye drops, 2 drops at a time, 1 times per 2h, 6 times per day. Conjunctival congestion, eye secretion, eye pain and photophobia were observed before and first, third, fifth and 7 days after corneal foreign body removal, respectively. The culture of the conjunctival sac secretions was performed before the corneal foreign body removal, and the bacteria culture positive were identified. The drug sensitivity test of gatifloxacin, levofloxacin, ofloxacin and cyclopropyl sand was used by the paper method. No systemic antibiotics were used in all cases.

Efficacy observation index and evaluation standard

All patients were asked the history of the disease in detail, and recorded the changes of the symptoms and signs of the patients before and after the removal of the corneal foreign body, and recorded the severity by the integral method. The symptoms and signs of eye pain, photophobia, tears, foreign body sensation, conjunctival congestion and eye secretion were recorded in the control group and the experimental group, and the patients were divided into 0, 1, 2 and 3 grade respectively according to the subjective feelings of the patients. Such as tears: no tears (0 point), a little tears (1 point), tears (2 points), tears (3 points).

Effectiveness evaluation

The percentage of improvement in the main symptoms and signs before and after treatment was calculated respectively. The formula for improving the percentage of the improvement = (pre treatment integral - post treatment integral) / pre - treatment integral *100%; the criteria for determining the curative effect of the disease were determined by 4 levels of recovery, efficacy, effectiveness and effectiveness. The curative effect of a single patient was judged by the descending value of the total score before and after treatment. Cure: The symptoms and signs of the integral is reduced more than 90%; Effect: the symptoms and signs score reduced ≥70% and <90%; slightly effective: the symptoms and signs of decreased integral ≥30% and <70%; Ineffective: symptoms and signs score decreased < 30%.

Continuous nursing intervention

Continuous quality improvement is to improve the related nursing projects continuously in the course of nursing management, according to the characteristics and effects of nursing, in order to achieve better quality of nursing. In the process of clinical nursing, this kind of nursing method has a very significant effect and it is a long-term effective management mechanism. Encourage nursing staff to strengthen nursing skills learning and training, so that they can have more skillful operation skills. The patients' nursing satisfaction is more than 98%, and no adverse events occur. We should strengthen the assessment of nurses' operative skills, and ask nurses to assess their operation skills by up to 95%. The working responsibilities of the group members mainly include the standard of enacting access to the nursing techniques of the nurses at all levels, the effective solutions to the existing problems of ocular nursing difficulties, the regulation of the operating norms of the nursing staff, the formulation and supervision of the training and assessment process of the nursing staff. Meanwhile, patients were asked to evaluate the satisfaction of nursing interventions.

STATISTICAL ANALYSIS

Statistical analysis will use SPSS11.0 for windows statistical software for data analysis, all the statistical tests are both tested by bilateral test, $P < 0.05$ for the difference is statistically significant.

RESULTS

Test cases completed by the selected cases

The test group and the control group were all selected 130 cases, of which 130 cases were completed; two groups had no cases of exfoliation and elimination. The evaluation of the curative effect was FAS (full analysis set) analysis and PPS (per-protocol set) analysis, FAS analysis and PPS analysis results were consistent. The general data of the 2 groups before treatment include sex, age, visual acuity, complication, pre therapy and allergy, and the difference of symptoms and signs before treatment.

Effectiveness results

Bacteriological efficacy: the bacterial clearance rate test group and the control group were 93.5% and 90.7% respectively. The difference of bacterial clearance rate between the test group and the control group was statistically significant ($P<0.05$) (table 1). A total of 218 strains of pathogenic bacteria were isolated, and the results showed that gatifloxacin and levofloxacin had good antibacterial activity to the pathogenic bacteria isolated from the study, including Gram-positive cocci and gram-negative bacilli, through the determination of the MIC (minimun inhibitory concentration) of the surviving pathogenic bacteria. However, the antibacterial activity of gatifloxacin in the experimental group was better than that of the control drug, levofloxacin (table 2).

The total score of the disease was (23.54±7.13) and (1.54 ±2.34) before and after treatment, and the total score of the control group was (22.16±7.32) and (2.31±3.17) respectively. There was no statistical difference between

Table 1: Bacterial scavenging effect

Strain	Experimental group (n =130)				Control group (n =130)			
	Number	Eliminate	Partial clearance	Remaining	Number	Eliminate	Partial clearance	Remaining
Gram-positive bacteria	86	75	7	4	84	71	7	6
Corynebacterium	8	7	0	1	7	5	2	0
Staphylococcus epidermidis	25	22	2	1	22	19	1	2
Staphylococcus aureus	12	12	0	0	14	13	0	1
staphylococcus sciuri	6	5	0	1	8	5	2	1
Staphylococcus aureus	5	2	2	1	7	6	1	0
Staphylococcus	17	14	3	0	12	10	1	1
Pathogenic Streptococcus	13	13	0	0	14	13	0	1
Gram-negative bacteria	23	14	6	3	24	16	4	4
Acinetobacter baumannii	4	2	1	1	5	3	1	1
Escherichia coli	3	2	0	1	3	3	0	0
klebsiella pneumoniae	6	4	2	0	8	5	2	1
Proteus vulgaris	3	3	0	0	2	1	0	1
Proteus mirabilis	5	2	2	1	4	2	1	1
Enterobacter cloacae	2	1	1	0	2	2	0	0
Total	109	89	13	7	108	87	11	10
Bacterial clearance rate	93.5%				90.7%			

Table 2: Comparison of antibacterial activity

Experimental bacteria	Number	Test medicine	MIC50	MIC90
Corynebacterium	15	Gatifloxacin	0.150	0.750
		Levofloxacin	0.150	1.000
Staphylococcus	124	Gatifloxacin	0.125	0.750
		Levofloxacin	0.750	1.500
Escherichia coli	5	Gatifloxacin	0.125	2.000
		Levofloxacin	0.750	1.500
Acinetobacter baumannii	9	gatifloxacin	0.750	1.000
		Levofloxacin	1.000	2.000
Klebsiella pneumoniae	14	Gatifloxacin	0.750	2.000
		Levofloxacin	0.500	1.750
Pathogenic Streptococcus	27	Gatifloxacin	1.000	1.750
		Levofloxacin	1.000	1.750
Proteus	5	Gatifloxacin	1.250	2.000
		Levofloxacin	1.250	2.000
Enterobacter cloacae	4	Gatifloxacin	1.000	2.000
		Levofloxacin	2.000	2.000

Table 3: Evaluation of clinical efficacy of experimental group and control group

Index	Experimental group (n =130)				Control group (n =130)				P value
	Recovery	Effective	Partial validity	Invalid	Recovery	Effective	Partial validity	Invalid	
Total	95	22	8	5	61	36	19	14	
Recovery rate (%)	73.1%				46.9%				0.017
Effective rate (%)	96.1%				89.2%				0.004

Table 4: Comparison of patients' satisfaction after nursing intervention

Time	Cases	Satisfied	Basic satisfaction	Dissatisfied	Satisfaction (%)
Before implementation	130	76	34	20	84.6%
After implementation	130	91	35	4	96.9%

the two groups (P>0.05). The total effective rate (cure + effective) in the experimental group and the control group was 96.1% and 89.2% respectively. The cure rate of the experimental group and the control group were 73.1% and 46.9%, respectively, and the difference between the two groups was statistically significant (P<0.05) (table 3).

DISCUSSION

Corneal foreign body is a common ocular trauma, iron foreign body can be formed. Plant bodies are easy to cause infection (Marguerite *et al.,* 2010; Liam *et al.,* 2014). Clinically, for shallow corneal foreign bodies, it can be swallowed with salted cotton swabs under topical anesthesia. The deeper foreign body can be eliminated by aseptic needles (Muthiah *et al.,* 2014). The elimination of foreign bodies should be strictly implemented aseptic operation, otherwise there will be a risk of suppurative corneal ulcers (Mannen *et al.,* 2010). Foreign bodies after general antibiotic eye drops and ointment. Therefore, selecting effective antibiotics is the key to the curative effect after corneal foreign body surgery. Gatifloxacin is a new generation of quinolone antibiotics. Its antibacterial spectrum is wide, and the antibacterial action is the same as other quinolone antibacterial agents. By inhibiting the formation of DNA double helix in bacteria, DNA is damaged and thus exerts antiseptic effect (Nishida *et al.,* 2015). Compared with the 3 generation fluoroquinolone drugs such as ciprofloxacin and ofloxacin, the latter has weak activity against G- bacteria, G+ bacteria, anaerobes, mycoplasma, chlamydia and mycobacteria, and gatifloxacin has good antibacterial effect on these pathogens and low toxicity. The antibacterial activity of gatifloxacin is stronger than that of other species, and its antibacterial spectrum is more extensive (Noriko *et al.,* 2017). The activity of anti G+ bacteria is 4~32 times stronger than ciprofloxacin and ofloxacin. There is no cross resistance between other antibiotics and other antibiotics, and the widely used ciprofloxacin, lomefloxacin, fleroxacin, and macrolides and aminosides are widely used in clinical practice. All drugs have cross resistance (Presbitero *et al.,* 2003). The previous generation of quinolones only uses one strong active site, and the bacterial resistance only requires a mutation of one site, which is more likely to induce resistance strains; and gatifloxacin can block two loci because of structural improvement (Perl *et al.,* 2015). Bacteria need to be mutated at two enzyme sites to produce resistance to it. Therefore, gatifloxacin is more resistant to antibiotics than previous quinolones.

In clinical trials, gatifloxacin has a good effect on various respiratory tract infections, simple or complex urinary tract infections, bacteria induced sexually transmitted infections and soft tissue infections (Marguerite *et al.,* 2010). However, with the continuous increase of clinical application, it has been found that gatifloxacin has a more obvious adverse effect on blood glucose metabolism and heart function, but the local use of Gatifloxacin Eye Drops, body and eye side effects are small (Nicola *et al.,* 2015). The study does not have serious adverse events, it shows that the side effect of Gatifloxacin Eye Drops is small and the safety is high (Sanomura *et al.,* 2014). In this study, the gatifloxacin group was 96.1%, more than 89.2% (P<0.05) of levofloxacin group and MIC determination of the isolated bacteria in the study. The MIC of gatifloxacin group was less than or equal to MIC of levofloxacin, indicating that gatifloxacin was more active than left Ofloxacin eye drops.

At the same time, the comprehensive quality of nursing staff is directly related to the quality of nursing, to strengthen the training of nursing staff, and to improve the traditional traditional training model is of great significance to improve the effect of training (Solinas *et al.,* 2015). We should strengthen the analysis of the nursing status and find out the problems in the nursing process. According to the existing problems, we should work out effective solutions to solve them (Singh *et al.,* 2016). We should clarify the responsibilities and obligations of each nurse and improve their sense of responsibility. In daily care, we should constantly clarify the responsibilities of nursing staff. In the work, the team mainly summarized the analysis of the nursing service level, and found out more scientific and efficient operation skills (Ethan *et al.,* 2013; Isorni *et al.,* 2015). Improve the quality of nursing service, strengthen the operation skills of nursing staff, and make patients get better quality nursing service during hospitalization and improve the comfort of hospitalization. We urge and encourage nurses to enhance their learning and training of nursing skills, so that they can have more skillful operation skills (Claassen *et al.,* 2012; Bruno *et al.,* 2016). The patients' nursing satisfaction is more than 98% and no adverse events occur. We should strengthen the assessment of nurses' operative skills, and ask nurses to assess their operation skills by up to 95% (David *et al.,* 2004). We should improve the process of evaluation and formulate risk prevention procedures for possible risks. For example, in patients with corneal foreign body removal, before the operation of the patient's eye abnormalities, the nature of foreign bodies, the

psychological status of the patient, whether the drug allergy, the environment is suitable for evaluation. When evaluating abnormal eye condition, we need to evaluate whether the eye has secretion discharge, whether there are irritation symptoms and vision condition.

CONCLUSION

This study analyzed the treatment of the foreign body of the cornea by Gatifloxacin eye drops, the results showed that gatifloxacin has high bacterial clearance rate, the clinical efficacy is accurate, and the adverse reaction is less. Compared with the control drug levofloxacin, there is no significant difference in its effectiveness and safety. Therefore, as a new type of quinolone antibacterial agent, gatifloxacin has the characteristics of wide antibacterial spectrum, definite curative effect, small adverse reaction and almost no potential light toxicity. It provides the ophthalmologist with strong bactericidal, relatively weak toxicity, broad antibacterial spectrum and covering Gram-positive and negative bacteria with good tissue penetration. The effective antibiotics with low drug resistance have good effects on prevention, control and treatment of ocular infections caused by sensitive bacteria. At the same time, the application of continuous quality improvement in nursing management can obviously improve the quality of nursing, improve the assessment rate of operation technology and then improve the patient satisfaction.

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