

Original Article

Clinical efficacy of clindamycin combined with levofloxacin hydrochloride in the treatment of gynecological pelvic inflammatory disease

Ling Sha¹, Wei Wang²

¹Department of Pharmacy, The Affiliated Hospital of Medical School of Ningbo University, Ningbo, Zhejiang Province, China; ²Department of Pharmacy, Yantai Yuhuangding Hospital, Yantai, Shandong Province, China

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Abstract: Objective: To investigate the effect of clindamycin combined with levofloxacin hydrochloride in treating pelvic inflammatory disease. Methods: Eighty patients with pelvic inflammatory disease who were admitted to Yantai Yuhuangding Hospital were randomly divided into two groups, with 40 patients in each group (n=40). The control group was treated with clindamycin hydrochloride (0.6 g clindamycin hydrochloride mixed with 0.9% normal saline which was given intravenously twice a day for 1 month). The treatment group was treated with levofloxacin hydrochloride combined with clindamycin (0.6 g clindamycin + 0.2 g levofloxacin hydrochloride mixed with 0.9% normal saline which was given intravenously twice a day for 1 month). The serum inflammatory factors, hemorheology indexes, effective rate of treatment and incidence of adverse reactions were compared between the two groups. Results: After treatment, the serum inflammatory factors and hemorheology indexes in the treatment group were better than those in the control group (P<0.05). Besides, the effective rate was higher, and the incidence of adverse reactions was lower in the treatment group than the control group (P<0.05). Conclusion: Clindamycin combined with levofloxacin hydrochloride has a good effect in the treatment of pelvic inflammatory disease, which can not only greatly reduce the level of inflammatory factors in patients, but also improve the poor condition of blood and help to reduce the incidence of adverse reactions.

Keywords: Clindamycin hydrochloride, levofloxacin hydrochloride, pelvic inflammatory disease, therapeutic effect

Introduction

Pelvic inflammatory disease is a common type of inflammatory disease in gynecological clinical practice, which tends to occur in the connective tissue, pelvic peritoneum and genital area of women [1, 2]. Pelvic inflammatory disease refers to symptoms such as irregular menstruation and pelvic pain, which make patients suffer from a lot of pain, psychological stress and shock in life [3]. If the patient does not receive effective treatment in time, it easily causes chronic pelvic pain and even infertility [4].

Nowadays, the clinical treatment of pelvic inflammatory disease is mainly based on drugs, and clindamycin, levofloxacin hydrochloride, etc. are more commonly used [5, 6]. The former is a broad-spectrum antibiotic, belonging to the

lincomycin class, which has a high frequency of application in the treatment of infectious diseases due to its strong resistance to gram-positive aerobes and anaerobes, wide tissue distribution and does not require skin testing [7-9]. The latter is also a broad-spectrum antimicrobial drug, which can strongly inhibit gram-positive (G⁺) bacteria and gram-negative (G⁻) bacteria, and is mostly used in clinical treatment of skin and soft tissue infections, intestinal infection, reproductive system infection and other diseases [10-12]. Because levofloxacin hydrochloride has a poor anti-anaerobic ability, it may not have strong antibacterial effect in treating pelvic inflammatory disease, thus affecting the therapeutic effect [13]. At present, the effects of levofloxacin hydrochloride and clindamycin in the treatment of pelvic inflammatory disease have been reported [14, 15]. Effective and timely treatment is of great significance for the

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rehabilitation and prognosis of patients with pelvic inflammatory disease. Therefore, clindamycin combined with levofloxacin hydrochloride was used to explore the therapeutic effect in patients with pelvic inflammatory disease in this study.

Materials and methods

The general information

Eighty patients with pelvic inflammatory disease who were admitted to Yantai Yuhuangding Hospital from August 2018 to August 2019 were collected and randomly divided into two groups, with 40 patients in each group. The control group received clindamycin hydrochloride, and the treatment group was treated with levofloxacin hydrochloride combined with clindamycin. The average age of patients in the two groups was 38.2 ± 4.4 and 38.4 ± 4.5 years old respectively, and the course of disease was 7.25 ± 1.24 and 7.32 ± 1.31 months, respectively. The disease was classified into 3 types, including 17 and 18 cases of pelvic connective tissue inflammation, 14 and 12 cases of pelvic peritoneal inflammation, and 9 and 10 cases of genital inflammation in the two groups, respectively. There was no statistically significant difference in general clinical data between the two groups. All patients volunteered to participate in this study and signed the informed consent, and this study was approved by the Ethics Committee of Yantai Yuhuangding Hospital.

Inclusion and exclusion criteria

Inclusion criteria: No abnormalities were found in b-mode ultrasound and vaginal secretions; all patients met the diagnostic criteria of Obstetrics and Gynecology, and were diagnosed by clinical manifestations, laboratory examination and imaging examination [16].

Exclusion criteria: Patients with other serious gynecological diseases; patients with important organ disorders such as heart, liver and kidney; patients who took antibiotics within the last week; pregnant and lactating patients; patients with gastrointestinal diseases; patients who quit the study halfway; patients with severe psychological disorders, epilepsy or brain diseases.

Methods

All patients stopped other medications one week in advance of the study treatment, they rested in bed as much as possible during the treatment, and kept the vulva in a clean state. Besides, the patients could not have sex. The treatment method of the control group was as follows: 0.6 g of clindamycin hydrochloride (H20133160, Anhui Pioneer Pharmaceutical Co., Ltd., China) was added to 250 mL of 0.9% normal saline. After mixing, the drug was given intravenously to patients twice a day for 1 month. The treatment method of the treatment group was as follows: 0.6 g of clindamycin hydrochloride (same as above) was added to 250 mL of 0.9% normal saline, and then 0.2 g of levofloxacin hydrochloride (H20000057, Zhejiang Pharmaceutical Co., Ltd. Xinchang Pharmaceutical Factory, China) was added to 100 mL of 0.9% normal saline. After mixing separately, the drugs were given intravenously to patients twice a day for 1 month.

Outcome measures

Main outcome measures: Changes of inflammatory factors before and after treatment (high sensitivity C-reactive protein, tumor necrosis factor- α , white blood cell count, interleukin-6), hemorheology indexes (high-cut and low-cut whole blood viscosity and plasma viscosity), changes in clinical symptoms and treatment effective rate. Total effective rate (%) = (number of cured cases + number of marked effective cases + number of effective cases)/number of patients * 100%.

Secondary outcome measures: Occurrence of adverse reactions in patients after treatment including abdominal pain, nausea and vomiting, skin allergy, dizziness and loss of appetite. Incidence of adverse reaction (%) = number of adverse reaction cases/number of patients * 100%.

Statistical analysis

The data were analyzed by SPSS 20.0. The measurement data were expressed as mean \pm standard deviation ($\bar{x} \pm sd$). If the data accorded with a normal distribution and homogeneity of variance, two tailed independent sample t-test was used for comparisons between groups, and paired sample t-test was used for

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Table 1. General information of patients ($\bar{x} \pm sd$, n/%)

	Control group (n=40)	Treatment group (n=40)	t/ χ^2	P
Age (year)	38.2±4.4	38.4±4.5	0.201	0.841
BMI (kg/m ²)	20.72±1.51	21.03±1.84	0.824	0.413
Course of disease (month)	7.25±1.24	7.32±1.31	0.245	0.807
Disease type (cases)			0.235	0.889
Genital inflammation	9 (22.5%)	10 (25.0%)		
Pelvic peritoneal inflammation	14 (35.0%)	12 (30.0%)		
Pelvic connective tissue inflammation	17 (42.5%)	18 (45.0%)		
Marriage status			0.621	0.431
Married/cohabiting	32 (80.0%)	29 (72.5%)		
Other	8 (20.0%)	11 (27.5%)		
Family monthly income per capita (yuan)			0.487	0.485
≤3000	16	13		
>3000	24	27		

Note: BMI: body mass index.

Table 2. Comparison of inflammatory factor levels before and after treatment ($\bar{x} \pm sd$)

	Control group (n=40)	Treatment group (n=40)	t	P
Before treatment				
CRP (mg/L)	31.63±2.73	30.51±2.64	1.865	0.066
Tumor necrosis factor- α (ng/L)	4.78±0.15	4.82±0.21	0.980	0.330
Interleukin-6 (ng/L)	278.82±24.27	273.95±21.92	0.942	0.349
WBC ($\times 10^9/L$)	24.18±2.14	25.00±1.98	1.779	0.079
After treatment				
CRP (mg/L)	8.17±1.92***	6.92±1.75***	3.043	0.003
Tumor necrosis factor- α (ng/L)	2.90±0.42***	2.02±0.47***	8.830	<0.001
Interleukin-6 (ng/L)	152.87±21.82***	128.46±19.84***	5.235	<0.001
WBC ($\times 10^9/L$)	9.02±1.24***	7.92±1.38***	3.750	<0.001

Note: Compared with before treatment, ***P<0.001. CRP: C-reactive protein; WBC: white blood cell.

intra-group comparison before and after treatment. The enumeration data were expressed as cases/percentage (n/%) and evaluated by the χ^2 test. P<0.05 indicated that the difference was statistically significant.

Results

Comparison of general information

There were no significant differences in general data between the two groups (all P>0.05). See **Table 1**.

Comparison of inflammatory factor levels before and after treatment

Before treatment, there were no statistically significant differences in inflammatory factor

levels between the two groups (all P>0.05). After treatment, inflammatory factor levels of both groups were significantly lower than those before treatment, and the reduction in the treatment group was greater than that in the control group (all P<0.01), as shown in **Table 2**.

Comparison of hemorheology indexes before and after treatment

Before treatment, there were no statistically significant differences in hemorheology indexes between the two groups (P>0.05). After treatment, low-cut and high-cut whole blood viscosity and plasma viscosity in both groups were significantly lower than those before treatment, and the indexes in the treatment group were lower than those in the control group (all P<0.05). See **Table 3** and **Figure 1**.

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Table 3. Comparison of hemorheology indexes before and after treatment ($\bar{x} \pm sd$)

	Control group (n=40)	Treatment group (n=40)	t	P
Before treatment				
Low-cut whole blood viscosity (mPa.s)	12.19±0.48	12.01±0.51	1.625	0.108
High-cut whole blood viscosity (mPa.s)	5.89±0.37	6.01±0.42	1.356	0.179
Plasma viscosity (mPa.s)	2.12±0.10	2.08±0.12	1.620	0.109
After treatment				
Low-cut whole blood viscosity (mPa.s)	10.74±0.43***	9.34±0.32***	16.519	<0.001
High-cut whole blood viscosity (mPa.s)	5.10±0.32***	4.89±0.43***	2.478	0.015
Plasma viscosity (mPa.s)	1.61±0.14***	1.42±0.17***	5.456	<0.001

Note: Compared with before treatment, ***P<0.001.

Comparison of treatment effective rate

The total effective rate of treatment in the treatment group was significantly higher than that in the control group (97.50% vs. 85.00%, P<0.05). See **Table 4**.

Comparison of the incidence of adverse reactions

The incidence of adverse reactions in the treatment group was significantly lower than that in the control group (5.00% vs. 25.00%, P<0.05). See **Table 5**.

Discussion

In recent years, the incidence of pelvic inflammatory disease has continuously increased, affecting the normal life and work of patients, and even causing infertility [17, 18]. Untimely treatment will also prolong the course of the disease and increases the difficulty of being cured, so it is very important to take effective drug treatment as soon as possible [19, 20]. Both clindamycin and levofloxacin hydrochloride are broad-spectrum antibiotics. Among them, clindamycin can effectively inhibit common bacteria in gynecological diseases, while levofloxacin hydrochloride can effectively inhibit gram-negative and gram-positive bacteria, but the ability of anti-anaerobes is poor [6]. In this study, two drugs were used in combination and the therapeutic effect was discussed.

The main infection route of pelvic inflammatory disease is the spread upward along the mucous membrane of the reproductive tract. Inflammatory cells infiltrate into the inflamed area and produce a variety of cytokines and inflammatory mediators, which are clinically

manifested as increased levels of various inflammatory factors [21]. Therefore, active anti-infective therapy contributes in the treatment of the disease. It has been found that levofloxacin hydrochloride can effectively reduce the level of inflammatory factors and promote the absorption of inflammation in patients with pelvic inflammatory disease [22]. The results of this study showed that after treatment, the levels of inflammatory factors such as C-reactive protein, tumor necrosis factor- α , interleukin-6 and white blood cell count in the treatment group were significantly lower than those in the control group. Thus it can be seen that the combination of drugs can reduce the level of inflammation in the body and improve the inflammatory state in patients.

The blood circulation in patients with pelvic inflammatory disease is affected to varying degrees, and the blood is often viscous, stagnant and thick [23]. Studies have found that levofloxacin hydrochloride can change the hemorheology indexes of patients with pelvic inflammatory disease, and greatly improve the indicators of high-cut and low-cut whole blood viscosity [24-26]. In this study, it was found that after treatment, the low-cut and high-cut whole blood viscosity and the plasma viscosity of the treatment group were significantly lower than that of the control group, suggesting that the combined use of drugs had a prominent effect on the improvement of hemorheology indexes. In addition, studies have found that in the treatment of pelvic inflammatory disease, the incidence of adverse reactions in patients treated with levofloxacin hydrochloride is significantly lower than that in patients treated with the routine method [27]. In this study, it was found that the incidence of adverse reactions in patients

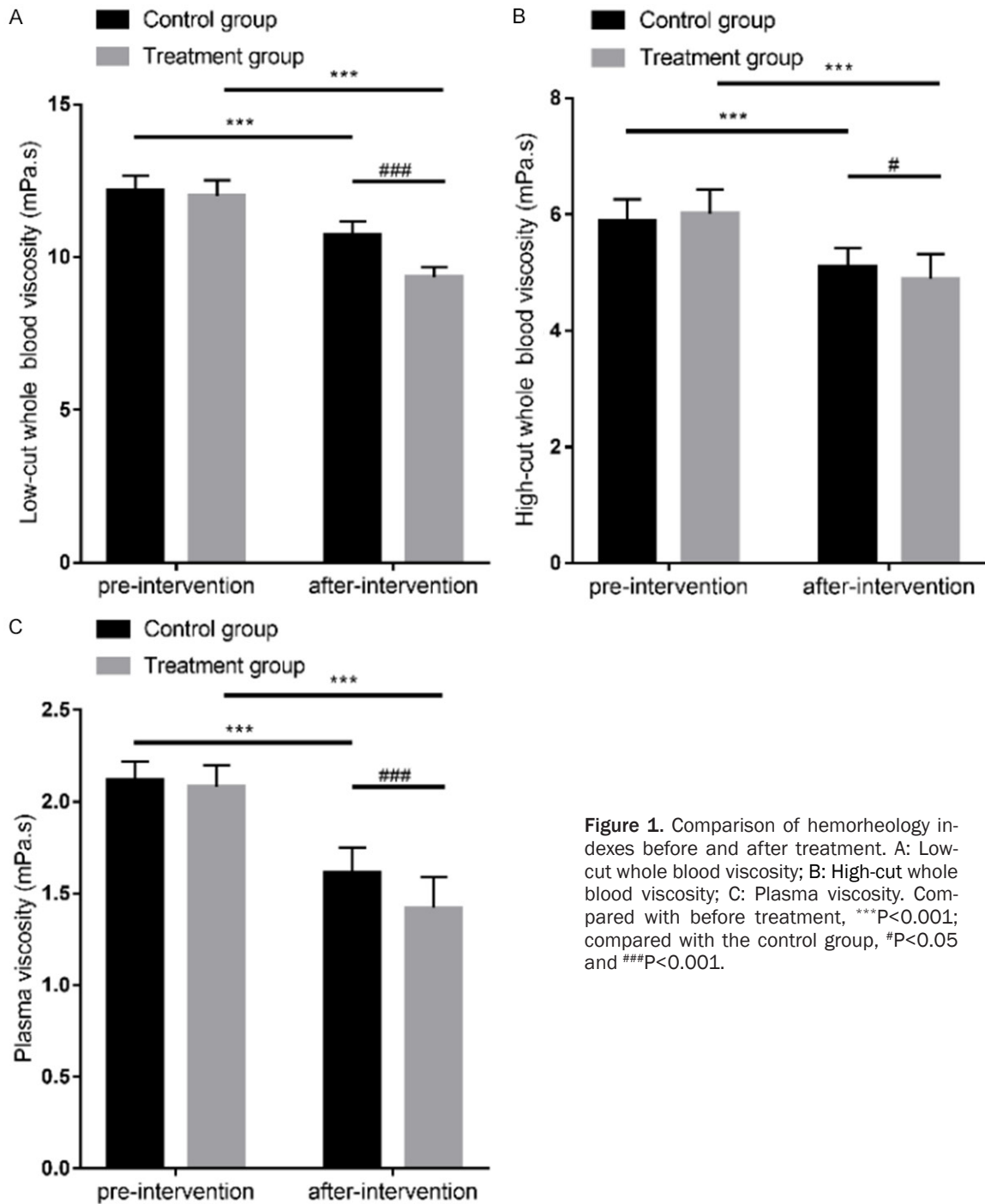


Figure 1. Comparison of hemorheology indexes before and after treatment. A: Low-cut whole blood viscosity; B: High-cut whole blood viscosity; C: Plasma viscosity. Compared with before treatment, ***P<0.001; compared with the control group, #P<0.05 and ###P<0.001.

treated with combined drugs was relatively low (only 5.00%), indicating that the combined treatment could significantly reduce the adverse reactions and avoid the psychological changes and physical discomfort caused by adverse reactions. Moreover, the effective rate of the treatment group was significantly higher than that of the control group, and the combined treatment was better than a single drug

in the treatment of pelvic inflammatory disease [28].

However, there are still some limitations in this study. First of all, the sample size is small, and more patients will be included for further research. Secondly, a single-center was used in this study which may affect the universal applicability of the results, such as increasing the

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Table 4. Comparison of treatment effective rate (n, %)

Groups	Control group (n=40)	Treatment group (n=40)	χ^2	P
Cured	15 (37.50)	18 (45.00)	0.464	0.496
Marked effective	15 (37.50)	20 (50.00)	1.270	0.260
Effective	4 (1.00)	1 (2.50)	0.853	0.356
Ineffective	6 (15.00)	1 (2.50)	2.505	0.113
Total effective rate	34 (85.00)	39 (97.50)	3.914	0.048

Table 5. Comparison of the incidence of adverse reactions (n, %)

Groups	Control group (n=40)	Treatment group (n=40)	χ^2	P
Abdominal pain	2 (5.00)	0 (0.00)	0.513	0.474
Nausea and vomiting	2 (5.00)	0 (0.00)	0.513	0.474
Skin allergy	1 (2.50)	0 (0.00)	1.013	0.314
Dizziness	2 (5.00)	1 (2.50)	0.346	0.556
Loss of appetite	3 (7.50)	1 (2.50)	1.053	0.305
Incidence of adverse reactions	10 (25.00)	2 (5.000)	6.275	0.012

possibility of false positive results, so multi-center trials will be carried out in the future to obtain more accurate conclusions. Thirdly, this study lacks dynamic monitoring of inflammatory factor levels in patients, and the follow-up time will be increased in the future to further study the improvement of inflammatory levels by the treatment. Finally, there is still a lack of research on the relationship between inflammatory factors and therapeutic effects, and future studies will add the analysis of these results.

In summary, clindamycin combined with levofloxacin hydrochloride has a very good effect in the treatment of pelvic inflammatory disease, which can not only alleviate the clinical symptoms, but also help to reduce the incidence of adverse reactions.

Disclosure of conflict of interest

None.

Address correspondence to: Wei Wang, Department of Pharmacy, Yantai Yuhuangding Hospital, No. 20 Yuhuangding East Road, Yantai 264000, Shandong Province, China. Tel: +86-0535-6691999; E-mail: wangwei99yt@163.com

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