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Original Article

The effect of adjuvant treatment in chronic pelvic inflammation by Fukejing capsules and its influence on hemorheology and inflammatory factors

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Abstract: Objectives: This study investigated and analyzed the therapeutic effect of Fukejing capsules combined with ceftriaxone sodium and metronidazole in treating chronic pelvic inflammation and its influence on hemorheology and inflammatory factors. Methods: 137 patients with chronic pelvic inflammation admitted to our hospital from March 2018 to April 2020 were selected as the research subjects, and randomly classified into observation group (n=70) and control group (n=67) based on the random number table. The control-group were treated with ceftriaxone sodium and metronidazole, while the observation-group received Fukejing capsules based on the medication taken by the control group. The clinical efficacy, changes of hemorheology indexes and inflammatory factors of the two groups were compared. Results: The overall response rate of the observation group was critically higher than that of the control group ($P<0.05$). The hemorheology indicators of plasma viscosity, the blood viscosity at low and high shear rate of the two groups of patients in post-treatment were notably lower than those in pre-treatment ($P<0.05$), and the indexes of the observation group in post-treatment were remarkably lower than that of the control group ($P<0.05$). The two groups' degree of serum TNF-α, IL-6 and CRP in post-treatment were critically lower than in pre-treatment ($P<0.05$), and the indicators of the observation group in post-treatment were dramatically lower than that of the control group ($P<0.05$). Conclusion: The treatment of Fukejing capsules combined with ceftriaxone sodium and metronidazole is effective in the chronic pelvic inflammation. It can efficiently reduce the blood viscosity of patients and cut down the inflammatory response of the body, which is worthy of clinical promotion.

Keywords: Fukejing capsule, chronic pelvic inflammation, hemorheology, inflammatory factors

Introduction

Chronic pelvic inflammation is a usual gynecological disease. It is the inflammation of reproductive organs, surrounding connective tissue and pelvic peritoneum that caused by upper genital infection in female [1]. The inflammation can occur in a single organ or in multiple parts of the body, including fallopian tubes, endometrium, ovaries, etc. The clinical manifestations of patients include infertility, pelvic pain, and ectopic pregnancy [2]. Chronic pelvic inflammation has a high incidence and is associated with viral invasion, endocrine disorders and poor hygiene habits. Due to its characteristics of slow onset, long course and easy recurrence, the disease has a serious impact on patients' physical and psychological health [3, 4]. The treatment of chronic pelvic inflammation includes drug therapy and surgical treatment. The drug therapy by metronidazole and related antibiotics is the preferred treatment for the disease adopted clinically. However, although drug therapy has achieved certain effects, the easily-occurred drug-resistance increases the probability of disease recurrence in patients, and impose serious side effects on the prognosis and living quality of patients [5]. Therefore, it has become the focus of attention on how to improve the clinical efficacy of chronic pelvic inflammation by clinical practitioners [6]. At present, some clinical reports have analyzed the efficacy of Fukejing capsule in the adjuvant treatment of chronic pelvic inflammation [7],

but there is still a lack of reports in sample observation, and no in-depth research and analysis have been carried out. This study, which from the perspective of hemorheology and inflammatory factors, explored and analyzed the effects of Fukejing Capsules combined with ceftriaxone sodium and metronidazole in the treatment of chronic pelvic inflammation on patients' hemorheology and inflammatory factor levels, and provided basis for clinical treatment of the disease.

Materials and methods

Clinical materials

137 patients with chronic pelvic inflammation hospitalized from March 2018 to April 2020 were selected as the research subjects, and randomly classified into observation group (n=70) and control group (n=67) based on the random number table. The study was approved by the Ethics Committee of hospital.

Inclusive and exclusive criteria

Inclusive criteria: (1) The patient met the diagnostic criteria of chronic pelvic inflammation formulated by *China Gynecology and Obstetrics* [8]; Patients aged between 18-45 years old; (3) The course of disease ≥3 months; and (4) Informed consents were obtained from the patient who voluntary signed with.

Exclusive criteria: (1) Patients with gynecological tumors, chronic appendicitis, endometriosis or tuberculous pelvic inflammation; (2) Patients had acute or subacute pelvic inflammation with pelvic abscess; (3) Patients who received medical treatment of chronic pelvic inflammation two weeks before enrollment; or (4) Patients with pregnancy, acute abdomen or gastrointestinal bleeding.

Methods

The control-group were given 2.0 g ceftriaxone sodium (Shanghai Roche Pharmaceutical Co., Ltd., H10983037) added 250 ml 0.9% normal saline intravenously by once a day. Meanwhile, metronidazole tablets (Shandong Qidu Pharmaceutical Co., LTD., H37022894) were taken orally for 3 weeks by 0.6 g/time and 3 times a day.

The observation-group was taken a 3-week oral treatment of Fukejing capsules (Gansu Xifeng Pharmaceutical Co., LTD., Z20040089) by 3 capsules/time and 3 times a day based on the treatment in the control group.

Evaluation of clinical curative effect

According to the literature standards, the marked effectiveness is defined as a return to normal vaginal discharge of patient after treatment. The clinical symptoms of the patient, such as irregular menstruation, abnormal leucorrhea, lumbosacral and lower abdominal pain, basically disappeared. The B-ultrasound examination showed that the patient's pelvic effusion and pelvic mass disappeared. The effectiveness refers to the patient's vaginal discharge significantly improved. The clinical symptoms, such as irregular menstruation, abnormal leucorrhea, lumbosacral and lower abdominal pain, have improved significantly. The patient's B-ultrasonography showed that the pelvic mass area and pelvic effusion reduced dramatically. The inefficacy refers to there is no improvement in: the patient's vaginal discharge, various clinical symptoms, and B-ultrasound results in post-intervention, or the symptoms were even worsened. The overall effective rate of treatment = (marked effectiveness + effectiveness)/total number of cases × 100%.

Index observation

(1) The two groups' fasting elbow venous blood was extracted respectively before and after treatment. CR-450 fluorescence spectrophotometer was adopted to detect the changes in hemorheological indexes, including plasma viscosity, the blood viscosity at low and high shear rate.

(2) The changes of TNF-α, interleukin-6 (IL-6), and C-reactive protein (CRP) in serum were measured by ELISA before and after treatment.

Statistical analysis

Data processing and analysis was conducted by statistical software SPSS 25.0. The comparison for measurement data was by *t* test and the enumeration data was by χ^2 test. $P<0.05$ was accepted as the difference was statistically significant.

Table 1. The comparison of clinical data between two groups of sufferers

Group	Case	Age (years, $\bar{x} \pm s$)	BMI (kg/m^2, $\bar{x} \pm s$)	Course of disease (years, $\bar{x} \pm s$)	Disease classification		
					Light	Moderate	Severe
Observation group	70	46.82±12.38	22.74±3.16	2.41±0.64	27	30	13
Control group	67	45.94±10.97	23.10±2.97	2.39±0.87	25	31	11
t/χ^2	-	0.440	0.686	0.154		0.033	
P	-	0.661	0.494	0.878		0.974	

Table 2. The comparison of clinical efficacy between two groups of sufferers [n (%)]

Group	Number of cases	Marked effective	Effective	Invalid	Overall effective rate (%)
The observation group	70	49 (70.00)	18 (25.71)	3 (4.29)	95.71
The control group	67	32 (47.76)	25 (37.31)	10 (14.93)	85.07
χ^2	-	-	-	-	4.512
P	-	-	-	-	0.034

Table 3. The changes of hemorheology indexes in two groups of sufferers before and after treatment (mPa·s, $\bar{x} \pm s$)

Group	Time point	The plasma viscosity	blood viscosity at low shear rate	blood viscosity at high shear rate
The observation group (n=70)	Pre-treatment	2.16±0.74	13.06±2.11	5.48±0.68
	Post-treatment	1.21±0.41*	7.96±1.85*	3.74±0.75*
	t	9.395	15.206	14.380
	P	0.000	0.000	0.000
The control group (n=67)	Pre-treatment	2.20±0.81	12.89±1.97	5.52±0.73
	Post-treatment	1.56±0.52	9.25±2.03	4.78±0.69
	t	5.443	10.533	6.030
	P	0.000	0.000	0.000

Note: compared with the control group in the same period, *$P<0.05$.

Results

The comparison of clinical data between two groups

There was insignificant difference in clinical data between the two groups (P>0.05), as shown in **Table 1**.

The comparison of clinical efficacy between two groups

The overall effective rate of treatment in observation group (95.71%) was remarkably superior to which in control group (85.07%) (*P<0.05*), as shown in **Table 2**.

The changes of hemorheology indexes in two groups

Before treatment, there was no significant difference in plasma viscosity, low shear whole blood viscosity and high shear whole blood viscosity between the two groups (P>0.05). The hemorheology indexes of plasma viscosity, the blood viscosity at low and high shear rate in both groups were dramatically lower than which in pre-treatment (*P<0.05*), and the indexes in observation group were remarkably lower than thoses in control group (*P<0.05*), as shown in **Table 3** and **Figure 1A-C**.

The changes of inflammatory factors in serum

There was no significant difference in serum TNF-α, IL-6 and CRP levels between the two groups before treatment (P>0.05). Both groups' TNF-α, IL-6 and CRP in in post-treatment were apparently lower than those in pre-treatment (*P<0.05*), and the indicators in observation group were critically lower than those in control group (*P<0.05*), as shown in **Table 4** and **Figure 2A-C**.

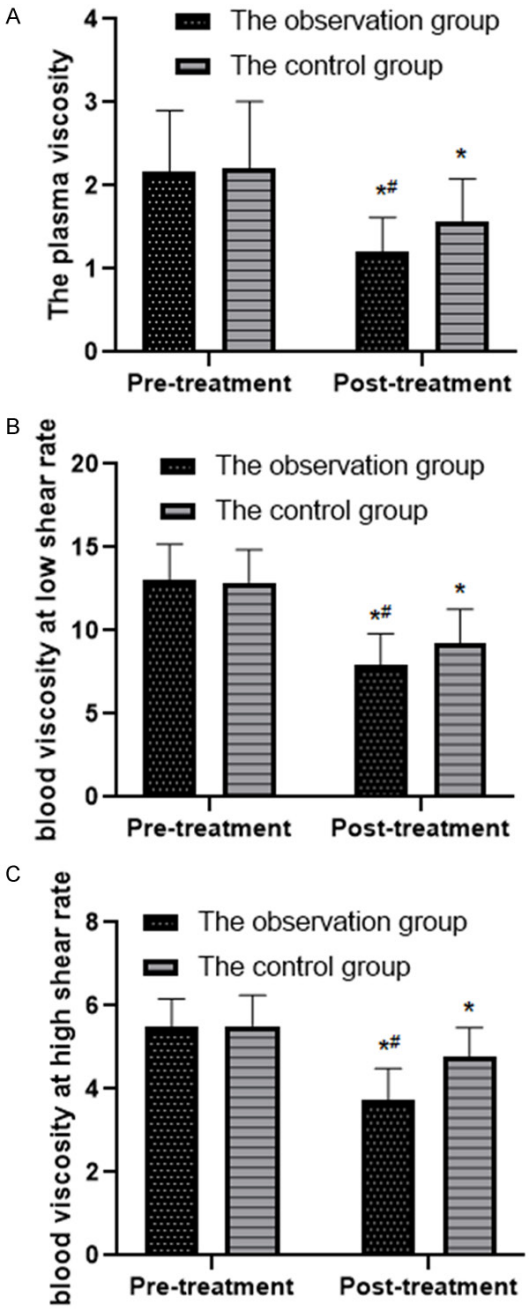

Figure 1. The changes of hemorheology indexes in two groups of sufferers before and after treatment. Note: Compared with the same group before treatment, *$*P<0.05$*; compared with the control group in the same period, *$^{\#}P<0.05$*. A: Plasma viscosity; B: Blood viscosity at low shear rate; C: Blood viscosity at high shear rate.

Discussion

Chronic pelvic inflammation is a common and multiple chronic gynecological inflammatory disease [9]. This disease affects female reproductive organs, as well as connective tissue for some of the cases [10]. It is primary treated with antibacterial drugs, which can achieve certain clinical effects. However, the disease is prone to relapse after cure, and even causes precancerous lesions [11-13].

Ceftriaxone sodium and metronidazole are antibiotics that commonly used to treat this disease clinically. Ceftriaxone sodium belongs to the third generation of cephalosporin, and has a good antibacterial effect on both gram-positive and gram-negative bacteria. However, clinical observation showed that the long-term use of ceftriaxone sodium can increase drug resistance and adverse reactions, and the recurrence rate in post-treatment is relatively high [14-16]. Metronidazole is a broad-spectrum anti-anaerobes drug that inhibits bacterial DNA synthesis, and kills bacteria by promoting DNA decomposition [17, 18]. Fukejing capsule is a kind of traditional Chinese medicine in treating chronic pelvic inflammation, which is composed of 20 kinds of traditional Chinese medicine. The primary components of the capsule are dandelion, red peony root, fragrant root, plantain seed, etc. Among them, dandelion is used for heat-clearing, detoxification and swelling; Xiangfu is used to relieve collaterals and pain; Red peony can help to relieve pain, reduce swelling and remove blood stasis; Plantago seed helps to clear heat and diuresis [19, 20]. The combination of these medicines has effects of clearing heat and removing dampness, removing blood stasis and dispelling congestion, promoting Qi and relieving pain of patients. This study analyzed the effect of Fukejing capsule combined with ceftriaxone sodium and metronidazole in treating chronic pelvic inflammation and the influence on hemorheology and inflammatory factors.

The results indicated that the overall effective rate of treatment in observation group was remarkably higher than thath in control group. The treatment of drug combination of Fukejing capsule with ceftriaxone sodium and metronidazole in chronic pelvic inflammation, which is in line with previous research results [21], can effectively improve the clinical efficacy. The hemorheology indexes of plasma viscosity and the blood viscosity at low and high shear rate in both groups post-intervention were dramatically lower than in prior-treatment, and the indexes

Table 4. The changes of serum inflammatory factors in the two groups of sufferers

Group	Time point	TNF-α (μg/L)	IL-6 (ng/L)	CRP (mg/L)
The observation group (n=70)	Pre-treatment	3.15±0.47	518.92±51.64	14.16±3.54
	Post-treatment	1.07±0.35*	278.59±35.40*	7.36±1.76*
	t	29.697	32.116	14.391
	P	0.000	0.000	0.000
The control group (n=67)	Pre-treatment	3.09±0.56	526.23±56.73	14.27±3.68
	Post-treatment	1.36±0.31	326.47±37.48	10.17±2.07
	t	22.123	24.048	7.948
	P	0.000	0.000	0.000

Note: compared with the control group in the same period, *P<0.05.

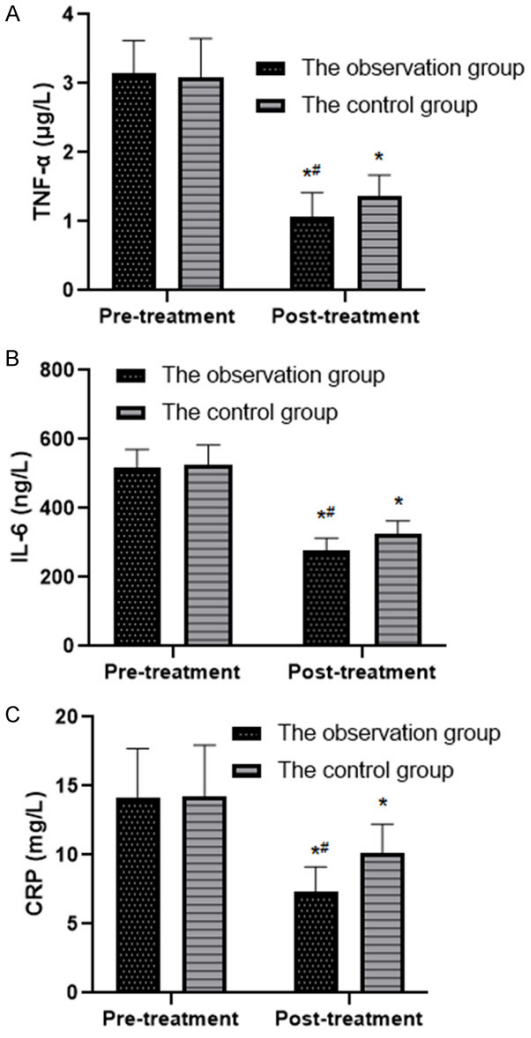

Figure 2. Comparison of TNF-α, IL-6 and CRP between the two groups before and after treatment. Note: Compared with the same group before treatment, **P<0.05*; compared with the control group in the same period, *#P<0.05*. A: TNF-α; B: IL-6; C: IL-8.

in observation group were remarkably lower than that in control group. The results showed that the combined use of Fukejing capsule could efficaciously reduce the blood viscosity of patients, which was related to the effect of removing blood stasis and dispersive knot of the capsule. The therapy promoted the ability of tissue regeneration and repairing of patients, and comprehensively improved their prognosis as well as the living quality. In addition, both groups TNF-α, IL-6 and CRP in in post-treatment decreased apparently than those in pre-treatment, and the indicators in observation group were critically lower than those in control group. As the most commonly used marker of acute phase protein, CRP is highly sensitive to chronic pelvic inflammation. The excessive TNF-α indicates that the body has reflected with serious immune toxic reaction. IL-6 is involved in course of chronic pelvic inflammation, and the abnormal expression of it can promote local inflammatory response and fibrosis in pelvic cavity [22]. This study suggested that Fukejing capsule combined with ceftriaxone sodium and metronidazole can effectively reduce the inflammatory response of patients. The excessive activation of inflammatory factors is the main mechanism leading to the progression of the disease, and the correction of inflammatory factors can control the disease progression, which is believed to be related to the effect of clearing heat and dispersing masses by Fukejing capsule. Modern pharmacological studies have shown [23-25] that dandelion has a obviously effect on anti-pathogenic microorganisms; Rhizoma cyperi can help to relax smooth muscle, relieve pain and anti-inflammatory; Radix Paeoniae rubra can resist thrombosis, antibacterial and anti-inflammatory. Therefore, in the treatment of patients with chronic pelvic inflammatory disease, adding Fukejing Capsules while giving conventional antibacterial treatment can form a significant anti-inflammatory effect, and in the meanwhile

promoting the blood circulation, so that the therapeutic effect could be improved.

However, due to the small sample size in this study and the lack of intensive study on the mechanism of Fukejing capsule, it is suggested that researchers could further expand the sample size and study the possible mechanism of action in depth.

In conclusion, the treatment of Fukejing capsule combined with ceftriaxone sodium and metronidazole in chronic pelvic inflammation has a remarkable curative effect. It can efficaciously reduce the blood viscosity of patients and reduce the body inflammatory reaction, which is worthy of clinical promotion.

Disclosure of conflict of interest

None.

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