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ORIGINAL RESEARCH

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Study on the effect of TP chemotherapy regimen combined with Qinggong detoxification soup on the clinical efficacy of cervical cancer patients

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Abstract

The main objective of this study is to check the efficacy of the combinational chemotherapy regimen and Qing Gong Detoxification Soup on the epithelial-mesenchymal transition gene expression, immune homeostasis mechanism, and tumor markers in patients with cervical cancer. In the present study, 88 individuals with cervical cancer were selected as experimental and control groups, 44 cases each, using the random number table method. The clinical efficacy, expression of epithelial-mesenchymal transition genes (Vimentin, N-cadherin, E-cadherin, α-catenin), Th1/Th2 (T helper cell 1/T helper cell 2), cytokines (IFN-γ, IL-4, IL-2, IL-6), tumor markers (CEA, SCCA, CA125), TCM (Traditional Chinese Medicine) symptom score and adverse reactions were investigated throughout the entire study. Our results clearly indicated the significant effectiveness of our combinational therapy in the treatment of cancer by 84.09% in comparison to the control group (63.64%). No significant differences in the primary and secondary symptom scores; *i.e.*, IFN-γ (Interferon-gamma), IL-2 (Interleukin-2), IL-4 (Interleukin-4), IL-6 (Interleukin-6), CEA (carcinoembryonic antigen), SCCA (squamous cell carcinoma antigen), and expression of several epithelial-mesenchymal transition genes, IFN-γ, as well as IL-2 between experimental and control groups were observed before starting the therapy. IFN-γ, IL-2, IL-4, IL-6, CEA, SCCA and CA125 (cancer antigen 125) scores were significantly improved after treatment in both groups, although the study group outperformed the control group and the differences were statistically significant ($p < 0.05$). We also found that the incidence of adverse reactions was 9.09% in the experimental group which was lower than 25.00% in the control group, and the differences were statistically significant ($p < 0.05$). This study confirmed that combinational therapy of Qing Gong Detoxification Soup and TP (paclitaxel-cisplatin) chemotherapy significantly enhanced the expression of the epithelial-mesenchymal transformation gene, repaired immune homeostasis, inhibited tumor markers, and reduced the occurrence of adverse reactions.

Keywords

Qing gong detoxification soup; Cervical cancer; Epithelial-mesenchymal transition gene expression; Immune homeostasis; Tumor markers

1. Introduction

The fourth common disease in women, cervical cancer poses a major threat to women's health due to its poor clinical prognosis and high case fatality rate. Clinical statistics have indicated that the incidence of cervical cancer in China is higher than the global average and the size of the patient population is very large [1]. At present, clinical treatment for cervical cancer is mainly based on surgical treatment and radiotherapy [2]. However, some cervical cancer patients have missed the window for surgical treatment and are unable to have surgery since they are frequently diagnosed in the middle and late stages of the cancer [3]. On the contrary, it has been reported that drug resistance could be impacted by radiotherapy increasing the risk of recurrence, clinical morbidity, and fatality [4]. There are several issues with current cancer clinical therapy, including the inability of radiotherapy to be selective and targeted, the inability of cancer drugs to precisely target the site of tumor damage, radiotherapy's damaging effects on healthy tissues and cells, as well as its detrimental effects on patient's immune systems, among other issues [5, 6]. Therefore, it is necessary to develop a new technique in order to protect the immune function during the treatment of cervical cancer with radiotherapy and enhance the clinical prognosis of patients. In this regard, a combination of Chinese medicine and chemotherapy can be used and promoted

in the clinical practice of cervical cancer treatment [7]. It has been reported that Chinese medicine effectively improved the immune function of cervical cancer patients and enhanced the clinical comprehensive efficacy of chemotherapy, which is of great clinical significance for the improvement of a patient's prognosis and survival treatment [8]. In the present study, we have applied Qing Gong Detoxification soup for cervical cancer patients who were under chemotherapy treatment based on TCM theory and achieved good results in clinical practice.

2. Materials and methods

2.1 Clinical data

Individuals were selected into a study group and control group (44 cases each), using the random number table method. 88 patients, aged 44–65 years, mean age (56.38 ± 5.14) years; mean weight (57.29 ± 5.17) kg; mean Key Performance Indicators (KPS) score (72.38 ± 6.14). Among them 31 patients with combined diabetes mellitus, and 27 patients with combined hypertension were reported.

2.1.1 Inclusion criteria

The following items were in the list of inclusion criteria:

(1) All individuals who met the clinical diagnostic criteria related to cervical cancer; (2) All individuals who were diagnosed for the first time; (3) The survival period of patients was assessed to be greater than 6 months; (4) The patients or their families signed the informed consent; (5) All patients who were diagnosed with stage IIIa cervical cancer.

2.1.2 Exclusion criteria

The following items were in the list of exclusion criteria:

(1) Patients with combined liver, kidney and other system dysfunction; (2) Patients with combined malignant tumors; (3) Patients with proximal and distal metastases; (4) Patients with immunocompromised function.

2.2 Treatment methods

All patients were given constant flow control, electrolyte balance, basic nutritional support, and relevant symptomatic treatment.

2.2.1 Control group

Patients in this group were given conventional cisplatin plus paclitaxel regimen chemotherapy treatment as follows: patients were given paclitaxel 135 mg/m^2, in drip day 1 (lasting 24 hours or 3 hours), usage: paclitaxel 30 mg + 0.9% Sodium Chloride (NaCl) 100 mL, IV drip, 30 min; paclitaxel remainder + 0.9% NaCl 500 mL IV drip 2.5 h or 24 h. Cisplatin usage 50 mg/m^2 + 0.9% NaCl 500 mL IV drip the next day (60 min). All treatment procedures were followed up 3 weeks for one treatment cycle at 3 consecutive cycles of treatment.

2.2.2 Study group

Patients in this group were given the Chinese herbal medicine (Qing Gong Detoxification Soup) based on the control group. The ingredients contained Astragalus membranaceus 50 g; Radix Achyranthes bidentata 30 g; Yun Ling, Rhizoma Polygonati, Radix Rehmanniae, Kun Bu 24 g for each; Radix Paeoniae Alba 15 g; Rhizoma Atractylodes Macrocephala 12 g; Radix Phellodendron, Radix et Rhizoma Ginseng, Radix Angelicae Sinensis, Radix Glycyrrhiza Uralensis 10 g for each. For the loss of appetite, Chen Pi and Citrus Aurantium 10 g for each were included, for cold extremities, Radix et Rhizoma Phellodendron and Cinnamomum 10 g each were included, for the loose discharge with excessive amount and edema, Radix Astragali was included. For constipation, 10 g of fire flaxseed and 6 g of raw rhubarb were included. The herbal medicines were all from a Chinese pharmacy.

2.3 Observation index

To evaluate the clinical efficacy of the above treatment, the expression of epithelial-mesenchymal transition genes (Vimentin, N-cadherin, E-cadherin, α-catenin), Th1/Th2, cytokines (IFN-γ, IL-4, IL-2, IL-6), tumor markers (CEA, SCCA, CA125), TCM symptom score, and adverse reactions were determined and followed up by statistical comparison.

(1) Judgment criteria for clinical efficacy

In our treatment procedure, we followed the standard protocols of the World Health Organization (WHO) which are based on the following concepts: 1 complete remission: the focal tissues and clinical symptoms completely disappeared, and the maintenance time exceeded 4 weeks; 1 partial remission: the degree of shrinkage of focal tissues exceeded 30% but did not completely disappear, and the patient's clinical symptoms significantly improved, but not completely, and the maintenance time exceeded 4 weeks; 1 stable: the degree of shrinkage of focal tissues reached 30%, or the degree of increase of focal tissues did not exceed 20%, and the patient's clinical efficacy was determined. The degree of increase did not exceed 20%, and the patient's clinical symptoms improved, or no significant progress was seen; 1 progressive: the degree of increase of focal tissue exceeded 20% or metastatic focal tissue appeared, or a new tumor developed. Total effective = complete remission + partial remission.

(2) Epithelial-mesenchymal transition gene

Patients' cervical tissue samples were collected, followed by the extraction of the RNA sample which was then transcribed to synthesize cDNA, and the mRNA expression of the gene was measured by fluorescence quantitative PLR (Passive leg raising) method.

(3) Detection of Th1/Th2 cytokines and tumor markers

Elbow venous blood was collected from patients and centrifuged, and serum was collected for the determination of Th1/Th2 cytokines, and tumor markers were measured by Enzyme-Linked Immunosorbent Assay (ELISA) Kit information is 20200121 Santa Cruz Biotechnology, Inc. of Dallas, TX USA and 20191222 Santa Cruz Biotechnology, Inc. of Dallas, TX USA.

(4) Chinese medicine symptom score

Patients were evaluated by referring to the relevant criteria in the Guidelines for Clinical Research on New Chinese Medicines. It mainly includes two dimensions: main symptoms and secondary symptoms. The scoring criteria for the main symptoms were as follows: 0~24 points; the scoring criteria for the secondary symptoms were as follows: 0~12

points; higher scores indicated more severe symptoms.

2.4 Statistical methods

SPSS 24.0 (International Business Machines Corporation, Armonk, NY, USA) was used to process the data, and ($\bar{x} \pm s$) and (%) were used to express the measurement and count data. *t*-value and chi-squared (χ^2) tests were used respectively. $p < 0.05$ was selected to express the statistical significance of the data.

3. Results

3.1 Comparison of clinical data between the two groups

Table 1 compares clinical data from both experimental and control groups. As shown in this table, no statistical differences were found between these two groups.

3.2 Comparison of clinical efficacy between experimental and control groups

Table 2 compares efficacy evaluation during the treatment. Our results indicate that the effective rate of the experimental group was 84.09% which was higher than control group (63.64%). Significant differences were also observed for all collected data between each group ($p < 0.05$).

3.3 Comparison of epithelial-mesenchymal transition gene expression between experimental and control groups

Prior to treatment, we discovered that there were no significant differences between the experimental and control groups in the expression of any of the genes implicated in the epithelial-mesenchymal transition. Gene expression considerably increased for both groups after therapy. See Table 3 and Fig. 1.

3.4 Comparison of Th1/Th2 cytokine indicators between experimental and control groups

Following therapy, there were significant decreases in CEA, SCCA and CA125 for the experimental group compared to the control group. See Table 4 and Fig. 2.

3.5 Comparison of tumor marker levels between experimental and control groups

Significant decreases in CEA, SCCA and CA125 for the experimental group in comparison with the control group were observed after treatment ($p < 0.05$). See Table 5.

3.6 Comparison of TCM symptom scores between experimental and control groups

Our results clearly indicate that before treatment there were no significant differences between experimental and control groups for the collected data of the primary and secondary symptom scores, and post-treatment caused significant decrease in both groups' primary and secondary symptom scores and the decreasing level were significantly lower for the experimental group in comparison with the control group ($p < 0.05$). See Table 6 and Fig. 3.

3.7 Comparison of adverse reactions between experimental and control groups

Our results clearly showed that the incidence of adverse reactions in the experimental group was 9.09%, which was lower than 25.00% observed in the control group, and all the differences were statistically significant ($p < 0.05$). See Table 7 and Fig. 4.

4. Discussion

Cervical cancer has risen to the fourth most common malignancy among women, drawing significant attention to emerging countries [9]. Currently, the primary issues for this cancer's treatment are early surgical treatment, chemotherapy and radiotherapy. Although there have been many successful cases of patients surviving after surgery or chemo/radiotherapy, many common side effects such as tiredness (fatigue), feeling and being sick, hair loss, infections, anemia, bruising and bleeding, sore mouth, and loss of appetite will remain with patients. Furthermore, many cervical cancer patients diagnosed in the middle or late stages are unable to have surgery and must rely on conservative treatment modalities such as radiotherapy and chemotherapy, for which clinical efficacy cannot be adequately assured [10]. It is reported that combinational treatment of Chinese Traditional Medicine of Qing Gong detoxification soup with chemotherapy significantly enhanced clinical intervention and treatment of cervical cancer with much satisfactory curative outcome [11].

Cervical cancer is commonly classified as either collapse and leaking or blockage. Cervical weakness and malnourishment are recognised to be associated with some of the causes of cervical cancer, among numerous other unknown risk factors. It is also important to remember that external harmful substances and one's own emotions can both contribute to the onset and progression of the illness. In this study, we developed Qing Gong Detoxifying Soup, which contains Atractylodes Macrocephalae, Phellodendron Bidentatae and Radix Aconiti, all of which are also found in San Miao Pill. The main impact of Qing Gong Detoxifying Soup is to reduce swelling and pain, which can effectively treat the symptoms of "five-color banding" in this disease. Raw ginseng, which is sweet, somewhat bitter, and warm in nature, is one of many components in Chinese Traditional Medicine that can quench thirst and encourage the creation of body fluid. It is an excellent tonic with specific benefits in the treatment of vital energy. Astragalus is also sweet in taste and mildly warm in nature, which can have the effects of draining pus, tonifying vital energy, and raising one's spirit, as well as astringing sores and producing muscle, promoting water retention, and reducing swelling, with certain advantages in treating diseases such as vital energy deficiency. It may also eliminate heat and moisture, detoxify, and have some benefits in the treatment of gynaecological cancers and pelvic inflammatory

TABLE 1. Comparison of clinical data between experimental and control groups.

Indicators	Study Group (n = 44)	Control Group (n = 44)	Statistical values	*p* value
Average age (yr)	56.34 ± 5.16	56.41 ± 5.17		
Mean weight (kg)	57.25 ± 5.16	57.33 ± 5.22		
KPS score (points)	72.34 ± 6.14	72.41 ± 6.21		
Combined hypertension (n, %)				
Yes	13, 29.55	14, 31.82	0.053	0.817
No	31, 70.45	30, 68.18		
Combined diabetes mellitus (n, %)				
Yes	16, 36.36	15, 34.09	0.050	0.823
No	28, 63.64	29, 65.91		

KPS: Key Performance Indicators.

TABLE 2. Comparison of clinical efficacy between experimental and control groups (n, %).

Groups	Number of cases	Complete remission	Partial remission	Stable	Progression	Total effective
Study Group	44	10, 22.73	27, 61.36	4, 9.09	3, 6.82	37, 84.09
Control Group	44	4, 9.09	24, 54.55	9, 20.45	7, 15.91	28, 63.64
χ^2 value	—					4.768
p value	—					0.029

TABLE 3. Comparison of epithelial-mesenchymal transition gene expression between experimental and control groups ($\bar{x} \pm s$).

Indicators	Study Group (n = 44)	Control Group (n = 44)	*t* value	*p* value
Vimentin				
Before Treatment	3.15 ± 0. 31	3.16 ± 0.32	−0.145	0.885
After Treatment	1.95 ± 0.16	2.56 ± 0.21	−15.249	<0.001
t value	21.123	9.592	—	—
p value	<0.001	<0.001	—	—
N-cadherin				
Before Treatment	2.75 ± 0.24	2.76 ± 0.26	−0.008	0.993
After Treatment	1.99 ± 0.16	2.42 ± 0.21	−10.705	<0.001
t value	18.722	7.055	—	—
p value	<0.001	<0.001	—	—
E-cadherin				
Before Treatment	0.44 ± 0.05	0.46 ± 0.06	−2.541	0.013
After Treatment	0.88 ± 0.07	0.66 ± 0.07	15.306	<0.001
t value	−34.232	−13.326	—	—
p value	<0.001	<0.001	—	—
α-catenin				
Before Treatment	0.62 ± 0.06	0.61 ± 0.05	0.684	0.496
After Treatment	0.96 ± 0.08	0.78 ± 0.06	11.164	<0.001
t value	−21.333	−12.879	—	—
p value	<0.001	<0.001	—	—

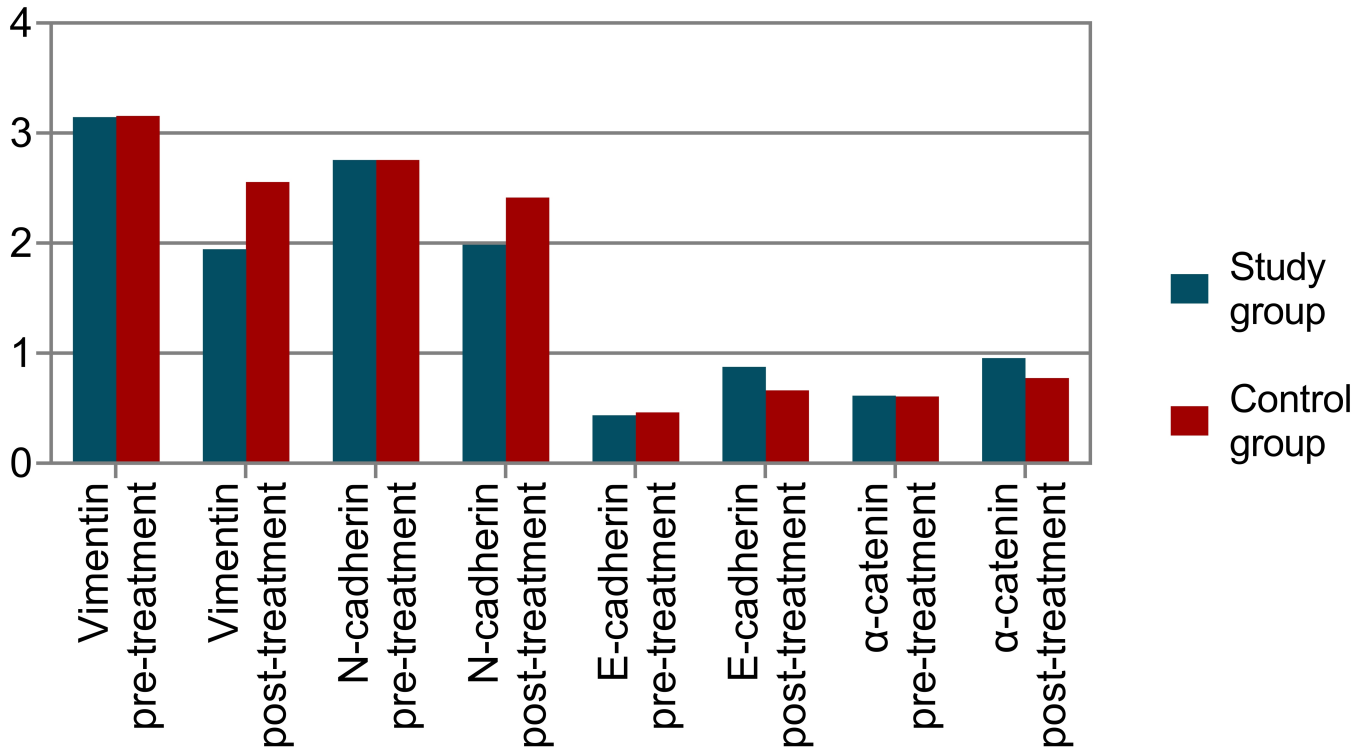

FIGURE 1. Comparison of the expression of epithelial-mesenchymal transition genes between experimental and control groups.

TABLE 4. Comparison of Th1/Th2 cytokine indicators between experimental and control groups ($\bar{x} \pm s$).

Indicators	Study Group (n = 44)	Control Group (n = 44)	*t* value	*p* value
IFN-γ (ng/L)				
Before Treatment	13.25 ±1.32	13.27 ± 1.29	−0.106	0.916
After Treatment	24.16 ± 2.16	19.02 ± 1.84	11.964	<0.001
t value	−28.095	−17.433	—	—
p value	<0.001	<0.001	—	—
IL-2 (ng/L)				
Before Treatment	17.53 ± 1.59	17.62 ± 1.60	−0.235	0.815
After Treatment	31.25 ± 3.15	24.15 ± 2.16	12.327	<0.001
t value	−27.077	−16.318	—	—
p value	<0.001	<0.001	—	—
IL-4 (ng/L)				
Before Treatment	21.15 ± 2.11	21.09 ± 2.08	0.134	0.893
After Treatment	13.25 ± 1.25	18.65 ± 1.86	−16.030	<0.001
t value	21.381	6.080	—	—
p value	<0.001	<0.001	—	—
IL-6 (ng/L)				
Before Treatment	43.25 ± 4.16	43.35 ± 4.09	−0.114	0.910
After Treatment	21.25 ± 2.16	31.02 ± 3.09	−17.215	<0.001
t value	31.891	16.121	—	—
p value	<0.001	<0.001	—	—

IFN-γ: Interferon-gamma; IL: Interleukin.

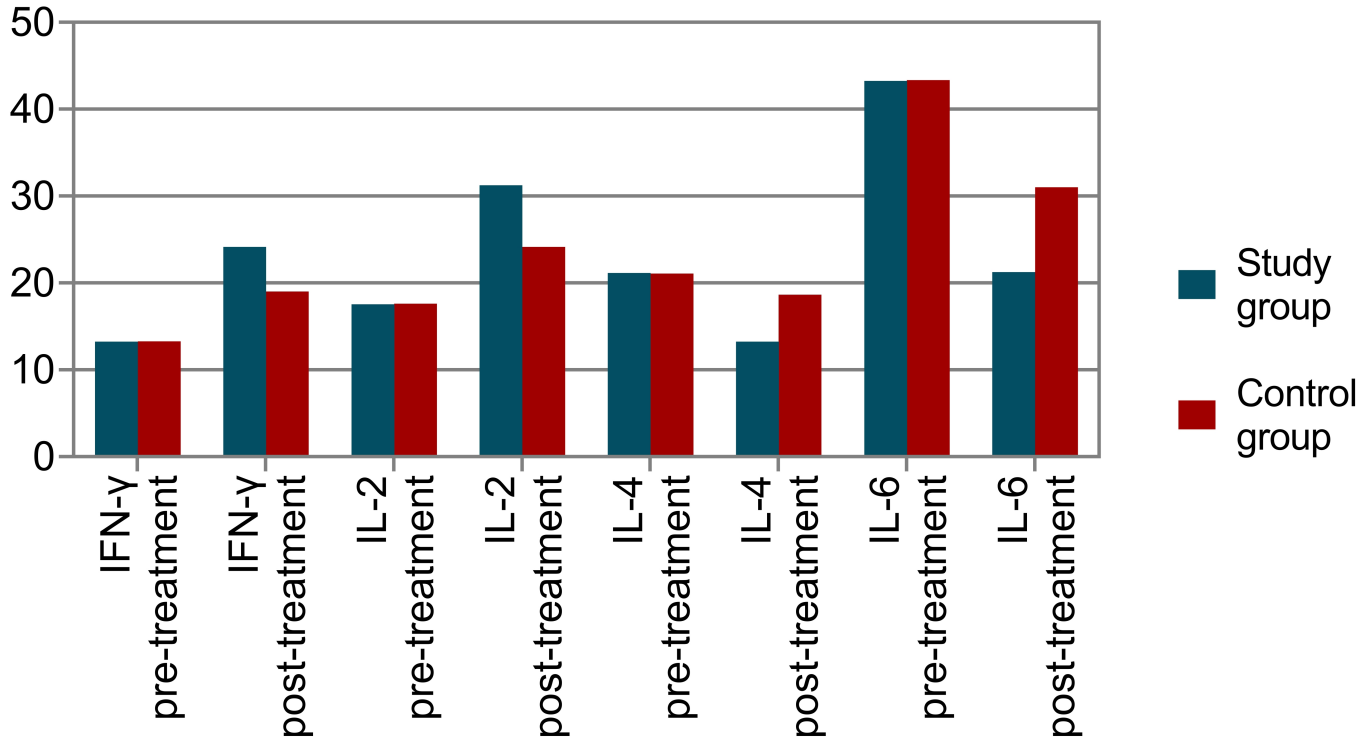

FIGURE 2. Comparison of Th1/Th2 cytokine indexes between experimental and control groups. IFN-γ: Interferon-gamma; IL: Interleukin.

TABLE 5. Comparison of tumor marker levels between experimental and control groups ($\bar{x} \pm s$).

Indicators	Study Group (n = 44)	Control Group (n = 44)	*t* value	*p* value
CEA (μg/L)				
Before Treatment	8.59 ± 0.86	8.61 ± 0.88	−0.108	0.914
After Treatment	2.89 ± 0.26	4.96 ± 0.44	−26.409	<0.001
t value	41.919	25.377	—	—
p value	<0.001	<0.001	—	—
SCCA (μg/L)				
Before Treatment	10.95 ± 1.11	10.99 ± 1.09	−0.170	0.866
After Treatment	4.56 ± 0.46	6.89 ± 0.66	−19.105	<0.001
t value	34.662	18.387	—	—
p value	<0.001	<0.001	—	—
CA125 (U/mL)				
Before Treatment	55.36 ± 5.66	55.46 ± 5.64	−0.080	0.936
After Treatment	24.35 ± 2.46	33.65 ± 3.41	−14.675	<0.001
t value	37.903	22.980	—	—
p value	<0.001	<0.001	—	—

CEA: carcinoembryonic antigen; SCCA: squamous cell carcinoma antigen; CA: cancer antigen.

TABLE 6. Comparison of TCM symptom scores between experimental and control groups ($\bar{x} \pm s$).

Indicators	Study Group (n = 44)	Control Group (n = 44)	*t* value	*p* value
Primary symptoms points (points)				
Before Treatment	21.25 ± 0.49	21.34 ± 0.57	−0.805	0.423
After Treatment	11.02 ± 1.04	15.64 ± 1.56	−15.556	<0.001
t value	56.155	22.179	—	—
p value	<0.001	<0.001	—	—
Secondary points (points)				
Before Treatment	9.16 ± 0.89	9.18 ± 0.84	−0.123	0.902
After Treatment	3.16 ± 0.40	5.70 ± 0.51	−26.818	<0.001
t value	42.337	23.072	—	—
p value	<0.001	<0.001	—	—

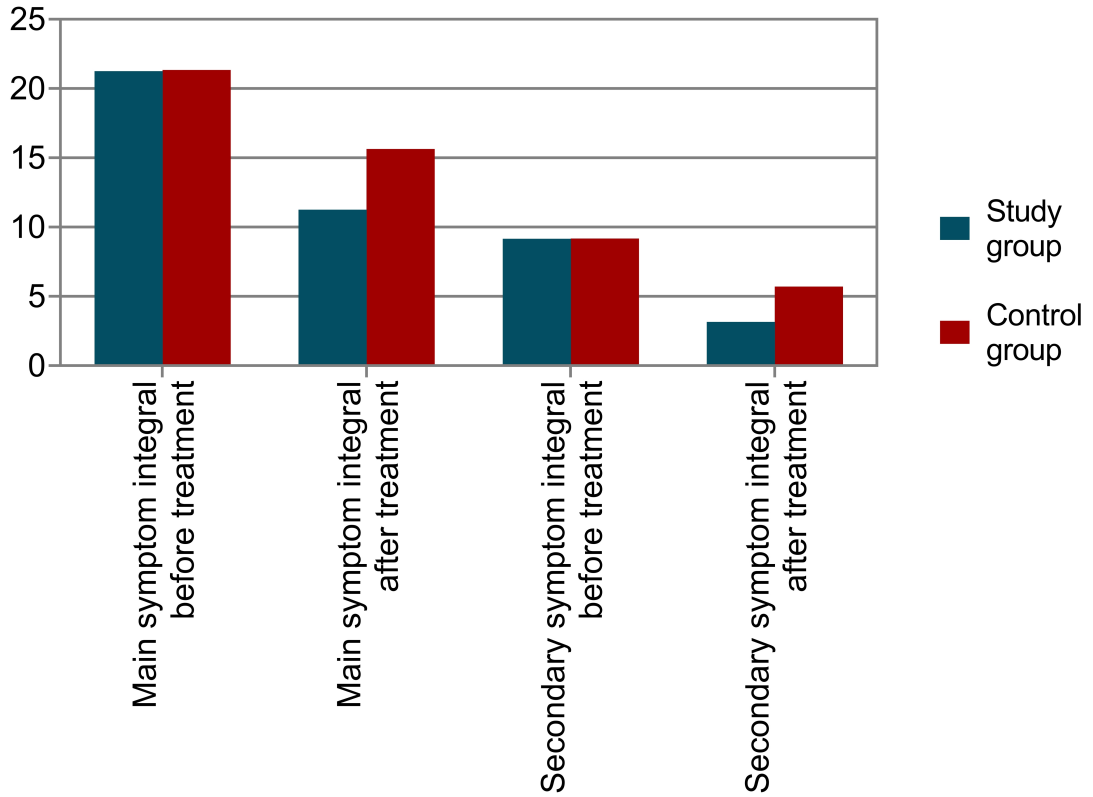

FIGURE 3. Comparison of TCM symptom scores between experimental and control groups.

TABLE 7. Comparison of adverse reactions between experimental and control groups (n, %).

Group	Number of cases	Vomiting	Diarrhea	Hair loss	Lowered white blood cells	Total effective
Study Group	44	1, 2.27	1, 2.27	1, 2.27	1, 2.27	4, 9.09
Control Group	44	3, 6.82	2, 4.55	3, 6.82	3, 6.82	11, 25.00
χ^2 value	—					3.938
p value	—					0.047

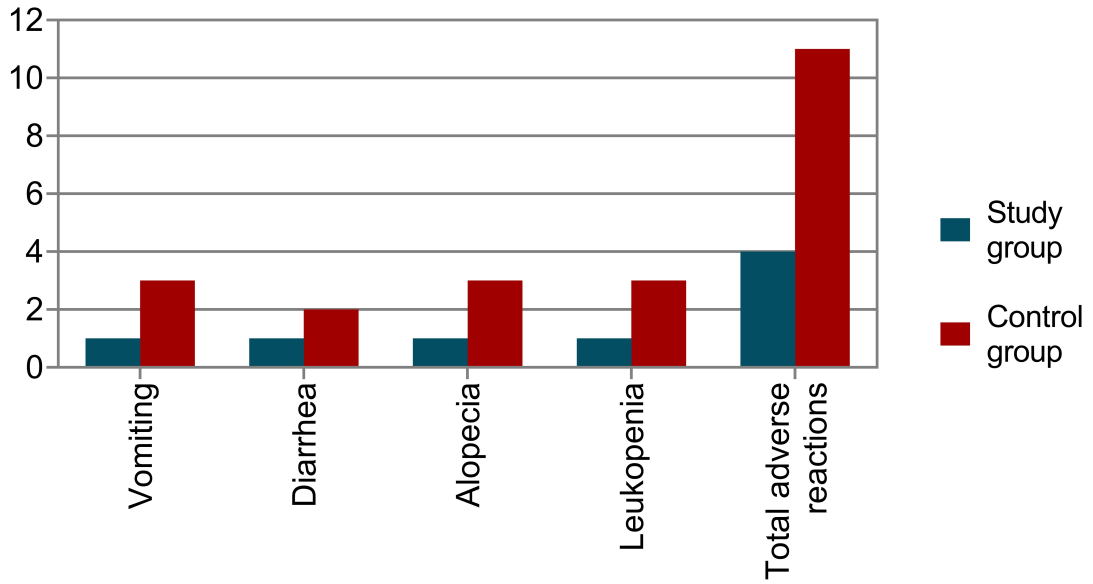

FIGURE 4. Comparison of adverse reactions between experimental and control groups.

disease. Simultaneously, relevant clinical investigations have demonstrated that Bupleurum can greatly improve the body's immunological function, which can assist tumour patients develop an immune barrier against tumour cells. Bupleurum can also improve the actions of the adrenal cortical system. Radix Angelicae Sinensis is pungent, sweet and warm in nature, and it can activate the blood to relieve pain, tonify the blood, and induce menstruation, as well as treat palpitations and dizziness, constipation and other disorders. White peony is a sour, bitter and somewhat frigid plant that can regulate menstruation and stop sweating, ease discomfort, and has some benefits in the treatment of blood deficiency and yellowing, night sweating and stomach pain. Yun Ling has a pleasant, light, and delicate nature, and it has the capacity to soothe the mind and strengthen the spleen, which can help treat edema, spleen deficiency, palpitations and insomnia. Radix Rehmanniae is sweet in taste and slightly warm in nature, which can nourish the blood and the kidney, and it has certain advantages in treating conditions such as blood leakage, and deficiency of the liver and kidney. Kun Bu has a salty flavor. It has the power to evacuate phlegm, disperse nodules and soften hardness. It also has certain advantages in the treatment of edema and tumor prevention. Raw licorice has the effect of detoxifying and clearing heat, restoring the pulse and stabilizing the heart. It can also harmonize the effects of the above drugs, further bringing into play the coordinated effects of multiple drugs. It may have mediated epithelial cell tissue attachment and prevented disorderly cell migration and movement toward the tissue periphery. As a result, N-cadherin and -catenin are well-known for their roles in suppressing and protecting against tumor spreading process during cervical cancer development. Vimentin and N-cadherin, on the other hand, can induce mesenchymal transition, which is the opposite of N-cadherin and -catenin's actions and can enhance tumor cell replication and metastasis.

Our study clearly confirmed that before therapy no significant alterations in the expression of epithelial-mesenchymal transition genes between experimental and control groups were observed, and by following the protocol of our combinational treatment, gene expression was significantly enhanced for both groups and the level of enhancement was significantly superior to the control groups ($p < 0.05$). We found that using Qing Gong Detoxification Soup greatly boosted the expression of epithelial-mesenchymal transforming genes, which can inhibit tumor cell reproduction and metastasis. N-cadherin and -catenin have been found to be highly expressed in normal cervical epithelial cells in women [12, 13]. It may have mediated epithelial cell tissue attachment and prevented disorderly cell migration and movement toward the tissue periphery. As a result, N-cadherin and -catenin are well-known for their roles in suppressing and protecting against tumor metastatic process during cervical cancer development. Vimentin and N-cadherin, on the other hand, can induce mesenchymal transition, which is the opposite of N-cadherin and -catenin's actions and can enhance tumor cell replication and metastasis [14]. The active components in Qing Gong Detoxification Soup control and disrupt genes involved in epithelial-mesenchymal transition which can prevent tumor cells from replicating and metastasizing [15].

Our results clearly indicate that before applying our combinational therapy, there was no any significant differences in the levels of IFN-γ, IL-2, IL-4 and IL-6 between experimental and control groups in the comparison of Th1/Th2 cytokine indexes, and after treatment, both groups' levels of these cytokines significantly improved. The experimental group's levels of these cytokines were shown to be statistically lower than those of the control group ($p < 0.05$). Our findings clearly indicate that Qing Gong Detoxification Soup can regulate the immune homeostasis of patients and promote the restoration of their immune function by improving the ratio of various factors. It has been reported that Th1/Th2 cytokines in a relatively stable and balanced state in a healthy body can enable the establishment of a complete external immune barrier [16]. By changing one of these factors, the immune homeostasis may

be disrupted, which leads to symptoms of abnormal immune function in the body [17]. It is reported that when immune cytokine starts to fluctuate to a certain extent, it results in damage to the immune balance, and by applying Qing Gong Detoxification soup the achievement in the regulatory effect of immune function by repairing related factors were observed [18].

Our findings further supported the notion that, prior to the administration of combination therapy, there were no significant differences in the tumor marker indices CEA, SCCA and CA125 between the experimental and control groups. The levels of CEA, SCCA and CA125 were dramatically reduced in both groups, and the experimental group's level was significantly lower than the control group's ($p < 0.05$). Our results unambiguously show that Qing Gong Detoxification Soup can reduce tumor marker expression in cervical cancer patients, most likely *via* modulating the patients' immune system and epithelial-mesenchymal transition process. In addition, the experimental group outperformed the control group in terms of TCM symptoms and adverse effects, as well as total clinical efficiency. Finally, our findings clearly show that Qing Gong Detoxification Soup improves the clinical effects of chemotherapy in cervical cancer patients, which is critical for improving patients' prognosis and quality of life.

5. Conclusions

In summary, the combinational therapy of Qing Gong Detoxification Soup with TP chemotherapy regimen for the treatment of cervical cancer significantly increased the expression of epithelial-mesenchymal transformation genes, restored immune homeostasis, inhibited tumour markers, and decreased the incidence of adverse reactions in patients, all of which have a positive impact on the patients' clinical prognosis and quality of life. Regarding future studies, the study's comparatively small sample size and relatively single source needs to be improved.

AVAILABILITY OF DATA AND MATERIALS

The authors declare that all data supporting the findings of this study are available within the paper and any raw data can be obtained from the corresponding author upon request.

AUTHOR CONTRIBUTIONS

ZYW and JYW—designed the study and carried them out; ZYW and SPL—supervised the data collection, analyzed the data, interpreted the data, prepare the manuscript for publication, and reviewed the draft of the manuscript. All authors have read and approved the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was obtained from the Ethics Committee of Longyan First Hospital Affiliated to Fujian Medical University (Approval no. LYREC2023-k037-01). Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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