# EFFECTS OF EMODIN ON CLINICAL EFFICACY, PEPSINOGEN PGI, PGII AND TUMOR MARKER CA724 IN PATIENTS WITH GASTRIC CANCER

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***ABSTRACT***

***Objective:*** *To explore the effect of emodin on the clinical efficacy, pepsinogen I (PGI), pepsinogen II (PGII), and tumor marker carbohydrate antigen 724 (CA724) in patients with gastric cancer.*

***Methods:*** *Sixty-eight patients with gastric cancer treated in the oncology department of our hospital from February 2018 to March 2020 were randomly selected and divided into a study group and a control group, with 34 cases in each group. The control group was treated with cisplatin and capecitabine, and the study group was given emodin on the basis of the control group. Both groups were treated for 3 weeks. The basic clinical data, clinical effects, PGI, PGII, CA724, and adverse reactions were compared between the two groups.*

***Results:*** *The total effective rates of the study group and the control group were 91.18% and 70.59%, respectively. The study group was significantly higher than the control group (P < 0.05). Compared with the before treatment and after treatment, the levels of PGI, PGII, and CA724 in the two groups were significantly increased, while the levels of PGII and CA724 were significantly decreased. The changes of each index in the study group were statistically significant (P<0.05). The main adverse reactions were gastrointestinal reactions, myelosuppression, thrombocytopenia, and leucopenia. Among them, the incidence of adverse reactions in the study group and the control group was 11.76% and 35.29%, respectively. The study group was significantly lower than that in the control group (P<0.05).*

***Conclusion:*** *Emodin in the treatment of gastric cancer can significantly reduce the levels of PGI and CA724 and improve the level of PGII, with significant clinical efficacy and higher safety.*

***Keywords:*** *Emodin, gastric cancer, clinical efficacy, PGI, PGII, CA724.*

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## Introduction

Gastric cancer is one of the most common malignant tumors in the world. Its mortality rate ranks second among all kinds of malignant tumors globally and is the most widespread cancer in the digestive system. The pathogenesis of gastric cancer is complex, and may be closely related to Helicobacter pylori infection, diet, heredity, and other factors[1]. Early gastric cancer often has no obvious symptoms; most patients with gastric cancer are diagnosed in the middle and late stages. According to relevant statistics, the 5-year survival rate of early gastric cancer is as high as 90%, while the 5-year survival rate of middle and advanced gastric cancer is less than 40%, which has a serious impact on the quality of life and health of patients[2]. Therefore, early detection, early diagnosis, and early treatment are of great significance in reducing mortality and improving the quality of life of patients. At present, Western medicine's clinical treatment of advanced gastric cancer often uses comprehensive treatment.

Though these therapies can achieve good results to a certain extent, the toxicity and side effects of Western medical treatments are high. Moreover, it is easy to produce drug resistance, which increases the treatment difficulty of patients[3].

Chinese medicine has unique advantages in the treatment of cancer, with important implications for inhibiting or killing tumor cells, postoperative conditioning and reducing adverse reactions of patients[4]. Studies have revealed that emodin, also known as frangulic acid, has an important role in the treatment of lung and ovarian cancers, but there are few studies on its effect on gastric cancer[5].

In this study, emodin was mainly used to treat gastric cancer, aiming to explore the effects on clinical efficacy, pepsinogen I (PGI), pepsinogen II (PG II), and tumor marker carbohydrate antigen 724 (CA724) in patients with gastric cancer.

## Data and methods

### *Basic information*

*Methods*

Sixty-eight patients with gastric cancer treated in the oncology department of our hospital from February 2018 to March 2020 were randomly selected and divided into a study group and a control group, with 34 cases in each group.

*Inclusion criteria:*

• All patients were in accordance with The diagnosis and treatment of gastric cancer[6] in Western medicine and Guiding Principles for Clinical Research of New Chinese Medicines[7] in traditional Chinese medicine and were confirmed by pathological examination;

• According to TNM staging, all patients were in stages II–IV;

• The study was approved by the hospital ethics committee, which was in line with medical ethics;

• All patients and their families provided informed consent by signing an informed consent form;

• The patient's survival time exceeded 3 months.

*Exclusion criteria for patients encompassed:*

• Complete medical records or dropped out halfway;

• Unable to take food from the mouth;

• Severe insufficiency of liver, kidney, or heart functions;

• Use of glucocorticoids or other drugs within 2 months before participating in the study;

• Having a history of severe drug allergies.

### *Treatment*

Patients in the control group were given cisplatin [(Jiangsu Haosen Pharmaceutical Co., Ltd., production batch No.: 20170813, specification: 6 mL: 30 mg) 30 mg/m$^2$ each time, once a day for 3 d, repeated treatment every 3 weeks] + capecitabine [(Shanghai Roche Pharmaceutical Co., Ltd.), production batch number 20173024, specification: 0.5 g * 12 tablets) 2.5 g/m$^2$ per day, with the total daily dose divided into two times in the morning and evening, 30 min after meals with warm boiled water and continuous use for 2 weeks, then rest for a week.]

Based on the control group, the patients in the study group were given emodin (Shanghai Chunyou Biotechnology Co., Ltd., specification: 20 mg), 100 mg, once a day. Both groups were treated for 3 weeks.

### *Observation index*

*Basic data*

The clinical data of patients in the study group and the control group were compared, including age, gender, course of disease, card type score, clinical pathological type, location of disease, and other factors. Before and after treatment, 5 mL of fasting median elbow vein blood was collected from all subjects. Serum and blood cells were separated with a low-temperature, high-speed centrifuge at a speed of 3000 r/min. the supernatant was taken and stored in an −80°C ultra-low-temperature refrigerator for subsequent research.

*Clinical efficacy*

The clinical effects of the two groups were evaluated, including cures, obvious effects, improvement, and deterioration. If a lesion completely disappeared and the laboratory examination index completely returned to a normal value, or the TCM syndrome score decreased by more than 95%, the lesion was regarded as cured. When the tumor diameter decreased by more than 50% or the TCM syndrome score decreased by 65% ~ 95%, it was regarded as improved.

Also, when the tumor diameter decreased by less than 50% or the TCM syndrome score decreased by 30% ~ 65%, it was regarded as improved. When the tumor diameter increased more than 25% or new lesions appeared, or the TCM syndrome scored less than 30%, the tumor was considered a deterioration. Among the subjects of the study, the clinical total effective rate = (cured + markedly effective + improved)/n.

*Determination of PGI and PGII levels*

PGI and PGII levels were measured by an enzyme-linked immunosorbent assay.

*Determination of CA724 level*

The change in the CA724 level was detected by chemiluminescence immunoassay.

*Adverse reactions*

The adverse reactions of the two groups were compared.

***Statistical methods***

The SPSS22.0 software package was used for statistical data analysis. The count data is expressed as a percentage, using the $\chi^2$ test. The comparison of measurement data between groups was performed by an independent sample t-test. The comparison before and after treatment was performed by a paired sample t-test. The comparison of the same index at different time points was performed by repeated-measures analysis of variance. The difference between groups at each time point was compared by an independent sample t-test. A least significant difference (LSD)-t test was used to compare time differences. A data comparison result of P<0.05 indicates that the difference is statistically significant.

## Results

***Comparison of basic data between the study group and the control group***

No significant difference was revealed in age, gender, card score, clinicopathological classification, and location between the two groups (P>0.05). See Table 1.

| Group | Study group ($n$ = 34) | Control group (n = 34) | $\chi^2/t$ | $P$ |
|---|---|---|---|---|
| Age (years) | 59.96 ± 10.76 | 58.71 ± 7.12 | 0.565 | 0.574 |
| Gender | | | | |
| Male | 19 (55.88) | 21 (61.76) | 0.243 | 0.622 |
| Female | 15 (44.12) | 13 (38.24) | | |
| Course of disease (years) | 8.95 ± 1.53 | 9.14 ± 1.71 | 0.483 | 0.631 |
| Card score | 77.12 ± 7.84 | 76.86 ± 7.13 | 0.143 | 0.887 |
| Clinicopathological classification | | | | |
| Adenocarcinoma | 16 (47.06) | 15 (44.12) | 0.728 | 0.695 |
| Mucinous adenocarcinoma | 8 (23.53) | 11 (32.35) | | |
| Signet ring cell carcinoma | 10 (29.41) | 8 (23.53) | | |
| Location | | | | |
| Antrum | 14 (41.18) | 15 (44.12) | 0.328 | 0.849 |
| Cardia | 11 (32.35) | 12 (35.29) | | |
| Lesser curvature and anterior and posterior wall of stomach | 9 (26.47) | 7 (20.59) | | |

**Table 1:** Comparison of basic data between the study group and the control group.

***Comparison of clinical efficacy between the study group and the control group***

The total effective rates of the study group and the control group were 91.18% and 70.59%, respectively. The total effective rates of the study group were significantly higher than those of the control group (P<0.05). See Table 2.

| Group | $n$ | Cured | Effective | Improved | Deteriorated | Total effective |
|---|---|---|---|---|---|---|
| Study group | 34 | 15(44.12) | 11(32.35) | 5(14.71) | 3(8.82) | 31(91.18) |
| Control group | 34 | 9(26.47) | 12(35.29) | 3(8.82) | 10(29.41) | 24(70.59) |
| $\chi^2$ | | | | | | 4.660 |
| $P$ | | | | | | 0.031 |

**Table 2:** The ratio of clinical efficacy between the study group and the control group (%).

***Comparison of PGI and PGII levels between the study group and the control group***

Compared with before treatment and after treatment, the levels of PGI and PGII in the two groups were significantly increased, the levels of PGII were significantly decreased, and the changes of each index in the study group were more significant (P<0.05). See Table 3.

| Group | $n$ | PGI (mg/L) | | $t$ | $P$ | PGII (mg/L) | | $t$ | $P$ |
|---|---|---|---|---|---|---|---|---|---|
| | | Before treatment | After treatment | | | Before treatment | After treatment | | |
| Study group | 34 | 30.65 ± 5.55 | 46.86 ± 7.33 | 10.281 | <0.001 | 27.93 ± 2.93 | 10.63 ± 3.24 | 23.092 | <0.001 |
| Control group | 34 | 31.32 ± 6.76 | 59.15 ± 4.72 | 19.682 | <0.001 | 27.24 ± 3.24 | 16.61 ± 2.43 | 15.304 | <0.001 |
| $t$ | | 0.447 | 8.220 | | | 0.921 | 8.610 | | |
| $P$ | | 0.657 | <0.001 | | | 0.360 | <0.001 | | |

**Table 3:** Comparison of PGI and PGII levels between the study group and the control group ($\bar{x}\pm s$).

***Comparison of CA724 level between the study group and the control group***

Compared with the before treatment, the level of CA724 in the two groups was significantly decreased after treatment, and the level of CA724 in the study group was significantly lower than that in the control group (P<0.05). See Table 4.

***Comparison of adverse reactions between the study group and the control group***

The main adverse reactions were gastrointestinal reaction, myelosuppression, thrombocytopenia, and leucopenia. Among them, the incidence of adverse reactions in the study group and the control group

was 11.76% and 35.29%, respectively. Results in the study group were significantly lower than that in the control group (P<0.05). See Table 5.

| Group | *n* | CA724 (U/mL) | | *t* | *P* |
|---|---|---|---|---|---|
| | | Before treatment | After treatment | | |
| Study group | 34 | 2.81 ± 0.51 | 1.72 ± 0.24 | 11.276 | <0.001 |
| Control group | 34 | 2.76 ± 0.47 | 2.21 ± 0.39 | 5.251 | <0.001 |
| *t* | | 0.420 | 6.239 | | |
| *P* | | 0.676 | <0.001 | | |

**Table 4:** Comparison of PGI and PGII levels between the study group and the control group ($\bar{x}\pm s$).

| Group | *n* | Gastrointestinal reaction | Myelosuppression | Thrombocytopenia | Leucopenia | Total |
|---|---|---|---|---|---|---|
| Study group | 34 | 2 (5.88) | 0(0.00) | 0(0.00) | 1 (2.94) | 4 (11.76) |
| Control group | 34 | 5 (14.71) | 2(5.89) | 2(5.88) | 3 (8.82) | 12 (35.29) |
| $\chi^2$ | | | | | | 5.231 |
| *P* | | | | | | 0.022 |

**Table 5:** Comparison of adverse reactions between the study group and the control group (%).

## Discussion

Cancer is the main killer of human health after cardiovascular diseases, and its incidence is increasing every year. According to statistics, there are more than 6 million deaths from cancer every year worldwide. Gastric cancer is a kind of high-incidence tumor in China, and it is the first cancer in the digestive tract. The specific symptoms of patients with early gastric cancer, such as distension, belching, and other symptoms, are often ignored. When obvious symptoms such as weight loss and bloody stool appear, they often reach the middle and late stages, which seriously affect people's life and health[8]. As is well known, the occurrence and development of gastric cancer is a long-term, multi-step and multi-factor process, and its pathogenic factors include biological factors, genetic factors, chemical stimulation, bad living habits, and environmental factors[9].

At present, surgery combined with radiotherapy and chemotherapy is the main treatment for advanced gastric cancer, but the adverse reactions are obvious, and the recurrence rate is high. In the past, there was no name for gastric cancer in traditional Chinese medicine. According to the characteristics of gastric cancer, it has been classified into the categories of "epigastralgia," "stomach accumulation," and "choking." It was considered that the occurrence of gastric cancer was mainly due to the patients' internal seven emotions, eating disorders, prolonged illness or injury, resulting in the body's viscera dysfunction, the body fluid, qi, and abnormal blood flow, producing a series of pathological changes such as stagnation of qi, phlegm coagulation, blood stasis, and more. These dysfunctions accumulate in the body's viscera and tissues, causing swelling and knots over time, eventually leading to the development of gastric cancer[10].

Emodin is a kind of anthraquinone derivative, which has antibacterial, antioxidant, and anti-inflammatory characteristics that improve immune function. Some studies believe that emodin can improve the therapeutic effect of patients by improving the changes of serum indicators[11]. In this study, emodin is mainly used in the treatment of gastric cancer. The results show that emodin has obvious clinical efficacy in the treatment of gastric cancer, and the safety is higher.

Pepsinogen is the migration of pepsin, which can not only reflect the number of glands and cells in gastric mucosa but also indirectly reflect the secretion function of different parts of the gastric mucosa[12]. Pepsinogen includes two subtypes: PGI and PGII. PGI is mainly secreted by the main cells of gastric fundus and cervical mucus cells. Besides these cells, PGII is also secreted by the cardia gland, pyloric gland of the gastric antrum, and the Brunner gland of the duodenum. The stomach is almost the only source of pepsinogen. Therefore, the detection of serum PGI and PGII concentration can reflect the morphology and function of gastric mucosa. The results showed that emodin could significantly reduce the levels of PGI and PGII in patients with gastric cancer. This may be because when gastric cancer occurs, the PGI level in gastric cancer patients decreases significantly due to the obvious expansion of the atrophy range and the infiltration of cancer tissue, while PGII continues to rise due to pseudopyloric gland metaplasia and secretion of other gland cells, resulting in a significant decrease in PGI level in patients with gastric cancer[13]. Emodin can significantly promote the proliferation of gastric cancer main cells and inhibit the metaplasia of the pyloric gland or intestinal epithelium.

CA724, a carbohydrate antigen, is a high molecular weight mucin tumor marker with double antigenic determinants. Studies have found that CA724 is mainly distributed in the cell membrane of patients with adenocarcinoma, and its level is

closely related to tumor size and clinical stage[14]. It is reported that CA724 is of great significance in the diagnosis, curative effect observation, prognosis evaluation, and postoperative detection of gastric cancer, colon cancer, and other malignant tumors[15]. The results showed that emodin could significantly reduce the level of CA724 in patients with gastric cancer. In sum, emodin can significantly reduce the levels of PGI and CA724 and improve the level of PGII in the treatment of gastric cancer. The clinical efficacy is significant, and the safety is higher than other treatments.

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