

Original Research Article

A study of the effect of combination of acupuncture and Chinese medicine (Ban Xia Xie Xin Decoction) on patients with sepsis-induced gastrointestinal dysfunction

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Abstract

Purpose: To investigate the therapeutic effect of combination of acupuncture and Ban Xia Xie Xin Decoction (BXXXD) in patients with sepsis-induced gastrointestinal dysfunction.

Methods: A total of 100 patients with sepsis and gastrointestinal dysfunction admitted to our hospital from June 2019 to December 2020 were randomly assigned to a control group and a study group for a retrospective analysis. Both groups received acupuncture treatment, while BXXXD was given to the study group, in addition to acupuncture. Treatment effectiveness, incidence of adverse reactions, degree of recurrence at 1, 2 and 3 months after treatment, gastrointestinal dysfunction scores after 1 week of treatment, quality of life index (QLI) scores, frequencies of flatulence and defecation within 48 h, number of bowel rumblings, as well as levels of gastrin and cholecystokinin (CCK), were determined and compared between the two groups.

Results: The group with BXXXD intervention demonstrated superior treatment effectiveness, QLI scores, frequencies of flatulence and defecation within 48 h, number of bowel rumblings, and level of gastrin than those who received only acupuncture treatment ($p < 0.05$). There was strong evidence of lower incidence of adverse reactions, recurrence at 1, 2, and 3 months after treatment; gastrointestinal dysfunction scores and CCK levels after 1 week of treatment was higher in the study group than in the control group ($p < 0.05$).

Conclusion: The combination of acupuncture and BXXXD is superior to acupuncture alone in sepsis patients with gastrointestinal dysfunction. The combination therapy produces its effect by decreasing clinical symptoms, promoting recovery of the patients, and elevating their quality of life.

Keywords: Acupuncture, Ban Xia Xie Xin Decoction, Sepsis, Gastrointestinal dysfunction, Quality of life

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INTRODUCTION

Sepsis-induced gastrointestinal dysfunction refers to a decrease in gastrointestinal function due to sepsis in patients, resulting in indigestion,

constipation, gastric aches and pains [1-3]. Sepsis is an important cause of death in intensive care unit (ICU) patients. It manifests in fever, rapid heartbeat, shortness of breath, edema, aberrantly elevated blood sugar, and

increased levels of inflammatory factors. Other features include raised blood pressure, decreased blood oxygen saturation, abnormal liver and kidney function, aberrant gastrointestinal function, shock, unconsciousness or even death [4-6].

Sepsis is linked to gastrointestinal dysfunction. Consequently, simultaneous treatment is important for patients with sepsis and gastrointestinal dysfunction, to avoid further progression of the disease.

Chinese medicine is effective for regulation of gastrointestinal function, enhancement of gastrointestinal peristalsis, and mitigation of indigestion and constipation. *Ban Xia Xie Xin Decoction* (BXXXD) is a traditional Chinese herbal medicine made from pinellia, astragalus, dried ginger, and ginseng, and it is used for the treatment of acute and chronic gastroenteritis. The formula is obtained from *Treatise on Febrile and Miscellaneous Diseases*, and it has produced beneficial outcomes in modern clinical applications [7-9]. The present study was aimed at investigating the effect of combination of acupuncture and BXXXD on patients with sepsis and gastrointestinal dysfunction.

METHODS

General patient profile

Retrospective analysis was carried out on 100 patients with sepsis and gastrointestinal dysfunction who were admitted to Department of Emergency and Critical Care Medicine, Affiliated Hospital of Shandong University of Traditional Chinese Medicine, from June 2019 to December 2020. The patients were randomly assigned to a control group and a study group. Patients in the control group were aged 39 - 75 years, while those in the study group were in the age range of 41 - 75 years. As shown in Table 1, the two

groups were comparable with regard to gender and age ($p > 0.05$). The protocol was approved by the Medical Science Research Ethics Committee of *Shandong Provincial Hospital affiliated to Shandong First Medical University* (approval no. 2018-101(05), and followed the international guidelines for human studies [10].

Inclusion/exclusion criteria

Inclusion criteria

Patients in the following categories were included: those who met the clinical manifestations of sepsis-induced gastrointestinal dysfunction, patients aged ≥ 18 years, those without other organic diseases, and those with no history of drug allergy, drug abuse, or bad habits.

Exclusion criteria

Patients who had a history of digestive system diseases, those with mental disorders, and patients with malignant tumors were excluded from the study. This study was approved by the ethics committee of our hospital. All patients voluntarily participated in the study and signed an informed consent form.

Treatments

Acupuncture treatment was adopted for patients in the control group. The patients were placed in a supine position, and the skin surface at the site of the needle was pre-disinfected. Acupuncture was conducted with a 0.3×40 mm needle on the acupoint of *Zhongwan*, *Zusanli*, *Neiguan*, *Sanyinjiao* and *Taichong* for 30 min, once daily for five consecutive days.

The study group was treated with acupuncture and BXXXD, while the control group received acupuncture only.

Table 1: Patient profile (mean \pm SD)

| Group | Study | Control | t/χ^2 | P-value |
|-----------------------------|-------------------|-------------------|------------|---------|
| Gender(male/female) | 30/20 | 27/23 | 0.37 | 0.55 |
| Age (years) | 59.67 \pm 7.45 | 59.10 \pm 7.77 | 0.37 | 0.71 |
| Height (cm) | 169.52 \pm 7.50 | 169.97 \pm 7.53 | 0.30 | 0.77 |
| Weight (kg) | 72.89 \pm 8.41 | 72.22 \pm 8.55 | 0.40 | 0.69 |
| History of smoking (years) | 8.73 \pm 1.28 | 8.60 \pm 1.54 | 0.46 | 0.65 |
| History of drinking (years) | 10.44 \pm 2.21 | 10.30 \pm 2.38 | 0.30 | 0.76 |
| Hypertension cases | 10 | 12 | 0.23 | 0.63 |
| Diabetes cases | 10 | 7 | 0.64 | 0.42 |
| Hyperlipidemia cases | 6 | 8 | 0.33 | 0.56 |

The BXXXD was produced from decoction of a mixture of pinellia (15 g), *Scutellaria baicalensis* (9 g), dried ginger (9 g), ginseng (9 g), roasted licorice (9 g), coptis (3 g), and 4 jujubes in 1 liter of water [11-13]. The decoction was stopped when 300 mL of liquid remained in the flask. The patients were given the decoction at a dose of 100 mL three times daily for seven consecutive days.

Treatment indicators

Treatment effectiveness, incidence of adverse reactions, extent of recurrence at 1, 2, and 3 months after treatment, gastrointestinal dysfunction scores after 1 week of treatment, QLI scores, frequencies of flatulence and defecation within 48 h, number of bowel rumblings, and levels of gastrin and CCK were determined and compared between the two groups of patients.

Treatment outcome

Treatment outcome was classified as markedly effective, effective or ineffective. If the clinical manifestations of sepsis and gastrointestinal dysfunction disappeared completely, and the patients had no adverse reactions, the outcome was markedly effective. If most of the clinical manifestations disappeared, and there were no obvious adverse reactions, the outcome was classified as effective.

However, if the clinical manifestations of the patient did not show any obvious sign of disappearance, and serious adverse reactions occurred, the outcome was deemed ineffective.

Gastrointestinal symptom

The gastrointestinal symptom rating scale (GSRS) had a total score of 112 points. The lower the score, the better the condition. The evaluation criteria included 16 items such as abdominal pain, constipation, diarrhea, nausea, and bowel rumblings. Each item had a total score of 7 points. 'No symptom' was scored 1 point, while very 'severe symptom' was scored 7 points.

QLI

The QLI standards involved scoring standards for daily activities such as work and life, and interpersonal relationships. Each standard had a full score of 10 points. The higher the score, the better the patient's quality of life, and vice versa. The effect of gastrin is opposite to that of CCK. Gastrin is a hormone that accelerates gastric emptying and enhances digestion, while CCK inhibits gastric secretion and gastric motility.

Statistical analysis

Data processing and analysis were conducted using SPSS20.0, while GraphPad Prism 7 (GraphPad Software, San Diego, USA) was employed for graphics. The results obtained in this research comprised count data and measurement data. Measurement data are expressed as mean \pm SD, and they were statistically analyzed with Students' *t*-test. Count data are presented as numbers and percentages [n (%)], and were compared with chi squared [χ^2] test. Values of $p < 0.05$ were taken as indicative of statistically significant differences.

RESULTS

Treatment efficacy

Results in Table 2 indicate higher treatment effectiveness in the study group than in the control group ($p < 0.05$).

Incidence of adverse reactions

From the results of Figure 2, it is apparent that the study group had a significantly lower incidence of adverse reactions than the control group ($p < 0.05$).

Incidence of recurrence after treatment

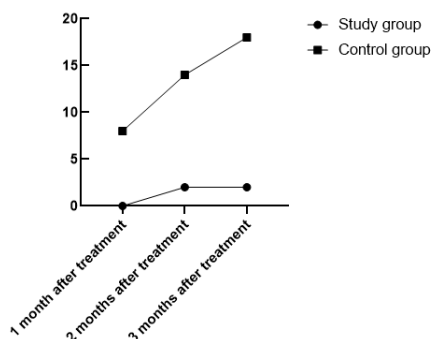
Compared to the control group, treatment with BXXXD + acupuncture significantly decreased the incidence of disease reoccurrence at 1 month (0% vs 8%, $X^2 = 4.17$, $p = 0.04$), 2 months (2% vs 14%, $X^2 = 4.89$, $p = 0.02$), and 3 months (2% vs 18%, $X^2 = 7.11$, $p = 0.008$) after treatment (all $p < 0.05$), as shown in Figure 1.

Table 2: Comparison of treatment efficacy between the two groups

| Group | markedly effective | effective | ineffective | Total effective rate |
|-----------------|--------------------|-----------|-------------|----------------------|
| study | 42 | 7 | 1 | 49(98%) |
| Control | 30 | 11 | 9 | 41(82%) |
| X^2 | | | | 7.110 |
| <i>P</i> -value | | | | 0.008 |

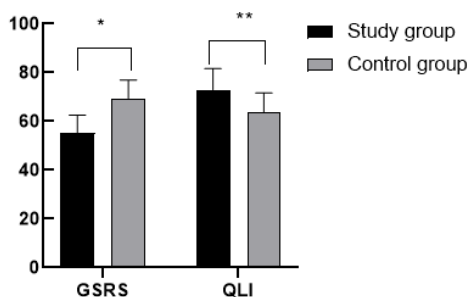
Table 3: Comparison of incidence of adverse reactions between the two groups

| Group | nausea | bad breath | peculiar urine | multiple organ dysfunction | Total incidence |
|-----------------|--------|------------|----------------|----------------------------|-----------------|
| study | 2 | 1 | 0 | 0 | 3(6%) |
| Control | 2 | 4 | 4 | 3 | 13(26%) |
| χ^2 | | | | | 7.440 |
| <i>P</i> -value | | | | | 0.006 |

**Figure 1:** Comparison of incidence of recurrence between the two groups at 1 month, 2 months, and 3 months post-treatment

Gastrointestinal dysfunction scores and QLI scores after 1 week of treatment

There was lower gastrointestinal dysfunction score in the study group (55.26 ± 7.31) than in the control group (69.8 ± 7.50), ($t = 9.60$, $p < 0.001$); QLI score was higher in the study group (72.99 ± 8.64) than in the control group (63.57 ± 8.03), ($t = 5.65$, $p < 0.001$), as shown in Figure 2.

**Figure 2:** Comparison of gastrointestinal dysfunction scores and QLI scores between the two groups after 1 week of treatment

Frequencies of flatulence and defecation, and number of bowel rumblings within 48 hours

The results in Table 4 reveal that the combination of BXXXD and acupuncture yielded beneficial outcome in terms of frequencies of flatulence and defecation and the number of

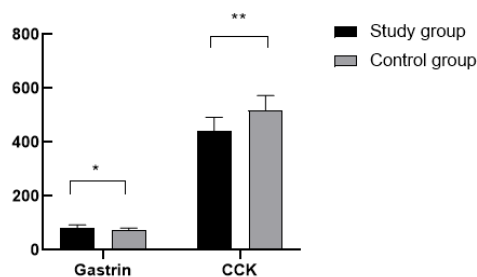
bowel rumblings in the study group, when compared to the control group ($p < 0.05$).

Table 4: Comparison of frequencies of flatulence and defecation, and number of intestinal rumblings in the two groups within 48 h (n)

| Group | Flatulence (n/48h) | Defecation (n/48h) | Bowel rumblings (n/min) |
|-----------------|--------------------|--------------------|-------------------------|
| study | 5.68 ± 1.13 | 3.25 ± 0.11 | 4.06 ± 0.81 |
| Control | 4.30 ± 0.96 | 2.00 ± 0.07 | 3.00 ± 0.62 |
| <i>t</i> | 6.58 | 67.79 | 7.35 |
| <i>P</i> -value | <0.001 | <0.001 | <0.001 |

Levels of gastrin and CCK

After 1 week of treatment, gastrin level (83.20 ± 9.91 ng/L) of the study group was significantly higher than that of the control group (72.54 ± 8.86 ng/L) ($t = 5.67$, $p < 0.001$); CCK level in the study group (441.46 ± 51.07 ng/L) was lower than that in the control group (519.68 ± 53.34 ng/L), ($t = 7.49$, $p < 0.001$), as shown in Figure 3.

**Figure 3:** Comparison of levels of gastrin and CCK between the two groups

DISCUSSION

Sepsis, a major contributing factor to the death of ICU patients, is characterized by fever, shock, and hypotension [14-16]. This infectious disease may also give rise to organ failure or dysfunction. It has been reported that increased levels of inflammatory factors are triggered by different types of bacteria in the gastrointestinal tract during gastrointestinal dysfunction, resulting in a high risk of sepsis [17-19]. Consequently, simultaneous treatment is indispensable for patients with sepsis and gastrointestinal

dysfunction so as to suppress the causative relationship between these two diseases [20-22].

Traditional Chinese medicine is an effective treatment method for improvement of gastrointestinal environment and function, while relieving clinical manifestations. In this respect, the most frequently used Traditional Chinese methods are acupuncture and Chinese medicine decoction. In particular, BXXXD is a traditional Chinese medicine formula used for the treatment of various types of acute and chronic gastroenteritis. It is decocted from a mixture of components such as pinellia, astragalus, ginseng, jujube, and other components. It produces promising therapeutic effect against gastrointestinal dysfunction through the combination of *cold* and *warm medicinals* and *dispersing abdominal mass* and *resolving accumulation* [23-25].

In order to study the effect of application of combination of acupuncture and BXXXD in the treatment of patients with sepsis and gastrointestinal dysfunction, this research matched patients with the two diseases as subjects. Treatment effectiveness, incidence of adverse reactions, recurrence at 1, 2 and 3 months after treatment, gastrointestinal dysfunction scores after 1 week of treatment, QLI scores, frequencies of flatulence and defecation within 48 hours, number of bowel rumblings, and levels of gastrin and CCK in the two groups of patients were determined and compared. The results showed that the group treated with BXXXD had better outcomes with respect to treatment effectiveness, QLI scores, frequencies of flatulence and defecation within 48 h, number of bowel sounds, and the level of gastrin, than the control group.

The combination of sepsis and gastrointestinal dysfunction is manifested as constipation, decreased frequency of flatulence, abdominal distension, gastric acid reflux, and weak or non-existent bowel sounds. Gastrin is a hormone that promotes the secretion of gastric juice and retards the formation of gastric acid. Thus, the secretion of gastrin is crucial in the treatment of gastric reflux patients since it substantially alleviates the manifestations of gastric reflux. In addition, the quality of life of patients with sepsis and gastrointestinal dysfunction is impaired to a certain extent. Consequently, patients' recovery can be determined by the assessment of quality of life. In this study, treatment of patients with sepsis and gastrointestinal dysfunction using combination of acupuncture and BXXXD resulted in an apparent promotion of the quality of life and disappearance of clinical manifestations of the

diseases. There was strong evidence of lower incidence of adverse reactions, reduced incidence of recurrence at 1 month, 2 months, and 3 months after treatment, lower gastrointestinal dysfunction scores and CCK levels after 1 week of treatment in the study group, when compared with the control group. After treatment, failure to adopt good dietary habits, or incomplete initial treatment may delay the patients' improvement. In light of this, the curative effects of the two treatment methods were analyzed by following up on the incidence of recurrence at 3 months after treatment.

Gastrointestinal dysfunction scores are mainly used to determine the degree of gastrointestinal disorders in patients through detection and evaluation of gastrointestinal tract conditions, so as to facilitate developments in treatment and the use of drugs. Similar results have also been proposed in a previous study which found that the comprehensive treatment of sepsis complicated with gastrointestinal dysfunction using combination of acupuncture and traditional Chinese medicine decoction resulted in enhanced treatment effect, improved clinical manifestations of patients, and decreased probability of multiple organ dysfunction [26].

Limitations of the study

The current study has several limitations, such as a small sample size and absence of a long-term follow-up. As a result, the findings should be interpreted with cautions, and long-term data and more participants will be needed to obtain more accurate data.

CONCLUSION

The combination of acupuncture with BXXXD produces a promising therapeutic effect in sepsis patients with gastrointestinal dysfunction, by reducing clinical symptoms, promoting recovery, and elevating the quality of life and the survival of patients.

DECLARATIONS

Conflict of interest

No conflict of interest is associated with this work.

Contribution of authors

We declare that this work was done by the authors named in this article and all liabilities

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