Treatment of abdominal compartment syndrome in severe acute pancreatitis patients with traditional Chinese medicine

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ABSTRACT

AIM: To investigate the therapeutic effect of traditional Chinese traditional medicines Da Cheng Qi Decoction (Timely-Purging and Yin-Preserving Decoction) and Glauber’s salt combined with conservative measures on abdominal compartment syndrome (ACS) in severe acute pancreatitis (SAP) patients.

METHODS: Eighty consecutive SAP patients, admitted for routine non-operative conservative treatment, were randomly divided into study group and control group (40 patients in each group). Patients in the study group received Da Cheng Qi Decoction enema for 2 h and external use of Glauber’s salt, once a day for 7 d. Patients in the control group received normal saline (NS) enema. Routine non-operative conservative treatments included non-per os nutrition (NPON), gastrointestinal decompression, life support, total parenteral nutrition (TPN), continuous peripancreatic vascular pharmaceutical infusion and drug therapy. Intra-cystic pressure (ICP) of the two groups was measured during treatment. The effectiveness and outcomes of treatment were observed and APACHE II scores were applied in analysis.

RESULTS: On days 4 and 5 of treatment, the ICP was lower in the study group than in the control group (P < 0.05). On days 3-5 of treatment, acute physiology and chronic health evaluation II (APACHE II) scores for the study and control groups were significantly different (P < 0.05). Both the effectiveness and outcome of the treatment with Da Cheng Qi Decoction on abdominalgia, burbulence relief time, ascites quantity, cyst formation rate and hospitalization time were quite different between the two groups (P < 0.05). The mortality rate for the two groups had no significant difference.

CONCLUSION: Da Cheng Qi Decoction enema and external use of Glauber’s salt combined with routine non-operative conservative treatment can decrease the intra-abdominal pressure (IAP) of SAP patients and have preventive and therapeutic effects on abdominal compartment syndrome of SAP.

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Key words: Da Cheng Qi Decoction; Glauber’s salt; traditional Chinese medicine; Severe acute pancreatitis; Abdominal compartment syndrome

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INTRODUCTION

Severe acute pancreatitis (SAP) is a serious surgical disease with a mortality of 25%-40%[1,2]. Patients with SAP tend to have elevated intra-abdominal pressure (IAP), which eventually leads to intra-abdominal hypertension (IAH). IAH causes organ dysfunctions such as respiratory, circulatory and renal failure, known as abdominal compartment syndrome (ACS)[3,4]. About 11% of SAP patients suffer from complications of ACS. SAP patients complicated by ACS, a special type of pancreatitis, tend to have a mortality of 66.7%[5]. There are certain guidelines for treatment of SAP, but no standard treatment for ACS
in SAP patients is available at present[8]. In our previous study, Da Cheng Qi Decoction showed beneficial effects on acute pancreatitis (AP) with no adverse effects[8]. In the present study, we used Da Cheng Qi Decoction and Glauber's salt combined with routine non-operative conservative treatments, including non-per os nutrition (NPON), gastrointestinal decompression, life support, total parenteral nutrition (TPN), continuous peripancreatic vascular pharmaceutical infusion and drug therapy in the treatment of ACS in SAP patients. Through comparison with the control group, we demonstrated whether the TCM-wm therapy is effective for treatment of ACS in SAP patients.

MATERIALS AND METHODS

Patients

A total of 80 consecutive SAP patients were treated in the Surgery Department of Affiliated Central Hospital of Huzhou Normal College. The age of the patients ranged 27-76 years (mean 54.4 years, median 47 years). There were 38 males (47.5%) and 42 females (52.5%), the male to female ratio was 0.905:1. When they were hospitalized, the severity of SAP was evaluated according to the serum level of amylase, CT serious index (CTSI)[7], acute physiology and chronic health evaluation II (APACHE II) score[9], and the diagnostic criteria and severity grade for AP proposed by the Japanese Ministry of Health, Labor, and Welfare (JMHLW)[10]. The diagnosis of ACS was made as previously described[10]. Demographic data, serum level of amylase, CTSI, APACHE II scores, ACS rate and severity grade ratio were not statistically different between the study and control groups (Table 1).

Methods

Eighty patients of SAP admitted for routine non-operative conservative treatment were randomly divided into study group and control group (40 patients in each group). Patients in the study group) received Da Cheng Qi Decoction enema (one dosage, 100 mL) for 2 h and external use of Glauber’s salt (100 g) once a day for 7 d. Patients in the control group received 100 mL normal saline (NS) enema. One dosage of Da Cheng Qi Decoction consists of 10 g Rheum officinale Baill, 10 g Sodium sulfate, 10 g Magnolia obvatura, 10 g Fructus aurantii, 10 g Radix parsniae rubra, and 10 g Raphanus sativus. Routine non-operative conservative treatment modalities included NPON, gastrointestinal decompression, life support, TPN, continuous peripancreatic vascular pharmaceutical infusion[11,12] and drug therapy. Intracystic pressure (ICP) in the two groups could reflect the IAP conditions at admission and on days 1-7 of treatment. ICP data were defined as previously described[13]. Effectiveness of the treatment on abdominalgia, burbullence relief time, ascites quantity, cyst formation, mortality rate and hospitalization time were observed. The ascites quantity in patients was defined by B-ultrasound test on day 7 of treatment. APACHE II scores, defined using Microsoft APACHE II graded compute program version 5.1, were applied for analysis.

Statistical analysis

All data were prepared and compiled using the SPSS computer program (version 11.0 for windows). The data were expressed as mean ± SD. Kolmogorov-samirnov test was used for the pattern of data distribution. Student’s unpaired t-test was used to compare data between the two groups when they were normally distributed. The Mann-Whitney U test was used when the data were not normally distributed. Chi square test and Fisher’s exact test were used for quantitative data analysis. Step-wise regression analysis was used for multivariate analysis to determine any confounding factors. P < 0.05 was considered statistically significant.

RESULTS

ICP and APACHE II scores

On days 4 and 5 of treatment, the ICP data obtained from the study group were lower than those obtained from the control group (P < 0.05). On days 3-5 of treatment, the APACHE II scores of the study group and control group were significantly different (P < 0.05, Table 2). As shown in Table 2, the ICP data were significantly decreased from the 4th treatment day in the study group (P < 0.05), while significantly decreased from the 6th treatment day in the control group (P < 0.05). The cumulative scores of APACHE II were significantly decreased from the 3rd treatment day in the study group (P < 0.05), while significantly decreased from the 6th treatment day in the control group (P < 0.05).

Effectiveness of treatment

As shown in Table 3, the relief time of abdominalgia and burbullence was shorter in the study group than in the control group (P < 0.05). The amount of ascites on day 7 of treatment was less in the study group than in the control group (P < 0.05).

Outcome of treatment

As shown in Table 4, the mortality rate was lower for the study group than for the control group, and there was no significant difference between the two groups. The cyst formation rate was significantly lower for the
### DISCUSSION

SAP is a serious pathological condition and SAP patients tend to suffer from ACS. It was reported that SAP can result in systemic inflammatory response syndrome (SIRS) trigged by local inflammation in the pancreas. The fundamental pathophysiology of SIRS is hypercytokinemia, a pathological condition in which inflammatory cytokines are excessively released from immunocompetent cells. During SIRS, activated inflammatory mediators result in the development of systemic capillary leakage syndrome (SCLS). In SCLS, vascular permeability is increased by the pathologic effects of humoral mediators, leading to interstitial edema and reduction of circulating blood volume. Progressive edema of peritoneum and gut contents could rapidly increase IAP. Moreover, massive pancreatic liquid collection in the abdominal and retroperitoneal cavity and a large amount of pancreatic necrotic tissue combined with infection would lead to the formation of abscess, causing intestinal obstruction and erosion of the surrounding organs, which further result in perforation and massive bleeding and recurrence of SIRS and SCLS. Edema caused by the septic retroperitoneal necrosis pushes the peritoneum, thus rapidly increasing IAP. Furthermore, for the treatment of SAP, early resuscitation with a large volume of fluid is essential to maintain organ perfusion. However, aggressive fluid resuscitation may aggravate intestinal edema, further increasing IAP, indicating that SAP can induce retroperitoneal edema or abscess, fluid collection in the abdominal and retroperitoneal cavity, intestinal edema, and that aggressive fluid resuscitation could increase IAP and abrupt elevation of IAP eventually causes IAH. IAH causes organ dysfunctions such as respiratory, circulatory and renal failure, known as ACS. Since SAP patients with complication of ACS have a very high mortality, it is very important to find a right way to prevent and treat ACS in SAP patients.

**Da Cheng Qi** Decoction is a traditional Chinese medicine documented in Shang Han Lun (Treatise on Febrile Diseases). Its major components include Rheum officinale Baill., sodium sulfate, Magnolia obavata, Fructus aurantii, Radix paconiae rubra, and Raphanus sativus. Modern clinical and experimental researches have focused on the effect of such components. Glauber’s salt, a sodium sulfate dehydrate (Na₂SO₄), is widely used as an anti-tissue edema agent in modern medical treatment. Non-operative conservative treatment has been widely accepted for AP. Especially, in our previous studies, continuous peripancreatic vascular pharmaceutical infusion could efficiently remove various humoral mediators and inflammatory cytokines from circulating blood, and decrease the mortality of SAP patients. In the present study, we used Da Cheng Qi Decoction and Glauber’s salt combined with routine non-operative conservative treatments including continuous peripancreatic vascular pharmaceutical infusion for treatment of ACS in SAP patients.

In this study, the ICP data were lower in the study group than in the control group on days 4 and 5 of treatment ($P < 0.05$). The APACHE II scores in study group were significantly less in the study group than in the control group on days 3-5 of treatment ($P < 0.05$). The cumulative scores of APACHE II were significantly decreased from the 4th treatment day in the study group ($P < 0.05$) while significantly decreased from the 6th treatment day in the control group ($P < 0.05$). The relife of abdominalalgia and burbulence was shorter in the study group than in the control group ($P < 0.05$). The amount of ascites on day 7 of treatment was less in the study group than in the control group ($P < 0.05$). The amount of ascites on day 7 of treatment was less in the study group than in the control group ($P < 0.05$). The cyst formation rate was significantly lower for the study group than for the control group ($P < 0.05$). The hospitalization time of the study group was significantly shorter than that of the control group ($P < 0.05$).
control group \((P < 0.05)\). The hospitalization time was significantly shorter in the study group than in the control group \((P < 0.05)\). These results suggest that *Da Cheng Qi* Decoction and Glauber’s salt combined with non-operative conservative treatments including continuous peripancreatic vascular pharmaceutical infusion can treat IAH by decreasing IAP, relaxing symptoms of ACS, slowing down the pathological condition exacerbation, and accelerating the recovery of illness.

In summary, *Da Cheng Qi* Decoction and Glauber’s salt combined with non-operative conservative treatments including continuous peripancreatic vascular pharmaceutical infusion (TCM-wm therapy) can prevent and treat ACS in SAP patients.

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