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Effect of traditional Chinese medicine on intra-abdominal hypertension and abdominal compartment syndrome: A systematic review and Meta-analysis

Yuxin Leng *, Han Li, Yu Bai, Qinggang Ge, Gaiqi Yao *

Department of Intensive Care Unit, Peking University Third Hospital, North Garden Road, No. 49, Haidian District, Beijing, 100191,. P.R. China

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ABSTRACT

Objective: Traditional Chinese medicine (TCM) recently become a widely used treatment option for treating intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS). However, we still lack large-scale, high-quality, randomized controlled trials (RCTs). The purpose of this systematic review was to evaluate the existing clinical trials and to provide additional specific evidence.
Methods: A systematic review of randomized controlled trials (RCTs) of TCM for IAH/ACS was conducted. The following databases were searched to identify relevant studies: PubMed, Medline (Ovid SP), The Cochrane Library, China Biology Medicine Database, Wanfang Database, Chinese Periodical Database, Chinese Clinical Trial Registry, and China Knowledge Resource Integrated Database. Meta-analysis was performed using Rev. Man 5.3.
Results: Fifteen studies involving 735 participants were included in the analysis. Compared to conventional therapy, TCM has a significant effect on reducing intra-abdominal pressure (IAP) [15 studies, 700 patients, standard mean difference (SMD) = −0.93, 95% credibility interval (CI): −1.35- -0.52], improving the APACHE II (five studies, 199 patients, SMD = −0.75, 95% CI: −1.30- -0.21), and shortening the length of hospitalization (LOH) (six studies, 214 patients, SMD = −1.21, 95% CI: −1.50- -0.91). The influence of mortality (six studies, 241 patients) was not significant [The pooled risk ratio (RR) was −0.07 (95% CI: −0.17- 0.03)].
Conclusions: TCMs seem to be effective for patients with IAH and ACS; however, most of the reviewed trials are of poor quality. Large-scale, high-quality clinical trials are warranted.

1. Introduction

Intra-abdominal hypertension (IAH), a sustained elevation of intra-abdominal pressure (IAP) above 12 mmHg in adults and above 10 mmHg in children, has emerged as a common serious complication in patients with critical illnesses [1]. When the IAP remains above 20 mmHg and is accompanied by new failure of at least one organ system, the patients will develop abdominal compartment syndrome (ACS), the mortality of which is up to 70% [2,3]. Given the high incidence and mortality, IAH and ACS still present particular challenges to clinicians in prevention from early stage and more effective treatment without abdominal decompression.

IAH induced intestinal ischemia and the subsequent increased intestinal permeability, bacterial translocation have been verified to be critical in leading to both enteric sepsis and ACS [4–8]. Recently, growing evidence has shown that traditional Chinese medicines (TCMs) are effective in controlling the elevation of IAP and inhibiting the development of ACS [9–11]. The mechanisms involved might be related to the protection of intestinal barriers [12–14]. However, without large-scale, high-quality clinical trials, drawing definite conclusions is difficult. Therefore, in order to provide more specific evidence, we performed a systematic review to evaluate the efficacy and safety of TCM for IAH and ACS.

2. Methods

2.1. Eligibility criteria

Randomized clinical trials that included adult patients (age ≥ 18 years) with IAH or ACS, irrespective of underlying causes, were included in the review. Trials were excluded when diagnostic criteria were not explicitly described in their methods section. Co-interventions with different types of TCM, Chinese medicine and acupuncture, Chinese medicine and massage were allowed. However, the trials compared the effects of Chinese medicine together with other non-traditional therapy (western medicine therapy) and the conventional therapies for IAH/ACS were excluded. There were no restrictions regarding the duration of treatment (days), route of drug administration (nasal feeding, oral, enema, external treatment, etc.), or outcome. No limitations were based on language or publication status. Observational studies and crossover studies were excluded.

* Corresponding authors.
E-mail addresses: Lengyuxin1980@126.com (Y. Leng), bngzhaoo@126.com (G. Yao).

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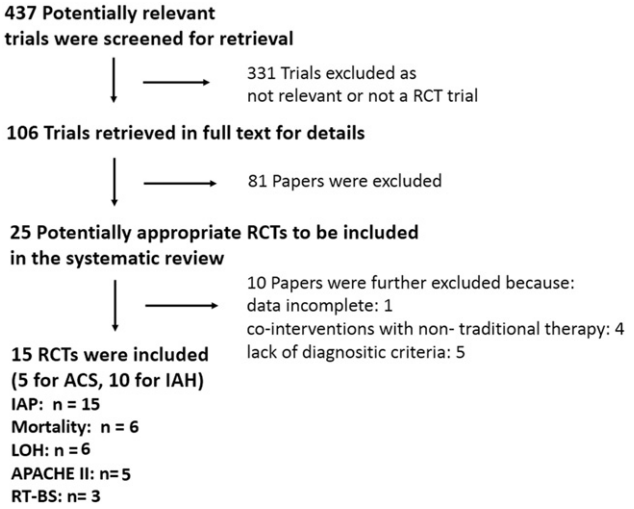

Fig. 1. Flow chart of reviewed studies. RCT: Randomized controlled trial; IAP: Intra-abdominal pressure; LOH: Length of hospitalization; APACHE II: Acute Physiology and Chronic Health Evaluation; RT-BS: Recovery time of bowel sound.

2.2. Search Strategy

We searched the following databases for randomized controlled trials (RCTs) (dated from 1st January 2006 to 20th August 2015): PubMed, Medline (Ovid SP), The Cochrane Library, China Biology Medicine Database, Wanfang Database, Chinese Periodical Database, Chinese Clinical Trial Registry, and China Knowledge Resource Integrated Database. At these databases, we used the following search terms: "traditional Chinese medicine," "traditional medicine," "herbal medicine," "tang" or "yin," and "intra-abdominal hypertension" or "abdominal compartment syndrome." All potentially relevant papers based on titles and abstracts were retrieved for full text screening. We also collected relevant articles by checking the references of the retrieved papers.

2.3. Study selection, data extraction, and quality assessment

By reviewing the identified titles and abstracts, two authors independently excluded obviously irrelevant reports and screened the remaining studies by full text (Leng YX, Li H). Disagreements were resolved through group discussion. A flow chart displaying the study selection process is shown in Fig. 1.

The data extraction process was independently performed by two authors (Leng YX, Ge QG). Unreported data were acquired by contacting the corresponding authors. We extracted the following parameters from each inclusive study: (1) first author and year of publication, (2) patients' characteristics and study design, and (3) clinical outcomes [ICU mortality, length of hospital stay (LOH), the level of IAP, APACHE II, and the recovery time of bowel sound (RT-BS)]. The quality of the included articles was assessed according to the Jadad scale (bad to good, 0–5) [15], which is based on randomization, double blinding, and flow of patients.

2.4. Statistical analysis

Review Manager 5.3 was used for statistical analyses. For dichotomous variables, we estimated the pooled risk ratios (RRs) and 95% confidence interval (CI). The numbers needed to treat (NNT) or numbers needed to harm with 95% (CI) based on a statistically significant RR were calculated. For continuous variables (LOH, the level of IAP, APACHE II, and the RT-BS), we calculated the estimation of standard mean difference (SMD) or mean difference (MD). Heterogeneity was explored by the I^2 test. If $I^2 < 50\%$, the fixed-effect model (Mantel Haenszel) was employed; otherwise, the random-effect model (DerSimonian and Laird) was used. The significance of pooled RR was determined by a Z test. $P < .05$ was considered statistically different. Funnel plots and Egger's test were applied to evaluate the potential publication bias if more than ten studies were included. We conducted the sensitivity analysis by taking each single study away from the total and reanalyzing the remainder.

3. Results

3.1. Study characteristics

After full text screening, 25 potentially relevant studies were identified. Among these studies, ten were excluded for the following reasons: lacking complete data (1 study), including co-interventions with non-traditional therapy (4 studies), and not describing the diagnostic criteria of IAH/ACS in detail (5 studies) (Fig. 1). Finally, 15 studies involving 735 participants were included [16–30]; of which five (191 participants) included patients with ACS [16–20]. Of the 15 included studies, three

Table 1
Quality and characteristics of all included studies

Ref.	Yr.	Sample size	Diagnosis, mmHg	Herbal	Route (NOE, EXT)	Frequency-duration	Outcomes	Report on adverse effect (Yes/No)	Jadad score
He JM [16]	2010	16	ACS-20	Gansui	NOE	*bid or tid- NA*	Mortality rate, LOH, RT-BS, IAP	No	2
Ou YT [17]	2012	24	ACS- 20	Gansui	NOE	bid or tid- 7d	Mortality, LOH, IAP, APACHE II	No	1
Zhang YH [18]	2007	45	ACS-25	Dachengqi decotion	NOE, Ext	*bid-3d*	Mortality, RT-BS, LOH, IAP	No	1
Yang HB [19]	2012	46	ACS-20	Mirabilite	Ext	*bid-2d*	IAP	No	1
Ba YZ [20]	2013	60	ACS-25	Chengqi decoction	NOE	*bid-NA*	Mortality, RT-BS, IAP, LOH	No	2
Pan L [21]	2014	42	IAH-7.37	Liqitongbian decotion	NOE	*once- 7d*	Mortality, IAP, APACHEII, LOH	Yes	3
Sun J [22]	2010	62	IAH-12	Liqitongbian decotion and mirabilite	NOE, Ext	*bid or tid- NA*	IAP, LOH	Yes	1
Wu GW [23]	2013	61	IAH-8.84	Chaishaochengqi decotion and mirabilite	NOE, Ext	*bid- 3d*	IAP, APACHE II	Yes	1
Wu QM [24]	2011	60	IAH-8.84	Dachengqi decotion and puncture	NOE	*once-NA*	IAP	No	2
Xu HQ [25]	2012	54	IAH-12	Dahuangfuzi decotion	NOE, Ext	*bid-7d*	IAP	No	1
Zou T [26]	2010	42	IAH-12	Evodia rutaecarpa	Ext	*bid-7d*	APACHE II, IAP	**No**	2
Zhou LX [27]	2011	52	IAH-10	Liqitongbian covariance	NOE, Ext	*bid or tid- 14d*	IAP	No	1
Guo LX [28]	2014	30	IAH-12	Hetaochengqi decotion	NOE	*tid-7d*	IAP, APACHEII	No	1
Xu XJ [29]	2012	100	IAH-7	Rhubarb,Dachengqi decotion and massage	NOE	*tid or bid-NA*	Mortality, IAP	No	1
Liang ZY [30]	2012	41	IAH-10	Rutaecarpa and rougui	Ext	*once (12 hours)- 4d*	IAP	No	3

NOE: nasal feeding, oral, or enema; external treatment; **EXT**: External use; **NA**: Not available0.