The effectiveness of traditional Chinese medicine treatment over postoperative flatulence patients: A meta-analysis of randomized controlled trials

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ABSTRACT

Modern Allopathic Medication (MAM) uses Neostigmine Intramuscular injection, gastrointestinal decompression, rectal discharge and other treatments, though effective, but patients could suffer. Evidence-based medicine is limited in its results of treatment. Several studies have suggested that traditional Chinese Medicine (TCM) provides an outstanding result in treatment, but most of the studies are of small sample sizes and as such, the results are not reliable. Also, there are few traditional TCM studies in evidence-based medicine and related reports, even the evaluation standard has not yet to be established. In this study, a comprehensive computer searching of Chinese and foreign databases was conducted. The Chinese databases include: China Biology Medicine database (CBM), Wanfang database, Chinese Journal Full text Database (CNKI) and VIP Journal Integration Platform (VJIP) database. Our foreign database includes: Pubmed, Web of science, Embase and Cochrane library. We also performed a manual search with articles quoted in the references. The result of (P < 0.00001), OR = 7.22, 95% CI [4.76, 10.95] obtained, showed that there was a significant difference between the TCM treatment group and other MAM treatment groups. Therefore, TCM treatment can improve the treatment of postoperative flatulence.

Key words: Traditional Chinese medicine, postoperative, flatulence, meta-analysis.

INTRODUCTION

Postoperative flatulence often occurs after surgery or after other abdominal surgeries over the spinal cord, causing lumbosacral (with anesthesia) and surgical injuries to the intestinal wall, thereby resulting in edema. Difficult (slow down) with bowel movements can prevent the passing out of intestinal gas, causing abdominal pain and lack of ability to pass gas or other clinical common symptoms. If the resulting physiological function of the organs is not coordinated, it will distort the body's internal/external balance of yin and yang, with Qi mechanism being disfigured. Also, it will inhibits qi dynamic, and chronic or severe stagnation of vital energy may lead to blood stasis, spleen and stomach injury (He, 2006). Thus if these are not been treated on time, the symptoms may delay wound healing, and even cause abdominal complications, postoperative ileus (POI) and other serious symptoms may develop. MAM uses Neostigmine Intramuscular injection, gastrointestinal decompression, rectal discharge and other treatments, though effective, but patients could suffer. Evidence-based medicine is limited in its results of treatment. Several studies have suggest that TCM provides an outstanding result in treatment, but most of the studies are of small sample sizes and as such, the results are not reliable. Also, there are few traditional TCM studies in evidence-based medicine and related reports, even the evaluation standard is yet to be established. In this study,
Meta-analysis is applied to provide more reliable evidence-based medicine for the treatment of Postoperative Flatulence. In this study, related literatures searches are retrieved and meta-analysis is applied to evaluate the efficacy of TCM in the treatment of postoperative flatulence.

MATERIALS AND METHODS

Literature searches

The database search was conducted among Chinese and foreign databases. The Chinese databases include: CBM, Wanfang database, CNKI and VJIP database. The foreign database include: Pubmed, Web of science, Embase and Cochrane library. We also performed a manual search with literatures quoted in the references. Key words for searching include: “Flatulence”, “Flatus”, “Postoperative Period”, “Period, Postoperative”, “Periods, Postoperative”, “Postoperative Periods”, “Randomized Controlled Trials”, “domized” and “placebo”. A total of 1259 patients were enrolled in the fifteen Chinese literature searches and Revmen5.3 software was used to conduct the meta-analysis.

Study selection and data extraction

Selection criterion: All patients included in the study were randomized; blinded, non-blinded researches are all included. The patients were grouped into two: the test group which was given TCM treatment, and the control group which was treated by MAM. Each group of samples comprised more than 20 cases. The treatment given to the test group included Traditional Chinese Medicine, Chinese patent medicine, Chinese Medicinal Decoction, Acupuncture, Acupuncture Point Injection, Acupoint Application, Massage and other methods. The control group applied all MAM therapies. Research outcome indicators in this study were classified by ordinal variables, and continuous interval variables. All research literatures were in full text. The languages of those literatures were either Chinese or English, with no limited publishing time.

Rejection of data: Any literature searches that could not meet the inclusion criteria, such as duplicated published literatures, data losses or having statistical errors, failure to use the standard efficacy evaluation criteria, non-randomized controlled trials, non-grouping of the test and control groups, were rejected.

Evaluation of effectiveness criteria

The evaluation criteria of TCM of postoperative flatulence were evaluated by standard evaluation criterion.

Literature screening

Two reviewers read the title and abstract of all selected literatures. After eliminating literature that clearly did not meet the inclusion criteria, all the searched literature that went through the initial screening of abstracts would be able to continue the full text, cross-check, and third-party audits. Any disagreement was resolved by the evaluators.

Quality assessment

The Jadad Quality Score was used to evaluate the quality of the literature included in the study.

Statistical processing

Meta-analysis was carried out using Revmen 5.3 software. The results of the enumeration data were expressed as the odds ratio (OR), and the 95% confidence interval (CI) was calculated to determine whether there was a statistical significance (when the difference was statistically significant P <0.05). When the meta-analysis results were heterogeneous (defined as heterogeneity test P <0.1), the random effect model was used to express the effect, and the use of the fixed effect model was described. There was a publication bias in the literature using a funnel chart.

RESULTS

Literature searches results

A total of 1449 literature searches were retrieved from the databases (time span from the inception of the databases to March, 2017). They include: 4 literature searches in databases of Pubmed, 54 in Web of science, 114 in Embase, 187 in Cochrane library, 565 in CBM, 35 in CNKI, 17 in VJIP, 469 in Wanfang, 4 as manual search. During data rejection, 256 literature searches of duplication were rejected, 11 literature searches of review were rejected, 2 animal literature searches were rejected, 1 non-Chinese medicine were rejected, 1146 of non-postoperative flatulence were rejected, 11 literature searches with evaluation results cannot be extracted were rejected, 1 literature search which contains randomized three studied groups was rejected, and 3 literature searches which contains TCM prevention were rejected. In the end, there were 15 literature searches of TCM treatment, all in Chinese, as shown in Figure 1.

Aggregate data synthesized from selected 18 literature searches.

The results of the basic characteristics and quality
evaluation of the included research are shown in Table1.

**Meta-analysis results**

**Clinical efficiency evaluation.** For the 15 TCM treatment studies, there were 638 case. 610 cases (95.61%) were effective with TCM treatment and 621 cases (75.68%) were effective with MAM in the control group ($I^2=20$, $P=0.23$). Therefore, the results of the meta-analysis showed that there was significant difference between the test group and the control group ($P < 0.00001$, OR = 7.22, 95% CI [4.76, 10.95]) (Figure 2). This indicates that the efficiency of TCM after treatment of flatulence and MAM contrast to each other. The difference was statistically significant, the effectiveness of TCM treatment efficiency is better than the MAM control group as shown in Figure 2.

**File drawer problem:** Here, we compare the efficacy and effectiveness of TCM treatment and MAM control group among all studies in those 15 literature searches with the effect of OR as the horizontal axis on the funnel map. The result in Figure 3 shows that the funnel map is biased on one side, indicating unjustifiably favorable result of the hypothesis.

**Heterogeneity test:** In heterogeneity test, $p=0.23$, $I^2=20$%, no significant heterogeneity was found in this study. We divided the TCM therapies into three groups: Decoction group, Neostigmine injection at Zusanli group, and other traditional Chinese medicine therapy group. All for further analysis.

As shown in Figure 4, the literatures which used TCM decoction method consisted of nine literatures (Du, 2012; Fu et al., 2013; Hong et al., 2012; Huan and Nong, 2011; Jiao, 2015; Li, 1999; Pang, 2015; Yang and Li, 2007; Yuan, 2009) and as compared with the control group of the MAM, the test group had 384 patients and the control group had 367 patients. No significant heterogeneity was found in the results (TCM decoction: $I^2=45$%, $P=0.07$), we then applied the fixed effect model for meta-analysis. The result showed that the effectiveness of TCM decoction group efficiency is better than that of the MAM control group (TCM decoction: $P < 0.00001$, OR = 8.65, 95% CI [5.08, 14.72]).
Table 1. The Characteristics of the included literatures.

<table>
<thead>
<tr>
<th>Study ID</th>
<th>Year</th>
<th>Date of Accrual</th>
<th>Study design</th>
<th>Testing scheme(T/C)</th>
<th>Patient characteristics mean age (years)</th>
<th>T/C</th>
<th>Intervention measures</th>
<th>Control group</th>
<th>Outcomes</th>
<th>Jadad scores</th>
<th>Operation type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xu (2)</td>
<td>2015</td>
<td>2011-2013</td>
<td>RCT</td>
<td>33/33</td>
<td>36.5±12.11</td>
<td></td>
<td>Neostigmine injection at Zusanli</td>
<td>Neostigmine injection</td>
<td>(1)(3)(5)</td>
<td>1</td>
<td>(9)(9)(10)</td>
</tr>
<tr>
<td>Jiao (3)</td>
<td>2015</td>
<td>N/A</td>
<td>RCT</td>
<td>43/43</td>
<td>(47.3±8.6)/(48.2±8.3)</td>
<td></td>
<td>Mu Xiang Shun Qi pill</td>
<td>Neostigmine Methylsulfate injection + Suppositories Glycerol</td>
<td>(1)(3)(5)</td>
<td>1</td>
<td>(1)</td>
</tr>
<tr>
<td>Fu et al.(4)</td>
<td>2013</td>
<td>2007.01-2011.12</td>
<td>RCT</td>
<td>50/50</td>
<td>67±2.5</td>
<td></td>
<td>Hou Po Pai Qi mixture</td>
<td>Did not use any drugs to promote peristalsis</td>
<td>(1)(3)</td>
<td>1</td>
<td>(6)</td>
</tr>
<tr>
<td>Hong and Nong (5)</td>
<td>2011</td>
<td>2007.05-2010.05</td>
<td>RCT</td>
<td>30/30</td>
<td>(46.9±11.9)/(43.6±15.6)</td>
<td></td>
<td>Mu Xiang Shun Qi pill</td>
<td>Citrate Mosapride + Vitamin B1</td>
<td>(1)(3)(4)(5)(6)</td>
<td>1</td>
<td>(1)</td>
</tr>
<tr>
<td>Zhang (6)</td>
<td>2009</td>
<td>2007.10-2008.08</td>
<td>RCT</td>
<td>26/26</td>
<td>N/A</td>
<td></td>
<td>Neostigmine injection at Zusanli</td>
<td>Neostigmine injection</td>
<td>(1)(3)</td>
<td>1</td>
<td>(4)</td>
</tr>
<tr>
<td>Li and Chen (7)</td>
<td>2011</td>
<td>N/A</td>
<td>RCT</td>
<td>60/60</td>
<td>16-72</td>
<td></td>
<td>Neostigmine injection at Zusanli</td>
<td>Neostigmine injection</td>
<td>(1)(3)(4)(5)(7)</td>
<td>1</td>
<td>(8)(9)(10)</td>
</tr>
<tr>
<td>Lin (8)</td>
<td>2012</td>
<td>2010.06-2012.02</td>
<td>RCT</td>
<td>33/33</td>
<td>37±1.2</td>
<td></td>
<td>Neostigmine injection at Zusanli</td>
<td>Neostigmine injection</td>
<td>(1)(2)(3)(4)(5)(6)</td>
<td>1</td>
<td>(4)</td>
</tr>
<tr>
<td>Pang (9)</td>
<td>2015</td>
<td>2011.03-2013.12</td>
<td>RCT</td>
<td>30/30</td>
<td>(31.5±2.5)/(29.5±2.5)</td>
<td></td>
<td>Tong Fu Xing Qi Tang + Convensional gastrointestinal decompression</td>
<td>Conventional decompression</td>
<td>(1)(2)</td>
<td>1</td>
<td>(3)(5)(6)</td>
</tr>
<tr>
<td>Yin (10)</td>
<td>2013</td>
<td>2010.02-2012.02</td>
<td>RCT</td>
<td>27/27</td>
<td>(38.09±12.14)/(39.26±13.05)</td>
<td></td>
<td>Moxibustion targeted nursing intervention</td>
<td>Routine nursing</td>
<td>(1)</td>
<td>1</td>
<td>(7)</td>
</tr>
<tr>
<td>Yuan (11)</td>
<td>2009</td>
<td>N/A</td>
<td>RCT</td>
<td>72/70</td>
<td>34/32</td>
<td></td>
<td>Pai Qi Tang + Chinese medicine deposited over navel</td>
<td>Suppositories Glycerol</td>
<td>(1)(3)(4)(5)(6)(7)</td>
<td>1</td>
<td>(4)</td>
</tr>
<tr>
<td>Yang and Li(13)</td>
<td>2007</td>
<td>N/A</td>
<td>RCT</td>
<td>35/20</td>
<td>43</td>
<td></td>
<td>Xing Qi Tong Fu Tang</td>
<td>Conventional decompression</td>
<td>(1)(2)</td>
<td>1</td>
<td>(2)(3)</td>
</tr>
<tr>
<td>Hong et al.(14)</td>
<td>2012</td>
<td>N/A</td>
<td>RCT</td>
<td>30/30</td>
<td>(39.0±12.2)/(40.0±12.6)</td>
<td></td>
<td>Zhi Po Tong Chang Tang</td>
<td>Suppositories Glycerol</td>
<td>(1)(3)(4)</td>
<td>1</td>
<td>(4)</td>
</tr>
</tbody>
</table>

Outcomes:
(1) Gas Passing time
(2) Recovery Time of Bowel Movement
(4) Abdominal Distension
(5) Abdominal Pain
(6) Defecation
(7) Normal Diet Recovery
(8) No Diarrhea

Operation Type:
(1) Primary Liver Cancer
(2) Biliary Tract Surgery
(3) Appendectomy Surgery
(4) Gynecologic Surgery
(5) Choledocholithotomy
(6) Cholecystectomy
(7) Mixed Hemorrhoid Surgery
(8) Stomach Surgery
(9) Pancreateicoduodenectomy
(10) Splenectomy
(11) Gastrointestinal Surgery
(12) Colorectal Cancer Radical Surgery

As shown in Figure 4, the literatures which used TCM Neostigmine injection for the Zusanli group consisted of four literatures (Li and Chen, 2011; Lin, 2012; Xu, 2015; Zhai and Ren, 2009) and as compared with the MAM control group, the test group had 152 patients and the control group had 152 patients. No significant heterogeneity was found in the results (Neostigmine injection at Zusanli: I²=0%, P=0.79), thus we then applied the fixed effect model for meta-analysis. The result showed that the effectiveness of Neostigmine injection of Zusanli group is better than the MAM control group [Neostigmine injection at Zusanli: P <0.001, OR = 4.56, 95% CI [1.83, 11.35]].

As shown in Figure 4, the literatures which used TCM for other TCM therapy group consisted of two literatures (He, 2006; Yin, 2013) and as compared with the MAM control group, the test group had 102 patients and the control group had 102 patients. No significant heterogeneity was observed in the results (Other TCM therapy: I²=31%, P=0.23), thus we then applied the fixed effect model for meta-analysis. The result showed that the effectiveness of Other TCM therapy efficiency is better than MAM control group {Other TCM therapy: P <0.0004, OR = 6.33, 95% CI [2.30, 17.46]}.

Sensitivity analysis.
Among literatures, there was no documented lost or withdrawal of cases; therefore, it can be concluded that nobody quit any of those treatments. But this conclusion could be neither scientific nor logical. Therefore, lost or withdrawal could not be analyzed as treatment failure. Based on the size of the sample...
In the provided literatures in a hierarchical meta-research findings. The research quality evaluation criterion requires the removal of some studies from the included literature to test its sensitiveness. After the data were removed from the sample test in response to the requirement of sensitivity analysis, we compared the recalculated results with data prior to the removal analysis. There was no significance change in OR values, indicating that the sensitivity was low and the results were relatively stable.

**DISCUSSION**

**Flatulence overview**

After abdominal surgery, the gastrointestinal function of...
every patient is disrupted to a certain extent. In general, small intestine recovers in 24 h after operation, the gastric motility recovers in 24-48 h, and the colon recovers in 48-72 h (Kehlet, 2000). Because the patient’s digestive path in the abdominal after the surgery could be altered, the alternation is amplified by the impact of anesthesia and surgical stresses, different surgical locations and different surgical methods lead to different severeness of gastrointestinal disorder (Teng and Li, 1997). Gastrointestinal activity after abdominal surgery will go through three stages: paralysis, irregular peristalsis and regular peristalsis (Huang and Guo, 2001). The first two stages of paralysis and irregular peristalsis are irregular and often occur 12 to 36 h after the surgery. Thus patients usually suffer from abdominal distension to abdominal pain, where the abdominal pain is not fixed in one specific location and is not rhythmic; the regular peristalsis usually occur 36 to 72 h after surgery, intestinal motility with gas passing out is a symptom (Zhao et al., 2011). The sooner we resolve post-operative gastrointestinal functions, the sooner we can effectively reduce postoperative complications. Flatulence is a common complication after abdominal surgery, and it has a direct impact on the surgery results (Fu et al., 2013). A rising probability of its occurrence is mainly contribution to laparoscopic surgery in the application of pneumoperitoneum. The surgical result of Postoperative Flatulence can still be classified as “abdominal distension” in TCM category. In TCM treatment, intestines related symptoms can be traced to the transmission of the zang-organs and fu-organs which inhibited qi dynamic running down and not increasing (Pang, 2015). The meta-analysis of the existing literatures show that the treatment of postoperative flatulence has certain effects. In terms of efficiency, TCM is better than the MAM control group.

The drawbacks on some of the literatures were that some of the literatures had low quality evaluation and no blindness data study. Furthermore, most of the literatures provided too little information to describe how to randomize the selection of samples. It resulted in doubt of accuracy in the conclusion to determine the quality of the random method used. The objective of the meta-analysis was based on a high-quality randomized controlled trial, and the efficiency of the treatment of postoperative flatulence still need to be further supported by a larger, high-quality, multi-centered, randomized controlled trial.
Side effects of TCM treatment

Side effects were only mentioned in three literatures, but were not observed in the test group and the control group. The rest of the literatures did not describe side effects at all. It generated doubts on the accuracy of their conclusions. Further analysis on side effects should be conducted.

File drawer problem over selected literatures

Evidence-based medical research requires a comprehensive collection of published and unpublished studies, which in this case are impossible for us to collect unpublished literatures. Furthermore, for the selected literatures in the funnel view, asymmetry in the diagram was identified. This indicates that the study was in favor of some results. To increase the credibility of the literature research, there is a need to collect unpublished results that are in contrary to the current results of this study.

Meanwhile, the research on this subject lacks a specific product or treatment approach. This can attributed to limited coverage of research literatures over the result of a single TCM treatment on different subjects and topics. Hence, this manuscript includes all TCM treatments in the study. This reduces the accuracy of the study. Therefore, further study on single TCM treatment is still required for further meta analysis.

Conclusion

TCM treatment can improve the treatment of postoperative flatulence.

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