Efficacy and safety of acupuncture in treating acute low back pain: a systematic review and bayesian network meta-analysis

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Background: Acute low back pain (ALBP) is common and acupuncture therapy is a treatment option. The comparative efficacy and safety of different acupuncture therapies are still unclear. The aim of this network meta-analysis (NMA) was to evaluate and compare the efficacy and safety of different acupuncture therapies for ALBP.

Methods: We performed a systematic search in PubMed, Cochrane Library, Embase, Web of Science, China National Knowledge Infrastructure (CNKI), VIP Database, Wanfang Database, and Chinese Biomedical Database (CBM). The outcome indicators measured were visual analog scale (VAS) score, lumbar range of motion (ROM) score, and adverse events. The risk of bias among included studies was assessed with the Cochrane risk-of-bias tool. WinBUGS 1.4 was used for the NMA.

Results: In total, nineteen randomized controlled trials (RCTs) comprising 1427 participants were included. Results of NMA showed the following: (I) compared with placebo, motion style acupuncture (MSA) (SMD: −2.21; 95% CI, −3.33 to −1.08), manual acupuncture (MA) (SMD: −1.14; 95% CI, −2.01 to −0.27), and electroacupuncture (EA) (SMD: −1.57; 95% CI, −2.98 to −0.15) were found to be more effective for decreasing VAS score; (II) compared with pharmacotherapy, MSA (SMD: −1.00; 95% CI, −1.47 to −0.54) and MA (SMD: −0.60; 95% CI, −1.15 to −0.05) were found to be more effective in reducing ROM score. Results of the surface under the cumulative ranking curve indicated that all acupuncture types were superior to placebo or pharmacotherapy in lowering VAS and ROM score. It was noted that MSA was the most effective treatment.

Conclusions: This study indicated that acupuncture therapy achieved good therapeutic effects in the treatment of ALBP, especially MSA therapy. Nevertheless, due to the low quality of the included trials, the credibility of our conclusions is low. Further well-designed RCTs with high quality and large samples are still needed to evaluate the efficacy and safety of acupuncture therapy for ALBP.

Keywords: Acupuncture; acute low back pain (ALBP); systematic review; network meta-analysis (NMA)
Introduction

Low back pain is now recognized as a major public health problem worldwide, with nearly 80% of the population experiencing low back pain in their lifetime (1). Evidence suggests that low back pain has a mean point prevalence of 20%, and a lifetime prevalence of 40% (2). Acute low back pain (ALBP) refers to pain that lasts between 24 hours and 12 weeks (3). ALBP is often nonspecific, hence it cannot be attributed to a specific cause (4). Nevertheless, the possible causes of ALBP include tumor, infection, trauma, osteoporosis, and inflammatory arthritis (5-7). While intense pain and physical disability resulting from ALBP have seriously affected the life quality of patients and posed a significant economic burden, there is a need to figure out the efficacy of interventions in treating ALBP (6-8).

Many pharmacologic and non-pharmacologic treatments are available for ALBP, but the jury is still out on the comparative efficacy among them. Treatments include nonsteroidal anti-inflammatory drugs (NSAIDs), muscle relaxants, physical therapy modalities, superficial heat, spinal manipulative therapy, acupuncture, exercise therapy, and others (4-7,9,10).

Acupuncture, an important component of Traditional Chinese Medicine (TCM), has shown its striking utility of pain alleviation in clinical practice and experimental evidence (11,12). Several systematic reviews have also confirmed the effectiveness of acupuncture therapies in treating ALBP (13-15). With regards to various types of acupuncture therapies for managing ALBP, researchers have expressed their attentions on manual acupuncture (MA), electroacupuncture (EA), motion style acupuncture (MSA), and so on. However, previous systematic reviews usually considered all the acupuncture therapies as a whole to evaluate its effectiveness. Thus, it remains unclear which acupuncture therapies are the most effective for ALBP.

Network meta-analysis (NMA) has been increasingly prevalent in medical research (16). Through a combination of direct and indirect comparisons, NMA allows the comparison of multiple interventions and ranking of different interventions (17). In this study, we conducted a Bayesian NMA to compare the efficacy and safety of different acupuncture therapies adopted in ALBP treatment. It is hoped that this work will serve as an acupuncture treatment selection guideline for ALBP. We present the following article in accordance with the PRISMA reporting checklist (available at http://dx.doi.org/10.21037/apm-21-551).

Methods

The study was registered at INPLASY under the code INPLASY2020120025, available at: https://inplasy.com/inplasy-2020-12-0025/.

Data sources and searches

We systematically searched PubMed, Cochrane Library, Embase, Web of Science, China National Knowledge Infrastructure (CNKI), VIP Database, Wanfang Database, and Chinese Biomedical Database (CBM) for randomized controlled trials (RCTs) from the date of their inception to 17 December 2020. The search was limited to studies published in English and Chinese. Full search details are shown in Appendix 1.

Study selection

Titles, abstracts, and full texts were screened independently by two reviewers (B Wu, L Yang). Disagreements were resolved through discussion with the third reviewer (C Fu). Studies were included if met the following criteria: (I) types of Studies: RCTs testing acupuncture for ALBP; (II) types of Participants: patients were diagnosed with ALBP (<12 weeks); (III) types of interventions: comparative interventions included acupuncture therapies (including MA, EA, and MSA. Table 1), pharmacotherapy (western medicine) and placebo; (IV) types of outcomes: the studies must include at least one of the following outcomes: visual analog scale (VAS) score, lumbar range of motion (ROM) score, and adverse events. The following were excluded: (I) duplicated literature; (II) protocol, case report, reviews, meta-analyses, conference abstracts, and animal experiments; (III) studies without sufficient data; (IV) combined interventions consisting of two or more acupuncture therapies; (V) studies that evaluated the combined effect of acupuncture and other related therapies; (VI) single acupuncture technique with different acupoints.

Data extraction and quality assessment

Two reviewers (B Wu, L Yang) screened all the studies for inclusion and performed the data extraction. All the discrepancies were reconciled by discussion with a third reviewer (C Fu). For each of the selected studies, the following information was extracted: author, publication
Table 1 Definitions of different acupuncture therapies

<table>
<thead>
<tr>
<th>Type of acupuncture</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual acupuncture</td>
<td>A traditional acupuncture technique that stimulates acupuncture points using thin, solid needles with some kind of manual manipulation (e.g., lifting and thrusting, twirling and rotating, or a combination of the two)</td>
</tr>
<tr>
<td>Electroacupuncture</td>
<td>A modified form of acupuncture technique that combines traditional manual acupuncture with modern electrotherapy. The principle of electroacupuncture is that a small electric current is passed between pairs of needles</td>
</tr>
<tr>
<td>Motion style acupuncture</td>
<td>A modified form of acupuncture technique that combines traditional manual acupuncture with exercise therapy. Motion style acupuncture technique requires active or passive movement of patients' body in company with needling, which can maximize the synergistic therapeutic efficacy of acupuncture and exercise therapy</td>
</tr>
</tbody>
</table>

Results

Study selection

Based on the search strategy, a total of 1883 studies were identified from these databases. After eliminating duplicates, the titles and abstracts of 996 articles were screened. In the end, 95 articles were selected for full-text screening, and 19 studies (22-40) were included in the data synthesis. Full details of the selection process are shown in Figure 1.

Study characteristics

A total of 19 studies were used for the final Bayesian NMA. All eligible studies were published between 2008 and 2020. Four of these studies were written in English, while fifteen studies were in Chinese. The participant sample size ranged from 13 to 113, and 779 (54.59%) of the 1,427 total participants were males. Participants' mean ages ranged from 25.30 to 47.00 years. Interventions of 19 RCTs included MSA, EA, MA, pharmacotherapy, and placebo. Besides, all 19 studies reported the VAS score, and 8 of 19 studies reported the ROM score and adverse events. The characteristics of the included studies are shown in Table 2. Furthermore, the network plot of comparisons are shown in Figure 2.

Methodological quality assessment

The risk of bias assessment of the 19 RCTs is presented in Figures 3 and 4. Fifteen studies were judged as low risk for random sequence generation, and one was judged as high risk because it was allocated in numerical order. Seven studies described the method of allocation concealment, which were judged as low risk. Four studies described double or single blinding, and these studies had low risk. All studies had a low risk of bias for incomplete outcome data.
for the missing data was few. Selective outcome reporting was unclear in all included studies, except for one study, which provided published protocols. Additionally, for the judgment of other risks, there was insufficient information to make correct assessments.

**Pairwise meta-analyses**

The results of pairwise meta-analyses are presented in Table 3. We generated 6 pairwise meta-analyses to compare the VAS score of different interventions. The VAS score of MA was significantly lower than that of placebo (SMD: −1.10; 95% CI, −1.59 to −0.61). VAS scores were significantly lower in MSA (MD: −1.21; 95% CI, −2.31 to −0.11) and MA (MD: −2.89; 95% CI, −3.35 to −2.43) than those in pharmacotherapy. Moreover, the VAS score of MSA was significantly lower than those of MA (SMD: −1.34; 95% CI, −2.11 to −0.56) and EA (MD: −1.07; 95% CI, −1.51 to −0.63). No significant difference between EA and pharmacotherapy were noted. In terms of ROM score, we performed 4 pairwise meta-analyses to compare different interventions. The ROM score of MSA was significantly lower than those of pharmacotherapy (SMD: −0.81; 95% CI, −1.12 to −0.50) and MA (MD: −0.58; 95% CI, −0.84 to −0.32). Furthermore, the ROM score of MA was significantly lower than that of pharmacotherapy (MD: −0.94; 95% CI, −1.20 to −0.68).

**NMA**

The results of NMA are presented in Figure 5. Data on VAS score were available from 19 RCTs, and the five reported arms were (I) MSA, (II) MA, (III) EA, (IV) pharmacotherapy, and (V) placebo. The MSA (SMD: −2.21; 95% CI, −3.33 to −1.08), MA (SMD: −1.4; 95% CI, −2.01 to −0.27) and EA (SMD: −1.57; 95% CI, −2.98 to −0.15) showed significantly better effects in reducing VAS score compared to placebo. Furthermore, the MSA was significantly more effective than MA (SMD: −1.06; 95% CI, −1.78 to −0.35) and pharmacotherapy (SMD: −1.17;
Table 2 Characteristics of the included studies

<table>
<thead>
<tr>
<th>Author, year</th>
<th>Country</th>
<th>Sample size</th>
<th>Sex</th>
<th>Age: mean (SD) or range</th>
<th>Interventions</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>C</td>
<td>T(M/F)</td>
<td>C(M/F)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kennedy, 2008; (22)</td>
<td>UK</td>
<td>24</td>
<td>24</td>
<td>13/11</td>
<td>MA, Placebo</td>
<td>(I)</td>
</tr>
<tr>
<td>Su, 2010; (23)</td>
<td>China</td>
<td>30</td>
<td>30</td>
<td>19/11</td>
<td>MA, Placebo</td>
<td>(I), (III)</td>
</tr>
<tr>
<td>Huang, 2012; (24)</td>
<td>China</td>
<td>30</td>
<td>30</td>
<td>17/13</td>
<td>MSA, Pharmacotherapy</td>
<td>(I), (II), (III)</td>
</tr>
<tr>
<td>Li, 2012; (25)</td>
<td>China</td>
<td>30</td>
<td>30</td>
<td>18/12</td>
<td>MSA, MA</td>
<td>(I), (III)</td>
</tr>
<tr>
<td>Shin, 2013; (26)</td>
<td>Korea</td>
<td>29</td>
<td>29</td>
<td>19/10</td>
<td>MSA, EA</td>
<td>(I), (III)</td>
</tr>
<tr>
<td>Hasegawa, 2014; (27)</td>
<td>Brazil</td>
<td>40</td>
<td>40</td>
<td>15/25</td>
<td>MA, Placebo</td>
<td>(I), (III)</td>
</tr>
<tr>
<td>Lin, 2016; (28)</td>
<td>China</td>
<td>14</td>
<td>13</td>
<td>9/5</td>
<td>MA, MA</td>
<td>(I), (III)</td>
</tr>
<tr>
<td>Liu, 2017; (29)</td>
<td>China</td>
<td>45</td>
<td>45</td>
<td>20/25</td>
<td>MSA, EA</td>
<td>(I), (II)</td>
</tr>
<tr>
<td>Qu, 2017; (30)</td>
<td>China</td>
<td>20</td>
<td>20</td>
<td>8/12</td>
<td>EA, Pharmacotherapy</td>
<td>(I)</td>
</tr>
<tr>
<td>Shang, 2017; (31)</td>
<td>China</td>
<td>60</td>
<td>30</td>
<td>33/27</td>
<td>MSA, Pharmacotherapy</td>
<td>(I)</td>
</tr>
<tr>
<td>Wang, 2017; (32)</td>
<td>China</td>
<td>53</td>
<td>54</td>
<td>31/22</td>
<td>MSA, MA</td>
<td>(I), (II)</td>
</tr>
<tr>
<td>Du, 2018; (33)</td>
<td>China</td>
<td>29</td>
<td>28</td>
<td>18/11</td>
<td>MSA, Pharmacotherapy</td>
<td>(I), (II)</td>
</tr>
<tr>
<td>Jiang, 2018; (34)</td>
<td>China</td>
<td>32</td>
<td>31</td>
<td>16/16</td>
<td>MSA, MA</td>
<td>(I), (II), (III)</td>
</tr>
<tr>
<td>Wen, 2018; (35)</td>
<td>China</td>
<td>50</td>
<td>50</td>
<td>26/24</td>
<td>MA, Placebo</td>
<td>(I)</td>
</tr>
<tr>
<td>Li, 2019; (36)</td>
<td>China</td>
<td>30</td>
<td>30</td>
<td>15/15</td>
<td>MSA, EA</td>
<td>(I), (II)</td>
</tr>
<tr>
<td>Song, 2019; (37)</td>
<td>China</td>
<td>37</td>
<td>37</td>
<td>20/17</td>
<td>MSA, MA</td>
<td>(I)</td>
</tr>
<tr>
<td>Yuan, 2019; (38)</td>
<td>China</td>
<td>34</td>
<td>34</td>
<td>20/14</td>
<td>MSA, EA</td>
<td>(I)</td>
</tr>
<tr>
<td>Hu, 2020; (39)</td>
<td>China</td>
<td>113</td>
<td>112</td>
<td>68/45</td>
<td>MA, Pharmacotherapy</td>
<td>(I), (II), (III)</td>
</tr>
<tr>
<td>Liang, 2020; (40)</td>
<td>China</td>
<td>30</td>
<td>30</td>
<td>18/12</td>
<td>MSA, Pharmacotherapy</td>
<td>(I), (II), (III)</td>
</tr>
</tbody>
</table>

Outcome: (I), visual analog scale score; (II), range of motion; (III), adverse events. M, male; F, female; T, treatment group; C, control group; MSA, motion style acupuncture; MA, manual acupuncture; EA, electroacupuncture.

Figure 2 Network plots of interventions (A for VAS score, B for ROM score). VAS, visual analog scale; ROM, range of motion; MSA, motion style acupuncture; MA, manual acupuncture; EA, electroacupuncture.
95% CI, −1.85 to −0.49) in reducing VAS score. Data on ROM score were available from 8 RCTs, and the four reported arms were (I) MSA, (II) MA, (III) EA, and (IV) pharmacotherapy. The MSA (SMD: −1.00; 95% CI, −1.47 to −0.54) and MA (SMD: −0.60; 95% CI, −1.15 to −0.05) showed significantly better effects in reducing ROM score compared to pharmacotherapy.

**Ranking probability**

The SUCRA-based rankings of all interventions are displayed in Figure 6. For the VAS score, MSA (98.0%) was the optimal intervention method, followed by EA (67.2%), MA (45.4%), pharmacotherapy (37.5%), and placebo (1.8%) which was ranked as the worst. For the ROM score, MSA (92.2%) was the best intervention, followed by EA (55.9%), MA (48.3%), and pharmacotherapy (3.6%) which was ranked as the worst. Based on the SUCRA values of intervention methods for VAS and ROM score, MSA appeared to be the best intervention method.

**Safety**

Eight studies reported adverse events, while no serious complications were observed in all included studies. Generally speaking, the major adverse effects of acupuncture therapy include fainting and haematoma formation. As most studies did not report the adverse events in a standard way, it was difficult to perform a quantitative analysis of adverse events in this review.

**Inconsistency analyse**

For the inconsistency test outcome of VAS score, it showed inconsistency between MSA and MA (P=0.02), and MA and pharmacotherapy (P=0.02). For the inconsistency test outcome of ROM score, it showed inconsistency between MSA and MA (P=0.006), MSA and pharmacotherapy (P=0.006), and MA and pharmacotherapy (P=0.006).

**Publication bias and sensitivity analysis**

Funnel plots revealed no evidence of publication bias (Appendix 2). Sensitivity analysis showed the result was robust (Appendix 3).

**Discussion**

ALBP is a common musculoskeletal disorder that seriously affects patients’ quality of life and imposes a substantial social and economic burden (6-8). Acupuncture is a widely used non-pharmacological therapy in China because of
its advantages of easy operation, safety, and reliability, etc. (13-15). Many studies have proved the effectiveness and safety of Acupuncture in treating ALBP (13). However, no previous studies have clarified which type of acupuncture technique shows the most efficacy in ALBP treatment. Thus, this study systematically analyzed the results of previous studies with Bayesian NMA to compare the efficacy and safety of different acupuncture techniques in the treatment of ALBP.

In this study, 19 RCTs recruiting 1,427 participants were included in the analysis. The SUCRA-based rankings of the primary outcome shown that the MSA was the most effective in reducing VAS and ROM score. EA was better than MA in reducing VAS scores, but both acupuncture techniques showed comparable efficacy in reducing ROM score. Overall, we found that all acupuncture treatments (MSA, MA, and EA) are more effective in both alleviating pain and improving lumbar activity of ALBP patients compared with pharmacotherapy or placebo. This was consistent with the results of the previous systematic review.

Figure 4 Reviewers’ judgements about each risk-of-bias item presented as percentages across all eligible studies.

Table 3 Pairwise meta-analyses

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Number of studies</th>
<th>MD/SMD (95% CI)</th>
<th>$I^2$ (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MA vs. placebo</td>
<td>4</td>
<td>$-1.10$ (-1.59, -0.61)</td>
<td>72</td>
<td>0.01</td>
</tr>
<tr>
<td>MSA vs. pharmacotherapy</td>
<td>5</td>
<td>$-1.21$ (-2.31, -0.11)</td>
<td>90</td>
<td>&lt;0.00001</td>
</tr>
<tr>
<td>MA vs. pharmacotherapy</td>
<td>1</td>
<td>$-2.89$ (-3.35, -2.43)</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>EA vs. pharmacotherapy</td>
<td>1</td>
<td>$-0.77$ (-1.57,0.03)</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>MSA vs. MA</td>
<td>5</td>
<td>$-1.34$ (-2.11, -0.56)</td>
<td>91</td>
<td>&lt;0.00001</td>
</tr>
<tr>
<td>MSA vs. EA</td>
<td>3</td>
<td>$-1.07$ (-1.51, -0.63)</td>
<td>0</td>
<td>0.84</td>
</tr>
<tr>
<td>ROM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSA vs. pharmacotherapy</td>
<td>3</td>
<td>$-0.81$ (-1.12, -0.50)</td>
<td>32</td>
<td>0.23</td>
</tr>
<tr>
<td>MSA vs. MA</td>
<td>3</td>
<td>$-0.58$ (-0.84, -0.32)</td>
<td>0</td>
<td>0.49</td>
</tr>
<tr>
<td>MA vs. pharmacotherapy</td>
<td>1</td>
<td>$-0.94$ (-1.20, -0.68)</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>MSA vs. EA</td>
<td>1</td>
<td>$-0.57$ (-1.40, 0.26)</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Italic values indicate a statistically significant result. MSA, motion style acupuncture; MA, manual acupuncture; EA, electroacupuncture.
Concurring with previous systematic reviews on acupuncture safety (13-15,41), no severe adverse events associated with acupuncture therapy were reported among the included studies. Moreover, the inconsistency was assessed by the node-splitting method, which showed inconsistency between the direct and the indirect comparisons. The possible causes of the variation were as follows: Firstly, only one or two RCTs comparing the related interventions, small effect size of the trials, and the results of indirect comparison are stronger. Secondly, it is difficult to rule out heterogeneity among studies due to the differences in acupoints, clinicians’ experience, treatment frequency, and follow-up time used across studies. We speculate that the inconsistency might be attributed to heterogeneity among studies. In general, patients who did not respond well to conventional pharmacotherapy may consider acupuncture as an alternative. Nevertheless, it is difficult to determine which acupuncture therapy is the best considering the low quality of the original study. As a result, clinicians must consider the clinical conditions and patient’s willingness when they make treatment decisions.

This study identified that MSA is the most effective treatment for ALBP, although its safety remained unclear. The MSA is a traditional acupuncture technique that has been recorded as a therapeutic modality for soft tissue injuries and musculoskeletal disorders in several ancient traditional Chinese medicine classics (26,28). MSA therapy requires active or passive movement of patients’ body in company with needling (26,28,42). It can maximize the synergistic therapeutic efficacy of acupuncture and exercise therapy. The mechanisms underlying the effects in pain relief and recovery of lumbar mobility in MSA therapy are not yet clear. However, according to previous studies, it may be related to acupuncture analgesia and cognitive shifts in pain perception. The mechanisms that MSA therapy enhances the effects of pain relief may be as follows. Firstly, acupuncture can increase the secretion of β-endorphin by stimulating the internal activity of the central nervous system (43,44). The increase in β-endorphin levels correlated with an increase in the pain threshold (44). Secondly, another possible mechanism is that acupuncture activates the diffuse noxious inhibitory control (DNIC), a descending system that modulates nociceptive neurons at the spinal cord level from top to bottom, resulting in pain alleviation (45,46). After acupuncture treatment, if patients feel less pain, then more mobility can be obtained. In the meantime, there is evidence that exercise therapy should be prescribed for the treatment of adults with ALBP to expedite recovery (47). Thus, MSA therapy could form a positive cycle leading to enhanced therapeutic efficacy.

However, this study has several limitations. First, due to poor reporting, most of the included RCTs were judged as having an unclear risk of bias in terms of allocation concealment, blinding, and selective outcome reporting. Methodologic limitations of the included RCTs may reduce the credibility of our conclusions to some extent. To improve the quality of evidence, future trials should follow the Consolidated Standards of Reporting Trials (CONSORT) guidelines (48) and Standards for Reporting Interventions in Controlled Trials of Acupuncture.
Figure 6 Surface under the cumulative ranking curves (A for VAS score, B for ROM score). VAS, visual analog scale; ROM, range of motion; MSA, motion style acupuncture; MA, manual acupuncture; EA, electroacupuncture.
Second, heterogeneity was difficult to rule out because of the differences in acupoints, clinicians’ experience, treatment frequency, and follow-up time used across studies. Third, Most of the included RCTs were implemented in China among Chinese populations, which may limit the generalization of our conclusions. Fourth, we failed to assess the safety of each acupuncture therapy due to a lack of standardization in the reporting of adverse events. Close monitoring and adequate reporting of adverse events need to be considered by future researchers in this field. The limitations above notwithstanding, this study comprehensively analyzed the efficacy of each acupuncture therapy for treating ALBP, which was quite fresh in a related study. To date, no studies have evaluated the efficacy of acupuncture therapy on ALBP based on NMA. The results of this study may provide a reference for the treatment of ALBP.

Conclusions

The findings of this comprehensive review indicate that acupuncture therapy achieved good therapeutic effects in the treatment of ALBP. Furthermore, MSA may be considered as an optimal treatment for ALBP. However, the low quality of the included studies limited the trustworthiness of the conclusion. Therefore, well-designed RCTs with high quality and large samples are still required to evaluate the efficacy and safety of acupuncture therapy for ALBP.

Acknowledgments

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Footnote

Reporting Checklist: The authors have completed the PRISMA reporting checklist. Available at http://dx.doi.org/10.21037/apm-21-551

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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References

33. Du L. Analgesiatiem-effects study of acupuncture at YaoTong Point combined with exercise therapy for acute lumbar sprain. Guangzhou University of Chinese Medicine 2018. Available online: https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CMFD&dbname=CMFD2001&filename=1019097231.nh&v=PcxD3ISX6aUTS01MvD2DxyZ0aFl8LiVdsmguySwBXMGQyHVxXmt9zDym9sAil
Appendix 1

Search strategy for Eight electronic databases

Search language=Auto
Databases= WOS, BCI, BIOSIS, CCC, DRCI, DIIDW, KJD, MEDLINE, RSCI, SCIELO, ZOOREC

Selection criteria:

1. Title or keyword:
   - "low back pain"
   - "back pain"
   - "sprains"
   - "strains"
   - "soft tissue injuries"
   - "musculoskeletal diseases"
   - "backache"
   - "lumbar sprain"
   - "lumbago"
   - "dorsalgia"
   - "lumbar pain"

2. Exact Match:
   - "acute" OR "chronic"

3. In the title or abstract:
   - "acute" OR "chronic"

4. Exact Match:
   - "RCT"

5. "Acupuncture"
   - "acupuncture"
   - "electroacupuncture"
   - "acupuncture, ear"
   - "acupuncture, points"
   - "acupuncture analgesia"
   - "Acupuncture Therapy"
   - "Acupuncture Points"
   - "Musculoskeletal Diseases"

6. "Sprains and Strains"
   - "Sprains and Strains"

7. "Back Pain"
   - "Back Pain"

8. "Acupuncture" (Title/Abstract)
   - "Acupuncture" (Title/Abstract)

9. "Electroacupuncture" (Title/Abstract)
   - "Electroacupuncture" (Title/Abstract)

10. "Acupuncture therapy" (Title/Abstract)
   - "Acupuncture therapy" (Title/Abstract)

11. "Acupuncture, ear" (Title/Abstract)
   - "Acupuncture, ear" (Title/Abstract)

12. "Acupuncture, points" (Title/Abstract)
   - "Acupuncture, points" (Title/Abstract)

13. "Acupuncture analgesia" (Title/Abstract)
   - "Acupuncture analgesia" (Title/Abstract)

14. "Backache"
   - "Backache"

15. "Sprains"
   - "Sprains"

16. "Strains"
   - "Strains"

17. "Soft tissue injuries"
   - "Soft tissue injuries"

18. "Musculoskeletal diseases"
   - "Musculoskeletal diseases"

19. "Back pain"
   - "Back pain"

20. "Sprains"
   - "Sprains"

21. "Strains"
   - "Strains"

22. "Soft tissue injuries"
   - "Soft tissue injuries"

23. "Musculoskeletal diseases"
   - "Musculoskeletal diseases"

24. "Acupuncture"
   - "Acupuncture"

25. "Electroacupuncture"
   - "Electroacupuncture"

26. "Acupuncture, ear"
   - "Acupuncture, ear"

27. "Acupuncture, points"
   - "Acupuncture, points"

28. "Acupuncture analgesia"
   - "Acupuncture analgesia"

29. "Backache"
   - "Backache"

30. "Sprains"
   - "Sprains"

31. "Strains"
   - "Strains"

32. "Soft tissue injuries"
   - "Soft tissue injuries"

33. "Musculoskeletal diseases"
   - "Musculoskeletal diseases"

34. "Acupuncture"
   - "Acupuncture"

35. "Electroacupuncture"
   - "Electroacupuncture"

36. "Acupuncture, ear"
   - "Acupuncture, ear"

37. "Acupuncture, points"
   - "Acupuncture, points"

38. "Acupuncture analgesia"
   - "Acupuncture analgesia"

39. "Backache"
   - "Backache"

40. "Sprains"
   - "Sprains"

41. "Strains"
   - "Strains"

42. "Soft tissue injuries"
   - "Soft tissue injuries"

43. "Musculoskeletal diseases"
   - "Musculoskeletal diseases"

44. "Acupuncture"
   - "Acupuncture"

45. "Electroacupuncture"
   - "Electroacupuncture"

46. "Acupuncture, ear"
   - "Acupuncture, ear"

47. "Acupuncture, points"
   - "Acupuncture, points"

48. "Acupuncture analgesia"
   - "Acupuncture analgesia"

49. "Backache"
   - "Backache"

50. "Sprains"
   - "Sprains"

51. "Strains"
   - "Strains"

52. "Soft tissue injuries"
   - "Soft tissue injuries"

53. "Musculoskeletal diseases"
   - "Musculoskeletal diseases"

54. "Acupuncture"
   - "Acupuncture"

55. "Electroacupuncture"
   - "Electroacupuncture"

56. "Acupuncture, ear"
   - "Acupuncture, ear"

57. "Acupuncture, points"
   - "Acupuncture, points"

58. "Acupuncture analgesia"
   - "Acupuncture analgesia"

59. "Backache"
   - "Backache"

60. "Sprains"
   - "Sprains"

61. "Strains"
   - "Strains"

62. "Soft tissue injuries"
   - "Soft tissue injuries"

63. "Musculoskeletal diseases"
   - "Musculoskeletal diseases"

64. "Acupuncture"
   - "Acupuncture"

65. "Electroacupuncture"
   - "Electroacupuncture"

66. "Acupuncture, ear"
   - "Acupuncture, ear"

67. "Acupuncture, points"
   - "Acupuncture, points"

68. "Acupuncture analgesia"
   - "Acupuncture analgesia"

69. "Backache"
   - "Backache"

70. "Sprains"
   - "Sprains"

71. "Strains"
   - "Strains"

72. "Soft tissue injuries"
   - "Soft tissue injuries"

73. "Musculoskeletal diseases"
   - "Musculoskeletal diseases"

74. "Acupuncture"
   - "Acupuncture"

75. "Electroacupuncture"
   - "Electroacupuncture"

76. "Acupuncture, ear"
   - "Acupuncture, ear"

77. "Acupuncture, points"
   - "Acupuncture, points"

78. "Acupuncture analgesia"
   - "Acupuncture analgesia"

79. "Backache"
   - "Backache"

80. "Sprains"
   - "Sprains"

81. "Strains"
   - "Strains"

82. "Soft tissue injuries"
   - "Soft tissue injuries"

83. "Musculoskeletal diseases"
   - "Musculoskeletal diseases"
Appendix 2.1 Funnel plot for the network meta-analysis of visual analog scale. A, motion style acupuncture; B, manual acupuncture; C, electroacupuncture; D, pharmacotherapy; E, Placebo.

Appendix 2.2 Funnel plot for the network meta-analysis of range of motion. A, motion style acupuncture; B, manual acupuncture; C, electroacupuncture; D, pharmacotherapy.
Appendix 3.1 Sensitivity analysis of visual analog scale score (manual acupuncture VS placebo)

Appendix 3.2 Sensitivity analysis of visual analog scale score (motion style acupuncture VS pharmacotherapy)

Appendix 3.3 Sensitivity analysis of visual analog scale score (motion style acupuncture VS manual acupuncture)

Appendix 3.4 Sensitivity analysis of visual analog scale score (motion style acupuncture VS electroacupuncture)

Appendix 3.5 Sensitivity analysis of range of motion score (motion style acupuncture VS pharmacotherapy)

Appendix 3.6 Sensitivity analysis of range of motion score (motion style acupuncture VS manual acupuncture)