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Research Article

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Acupoint hot compress for labor-pain management: a randomized, parallel-group, controlled trial

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Abstract: *Background*: Non-pharmacological pain-management approaches, including acupoint hot compress, may provide valuable support for women dealing with pain during the latent stage of labor, but the evidence supporting this effect is limited. We investigated whether acupoint hot compress reduced labor pain among primiparous parturients with planned vaginal delivery. *Methods*: We conducted a randomized controlled trial (RCT) at nine obstetric centers across China. Primiparous women aged 20-34 years, at 37-41 weeks' gestation with singletons and with planned vaginal delivery, were randomly assigned (1:1) to receive standard obstetrical care with acupoint hot-compress therapy or standard obstetrical care alone. The acupoint hot-compress therapy, involving the medial malleolus, plantar, and lumbosacral regions, was provided for parturients in the latent phase of the first stage of labor at (42±2) °C for 4 h, starting 1 hour after the onset of regular uterine contractions. The primary outcome measured was labor pain at 3 and 5 hours after the onset of regular uterine contractions, with labor pain at 1 hour used as the baseline. Pain intensity was assessed using the Visual Analog Scale and expressed as no pain (0), mild pain (range 1-3), moderate pain (range 4-6), or severe pain (range 7-10). The secondary outcomes were the duration of the first, second, and third stages of labor, maternal blood loss quantified at 0 and 2 hours postpartum, and depression symptoms identified using the Edinburgh Postnatal Depression Scale (EPDS) within 48 hours postpartum, as well as newborn Apgar scores. All statistical analyses were

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based on the modified intention-to-treat (ITT) population. *Results*: Between April 2024 and May 2025, 580 women were randomly assigned to the acupoint hot-compress intervention group and the standard-care control group. Of the 564 women included in the modified ITT population, baseline characteristics were comparable between the two groups, with the exception of baseline labor pain. Compared with parturients in the control group, those in the intervention group who underwent acupoint hot compress from the latent phase of the first stage, had reduced labor-pain intensity (3 hours: odds ratios (OR) = 0.46, 95% confidence interval (CI) (0.31, 0.68), P <0.001; 5 hours: OR = 0.11, 95% CI (0.07, 0.18), P< 0.001), after adjusting for baseline labor-pain intensity, and alleviation of postpartum depression symptoms (median EPDS score: 4.00 vs. 5.00, P = 0.009); while they had comparable labor duration, postpartum blood loss, and newborn Apgar scores. No adverse events were observed in either group. *Conclusions*: This RCT showed that acupoint hot compress, starting from the latent phase of the first stage of labor, could be considered as an adjunctive intervention for labor pain and postpartum depression for primiparous women with planned vaginal delivery, without effects on labor duration, blood loss, or newborn Apgar scores.

Key words: Acupoint hot compress; Randomized controlled trial; Labor pain; Postpartum depression; Maternal and fetal safety

1 Introduction

Labor pain is among the most severe types of physical pain experienced by women during their lifetime (Zuarez-Easton et al., 2023). Pain relief during labor is an essential aspect of obstetrical care because of its impact on the mother, fetus, and newborn (Lowdermilk, 2022). Adequate labor-pain management is critical, not only for alleviating physiological discomfort during childbirth, but also for attenuating its adverse psychological consequences in parturients (Tabatabaeichehr and Mortazavi, 2020). Optimal management of labor pain in women with vaginal delivery requires a comprehensive and individualized strategy that integrates effective analgesic care with consideration of potential impacts on obstetrical outcomes, including labor progress and maternal and fetal health (Lim et al., 2025). The World Health Organization (WHO) recommends application of warm packs for healthy pregnant women requesting pain relief during labor, depending on a woman's preferences, as one strategy to promote normal childbirth (WHO, 2018). Non-pharmacological pain management with relaxation techniques has been shown to lower pain intensity during the latent phase of labor (Smith et al., 2018). Furthermore, the American College of Obstetricians and Gynecologists (ACOG) Committee highlights that non-pharmacological pain-management approaches may provide valuable support for women dealing with pain during the latent stage of labor (ACOG, 2019). Mean pain scores (using the Visual Analog Scale (VAS), a validated and subjective measure of pain) in the latent phase of labor in a massage-only and massage-plus-acupressure group were reported to be lower than those in a control group (Gönenç and Terzioğlu, 2020).

Based on the principles of Traditional Chinese Medicine (TCM), acupoint hot compress, which integrates acupoint stimulation with localized heat, is well received in peripartum care due to its noninvasive nature, enhancing its physical and psychological acceptability among parturients. Although clinical evidence of acupoint hot compress specifically for analgesia remains limited, existing studies have demonstrated its potential in managing pain associated with conditions such as neck disorders (Li et al., 2021), myofascial pain syndrome (Boonruab et al., 2018), and knee osteoarthritis (Wang et al., 2022). In gynecological contexts, it has been shown to alleviate procedure-related pain and adverse reactions while enhancing comfort during hysterosalpingography (Xie et al., 2024). Furthermore, our previous randomized controlled trial (RCT) confirmed its efficacy in reducing postpartum uterine contraction pain, urinary retention, and depressive symptoms (Zhu et al., 2022). However, the therapeutic effects of acupoint hot compress when initiated specifically during the latent phase of labor remain inconclusive due to a paucity of robust evidence regarding its analgesic efficacy, obstetric outcomes, and safety.

As limited evidence existed on the use of acupoint hot compress during the latent phase of labor, the selection of acupoints in this study was based on expert consultation and clinical experience. After evaluating commonly used clinical protocols at the leading hospital, 10 experts in TCM independently provided opinions

and reached an agreement on the final acupoint selection. Therefore, the objective of this RCT was to investigate the effect of acupoint hot compress (starting from the latent phase of labor) on labor-pain relief, labor duration, postpartum blood loss, depression symptoms, and neonatal Apgar scores in primiparous women with planned vaginal delivery.

2 Results

2.1 Baseline characteristics of patients

In this two-arm, parallel-group, open-label RCT, we screened 21,721 pregnant women in nine obstetric centers from April 2024 to May 2025. 580 of the women were randomly assigned to the acupoint hot-compress intervention group or the standard-care control group. Ten women underwent cesarean section and six women dropped out before evaluating the baseline labor-pain intensity. Thus, a total of 564 women were included in the modified intention-to-treat (ITT) population. However, of these, 69 women did not complete all the primary-outcome assessments and 127 did not complete all the secondary-outcome assessments (Fig. 1). At trial entry, most of the baseline participant characteristics were similar between the two groups, except for the labor pain assessed at 1 hour after the onset of regular uterine contractions (Table 1). The proportion of women experiencing higher levels of pain was greater in the intervention group than in the control group at this point (P<0.001). No adverse events occurred in either of the two groups during the study.

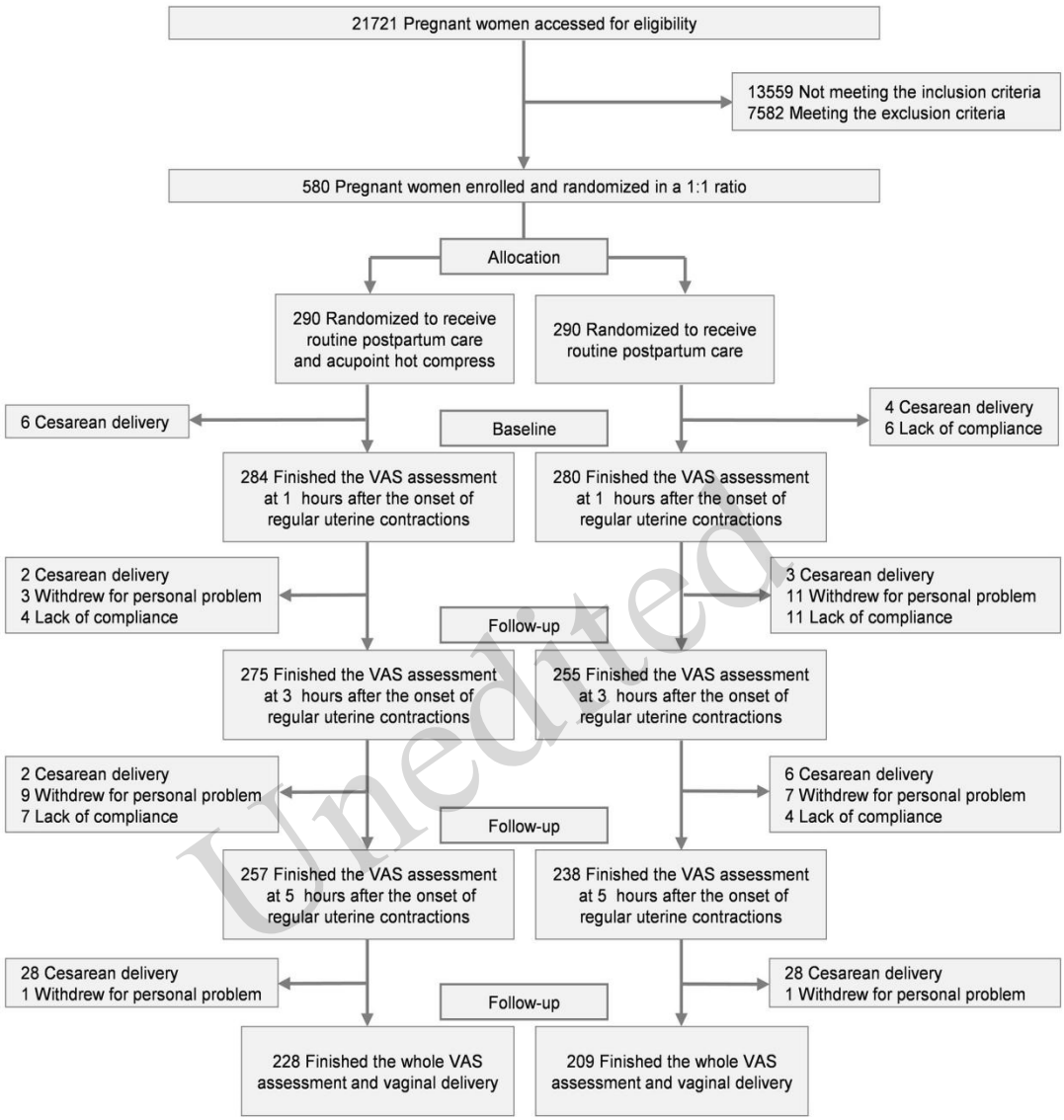

Fig. 1 Flowchart of participants.

Table 1 Baseline characteristics of participants

Characteristics	Intervention group	Control group	*P* value
n	284	280	
Mothers			
Age (year)	28.67 ± 3.06	29.07 ± 2.90	0.110
Pre-pregnancy BMI (kg/m^2)	21.39 ± 3.19	21.80 ± 3.22	0.130
BMI at delivery (kg/m^2)	26.53 ± 3.40	26.63 ± 3.19	0.710
Marital status			0.829
Married	275 (96.8%)	272 (97.1%)	
Unmarried	9 (3.2%)	8 (2.9%)	

Place of residence			0.067
City	269 (94.7%)	254 (90.7%)	
Village	15 (5.3%)	26 (9.3%)	
Maternal education			0.523
Less than college education	98 (34.5%)	87 (31.1%)	
College education	153 (53.9%)	153 (54.6%)	
Higher than college education	33 (11.6%)	40 (14.3%)	
Occupation			0.309
Paid activity	246 (86.6%)	234 (83.6%)	
Unpaid activity	38 (13.4%)	46 (16.4%)	
Cigarette smoking			0.122
Yes	0	3 (1.1%)	
No	284 (100%)	277 (98.9%)	
Alcohol intake			0.622
Yes	1 (0.4%)	2 (0.7%)	
No	283 (99.6%)	278 (99.3%)	
Health insurance			0.838
Yes	262 (92.3%)	257 (91.8%)	
No	22 (7.7%)	23 (8.2%)	
Mode of conception			0.165
Spontaneous	269 (94.7%)	257 (91.8%)	
ART	15 (5.3%)	23 (8.2%)	
Induction of labor			0.627
Yes	178 (62.7%)	181 (64.6%)	
No	106 (37.3%)	99 (35.4%)	
Labor epidural analgesia			0.760
Yes	245 (86.3%)	244 (87.1%)	
No	39 (13.7%)	36 (12.9%)	
Pregnancy complications[#]			0.236
Yes	92 (32.4%)	104 (37.1%)	
No	192 (67.6%)	176 (62.9%)	
Gestational age at delivery (weeks)	39.17 ± 0.94	39.30 ± 1.09	0.126
Offspring			
Gender			0.945
Male	129 (45.4%)	128 (45.7%)	
Female	155 (54.6%)	152 (54.3%)	
Birth weight (g)	3239.36 ± 355.26	3283.13 ± 324.66	0.127
Baseline labor pain intensity based on VAS*			<0.001

Mild	100 (35.2%)	154 (55.0%)
Moderate	165 (58.1%)	114 (40.7%)
Severe	19 (6.7%)	12 (4.3%)

Data was presented as mean ± SD, median (25th quartile, 75th quartile) or number (percentage). Statistical analyzed by the t-test, Wilcoxon-Mann-Whitney test, Pearson Chi-Square test or Fisher's exact test.

#Pregnancy complications: Included hypertensive disorders of pregnancy, intrahepatic cholestasis of pregnancy, gestational diabetes, hypothyroidism, Hashimoto thyroiditis, antiphospholipid, polycystic ovary syndrome and obesity.

*VAS at 1 hour after the onset of regular uterine contractions, prior to the intervention.

Abbreviation: BMI: body mass index; ART: assisted reproductive technology; SD: standard deviation; VAS: visual analog scale.

For both groups, the causes of dropout were cesarean delivery (3.4% and 4.5%, respectively), personal problems (4.1% and 6.2%, respectively), and lack of compliance (3.8% and 7.2%, respectively). Baseline data were compared between the participant population which completed all the VAS-score assessments and the dropout population (Table S1). There was no substantial difference at baseline in demographic characteristics. However, a higher rate of pregnancy complications ($P = 0.046$) and higher fetal birth weight ($P = 0.012$), as well as a lower rate of labor epidural analgesia use ($P = 0.003$) were found in the dropout population.

2.2 Primary outcome (labor-pain intensity)

After the acupoint hot-compress intervention, the proportion of women with mild pain was greater than that in the control group (Table 2), with a significant difference between the groups at 5 hours after the onset of regular uterine contractions ($P<0.001$). Considering the significant difference in baseline labor-pain intensity between the two groups, we carried out ordinal logistic regression on participants at 3 and 5 hours after the onset of regular uterine contractions. After adjustment for baseline pain levels, labor pain was negatively associated with acupoint hot-compress application (3 hours: odds ratios (OR) = 0.46, 95% confidence interval (CI) (0.31, 0.68), $P<0.001$; 5 hours OR = 0.11, 95% CI (0.07, 0.18), $P < 0.001$) (Fig. 2). In sensitivity analyses, the results of per-protocol and multiple-imputation analyses were consistent with the modified ITT analysis (Fig. 2). In the worst-case scenario, the level of labor pain at 5 hours after the onset of regular uterine contractions was still consistent with the modified ITT analysis, but this did not hold true at 3 hours (Fig. 2).

Table 2 Participant outcomes

	Intervention group	Control group	*P* value
Primary outcome			
Labor pain intensity at 3 hours after the onset of regular uterine contractions based on VAS			0.229
n	275	255	
Mild	74 (26.9%)	57 (22.4%)	
Moderate	177 (64.4%)	166 (65.1%)	
Severe	24 (8.7%)	32 (12.5%)	
Labor pain intensity at 5 hours after the onset of regular uterine contractions based on VAS			<0.001
n	257	238	
Mild	60 (23.3%)	14 (5.9%)	
Moderate	170 (66.1%)	125 (52.5%)	
Severe	27 (10.5%)	99 (41.6%)	
Secondary outcomes			

n	228	209	
Labor duration (minutes)			
First stage	580.00 (402.50, 848.75)	570.00 (425.00, 725.00)	0.497
Second stage	71.50 (41.00, 117.50)	71.00 (40.50, 105.50)	0.560
Third stage	6.00 (4.00, 8.00)	6.00 (4.00, 8.00)	0.680
Total	670.00 (487.75, 917.00)	650.00 (503.50, 835.00)	0.433
Blood loss (ml)			
0 hour postpartum	200.00 (150.00, 300.00)	200.00 (150.00, 300.00)	0.470
2 hours postpartum	40.00 (36.00, 50.00)	40.00 (32.50, 50.00)	0.902
Symptoms of depression based on EPDS	4.00 (2.00, 7.00)	5.00 (2.00, 8.00)	0.009
Apgar scores of newborns			
1 minute	10 (10, 10)	10 (10, 10)	0.721
5 minutes	10 (10, 10)	10 (10, 10)	0.511

Data was presented as mean ± SD, median (25th quartile, 75th quartile) and number (percentage). Statistical analyzed by the t-test, Wilcoxon-Mann-Whitney test, and Pearson Chi-Square test.
Abbreviation: VAS: Visual Analog Scale; EPDS: Edinburgh Postnatal Depression Scale; SD: standard deviation.

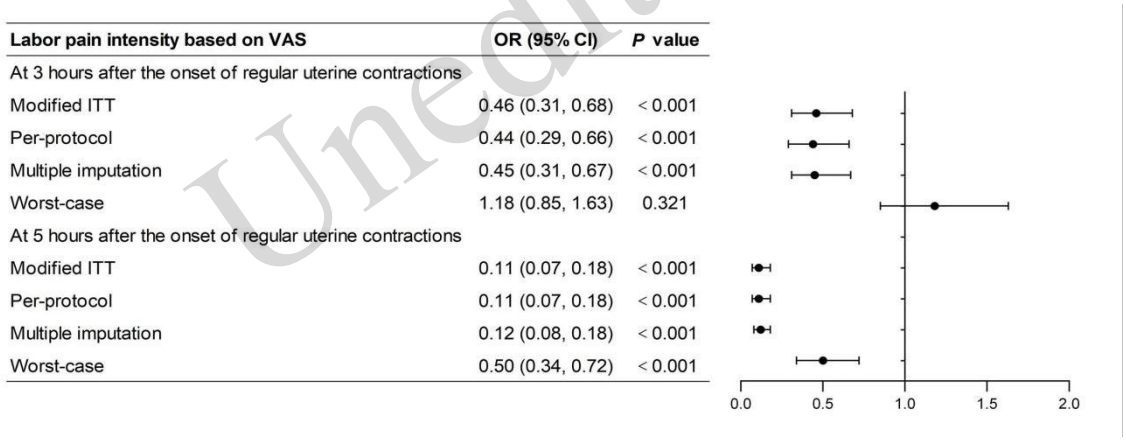

Fig. 2 Ordinal logistic regression between labor pain and acupoint hot compress.
Results are statistical analyses of the modified ITT population and per-protocol population, as well as multiple imputation data and worst-case imputation data. Regressions were determined based on acupoint hot compress and labor-pain intensity based on VAS as a categorical variable. All models are adjusted for labor-pain intensity at 1 hour after the onset of regular uterine contractions. Data are OR (95% CI) of models.
Abbreviation: VAS: Visual Analog Scale; CI: confidence interval; OR: odds ratio; ITT: intention-to-treat.

2.3 Secondary outcomes

2.3.1 Labor duration, maternal blood loss and symptoms of depression, and newborn Apgar scores

Ultimately, 437 women who completed all the VAS-score assessments and vaginal delivery were included for primary analysis (Table 2). There was no difference in most of the secondary outcomes including duration of labor, maternal blood loss, and newborn Apgar scores, with the exception of symptoms of depression. The median Edinburgh Postnatal Depression Scale (EPDS) score was 4.00 (interquartile range (IQR) 2.00 - 7.00) in the intervention group and 5.00 (IQR 2.00 - 8.00) in the control group, a statistically significant difference (P = 0.009). In sensitivity analyses, the results of modified ITT analyses were consistent with the per-protocol

analysis (Table S2).

2.3.2 Subgroup analysis based on the receipt of epidural analgesia

In women who received epidural analgesia, acupoint hot compress significantly decreased symptoms of depression (P = 0.026); however, for women who did not receive epidural analgesia, acupoint hot compress showed no significant effects on depression symptoms (P = 0.162) (Table S3). Moreover, in women who did not receive epidural analgesia, acupoint hot compress significantly decreased blood loss at 0 hours (after placental delivery) postpartum (P = 0.040); however, for the women who received epidural analgesia, acupoint hot compress had no notable effects (P = 0.148) (Table S3).

3 Discussion

In this trial, we found that acupoint hot compress on the medial malleolus, plantar, and lumbosacral regions significantly reduced labor-pain intensity from the latent phase of the first stage, and alleviated postpartum depression symptoms. Labor duration, postpartum blood-loss, and newborn Apgar scores were comparable between the intervention and control groups.

Since labor pain is one of the most severe kinds of physiological pain, effective management of it constitutes a cornerstone of obstetric care, exerting a profound influence on maternal perinatal experiences and neonatal outcomes (Lowe, 2002; Lim et al., 2018). Epidural analgesia is considered to be the most efficient method of pain relief during labor, but is often associated with iatrogenic risks such as maternal hypotension, fetal respiratory depression, or prolonged second-stage labor (Zuarez-Easton, et al., 2023). Non-pharmacologic modalities, which have emerged as a promising intervention for modulating labor pain, offer a favorable safety profile in comparison. . Methods such as relaxation techniques (i.e. yoga, hypnosis, and music), manual techniques (i.e. massage, reflexology, and shiatsu), techniques targeting acupuncture points (i.e. acupuncture, acupressure, and transcutaneous electrical nerve stimulation), and birthing balls are considered safe, although the evidence supporting their effectiveness for pain relief is not as robust as it is for pharmacological agents (Zuarez-Easton, et al., 2023; Larki et al., 2025). Acupressure, a noninvasive acupuncture technique , has recently been shown to significantly reduce labor pain compared to touch, sham acupuncture, and no intervention, by meta-analysis of RCTs (Larki, et al., 2025). Here, we investigated acupoint hot compress as a treatment for primiparous women with singleton pregnancies and planned vaginal delivery. After adjusting for baseline pain intensity, the intensity of labor pain was decreased in the intervention group compared with the control group (starting from the latent phase of the first stage) with high consistency of results across the modified ITT, per-protocol, multiple-imputation, and worst-case analyses. Acupoint hot compress is more acceptable than other non-pharmacological care of pregnant women and parturients, not only for its noninvasive nature, but also for its ease of use.

While the traditional four P's of labor (power, passage, passenger, and presentation) remain fundamental, the psyche is now established as the fifth pivotal determinant of parturition efficacy (Gill et al., 2025). Pain during labor and relief from it are emotional experiences (Zuarez-Easton, et al., 2023). Previous RCTs demonstrate that early epidural analgesia upon request in nulliparas neither prolongs labor nor increases obstetric interventions. However, epidural analgesia confers an elevated risk of maternal pyrexia (due to non-infectious inflammation) compared to non-epidural approaches (Li et al., 2020). Our data indicates that acupoint hot compress does not prolong labor duration, which would be a concern for its use. The widespread use of epidural analgesia in both groups limits our ability to isolate the independent effect of this intervention on labor duration.

There is conflicting evidence regarding the association between epidural labor analgesia and risk of

postpartum depression. RCT evidence shows no significant difference in the risk of postpartum depression between patients who receive epidural labor analgesia and those who use non-epidural analgesic modalities (Lim, et al., 2018; Tan et al., 2024). Likewise, one must evaluate the effect on postpartum depression symptoms in parturients who received acupoint hot compress. Acupoint hot compress significantly decreased the incidence of depression symptoms in participants receiving acupoint hot compress and not in controls, regardless of whether they received epidural analgesia. This supports our findings in a previous RCT of acupoint hot compress during the early postpartum period. In the current study, we see that acupoint hot compress starting from the latent phase of the first stage significantly decreases the incidence of depression symptoms in participants in the intervention group compared to the control group, with similar proportions of epidural analgesia at baseline in both groups.

To further confirm the safety of acupoint hot compress for both parturients and newborns during vaginal delivery, we analyzed postpartum blood loss. Severe postpartum hemorrhage is still the leading cause of maternal morbidity and mortality worldwide (Attali et al., 2025), and neonatal Apgar scores are predictors for neonatal morbidity (Hong et al., 2024). Our findings indicate that use of acupoint hot compress starting from the latent phase has no effect on maternal postpartum blood loss or neonatal Apgar scores, implying its safety for both mothers and fetuses.

The exploratory subgroup analysis suggests that acupoint hot compress significantly decreases depression symptoms for the women receiving epidural analgesia, and significantly decreases blood loss at 0 hours postpartum for the women not receiving epidural analgesia. The relatively small numbers of participants without epidural analgesia may limit our ability to demonstrate significant outcomes, and more trials are needed to further confirm the findings. However, the present study may provide some evidence for the potential roles of acupoint hot compress in labor-pain management, as an adjunct to epidural analgesia.

There are several limitations in the current trial. First, the lack of a credible placebo precluded participant blinding. As the VAS score is a subjective measure, this unblinded design creates a risk of performance bias, since knowing whether or not one is receiving the treatment could influence pain reporting and potentially inflate estimates of pain relief. Given the observed between-group difference in baseline labor pain, we used an ordinal regression model to adjust for baseline labor pain-intensity to strengthen the validity of our observed intervention effects. Additionally, the absence of a sham control group, such as hot compress applied to non-acupoint areas, limits our ability to distinguish the specific effects of acupoint stimulation from the general analgesic effects of hot compress. Second, the missing data on the primary outcome was a source of bias. Third, although TCM (traditional Chinese medicine) efficacy relies on syndrome differentiation, we adopted a uniform protocol for all participants. The lack of individualized treatment could have attenuated therapeutic response in specific participants, increasing outcome variability. Fourth, fixed-size applicators of acupoint hot compress may inadequately stimulate target acupoints due to anatomical variation, potentially activating adjacent non-target points. This is particularly relevant for the lumbosacral region, where Baliao (BL31-34) acupoints are located, as this area contains muscles and nerves directly involved in the labor process. Applying hot compress to this region could produce effects unrelated to acupoint stimulation, making it difficult to attribute observed outcomes solely to the specific acupoints. Fifth, the study consisted of healthy primiparous women with singleton pregnancies and planned vaginal delivery at baseline. Hence, the results may not apply to populations with pre-pregnancy medical complications or multiparous women. Finally, given that all interventions and measurements were conducted during inpatient labor and vaginal delivery, the long-term effects of acupoint hot-compress therapy remain unclear. Additional research is required to determine long-term effectiveness and clarify the underlying mechanisms of this intervention.

4 Conclusions

This RCT indicates that acupoint hot-compress therapy, involving the medial malleolus, plantar, and lumbosacral regions, starting from the latent phase of the first stage of labor, could act as an adjunct to standard obstetric care among primiparous women with planned vaginal delivery. It appears to be a good option for management of labor pain and postpartum depression, with no effects on labor duration, blood loss, or newborn Apgar scores. However, the widespread use of epidural pain relief among participants limits our ability to isolate the independent effect of the intervention on labor duration. Based on these findings, acupoint hot compress could be considered for healthy parturients who request pain relief during labor, depending on their preferences, and serve as one strategy to promote normal childbirth.

Materials and methods

Detailed methods are provided in the electronic supplementary materials of this paper.

Data availability statement

The data are available from the corresponding author on reasonable request.

Acknowledgments

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Author contributions

Fangfang WANG performed the methodology, resources, formal analysis, writing – original draft, and writing –review & editing. Leyi FU performed the methodology, formal analysis, and writing – original draft. Xinyue LI performed the methodology, data curation, and writing – original draft. Yuqun PU performed the data curation. Lianqing GONG performed the data curation. Lin ZHOU performed the data curation. Lanxiang FU performed the data curation. Yaping CHEN performed the data curation. Mali CHEN performed the data curation. Yue QIN performed the data curation. Xiaoying LV performed the data curation. Ye ZHANG performed the data curation. Xiong DENG performed the data curation. Xiaopei WANG performed the data curation. Zihan GAO performed the data curation. Rong JIN performed the data curation. Hongzhe WANG performed the data curation. Hye Won LEE performed the methodology. Xinfen XU performed the methodology and supervision. Danqing CHEN performed the methodology and supervision. Jue ZHOU contributed to the methodology, resources, and supervision. Myeong Soo LEE contributed to the methodology and supervision. Fan QU contributed to the conceptualization, methodology, resources, supervision, and writing –review & editing. All authors read and approved the final manuscript and, therefore, had full access to all the data in the study and take responsibility for the integrity and security of the data.

Compliance with ethics guidelines

Fangfang WANG, Leyi FU, Xinyue LI, Yuqun PU, Lianqing GONG, Lin ZHOU, Lanxiang FU, Yaping CHEN, Mali CHEN, Yue QIN, Xiaoying LV, Ye ZHANG, Xiong DENG, Xiaopei WANG, Zihan GAO, Rong JIN, Hongzhe WANG, Hye Won LEE, Xinfen XU, Danqing CHEN, Jue ZHOU, Myeong Soo LEE, and Fan QU declare that they have no conflict of interest.

The study has been approved by the ethics committee of Women's Hospital, School of Medicine, Zhejiang University (No. IRB-20230379-R). The trial was registered by the Chinese Clinical Trial Registry with the identification of ChiCTR2300079244. Informed consent was obtained from all participants for being included in the study. Additional informed consent was obtained from all participants for whom identifying information is included in this article.

Declaration on the use of generative AI tools

No generative AI tools were used in the preparation of this manuscript.

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Supplemental material

Materials and methods; Tables S1-S3