Journal of Clinical and Nursing Research, 2025, Volume 9, Issue 11
http://ojs.bbwpublisher.com/index.php/JCNR
Online ISSN: 2208-3693
Print ISSN: 2208-3685

Clinical Study on Acupoint Injection Combined with Intraspinal Anesthesia for Labor Analgesia in Primiparas

Shuaihui Zeng†, Zesen Zhan†, Zijing Zhang*

Department of Obstetrics, The Third Affiliated Hospital of Sun Yat-sen University, Guangzhou, Guangdong, China
† These authors contributed equally to this work and share the first authorship.

***Corresponding author:** *Zijing Zhang, zhangzj53@mail2.sysu.edu.cn*

Abstract: *Objective*: To investigate the effects of intraspinal anesthesia combined with acupoint injection at Zusanli (ST36) and Sanyinjiao (SP6) on labor progression and delivery outcomes in full-term primiparas. *Methods*: A retrospective analysis was conducted on 303 full-term primiparas who delivered between July and December 2023. According to the analgesic method, the participants were divided into an observation group (n = 110) and a control group (n = 193). Maternal general characteristics, mode of delivery, duration of each labor stage, incidences of uterine inertia, urinary retention, and intrapartum fever, as well as neonatal outcomes, were compared between the two groups. *Results*: The rate of vaginal delivery in the observation group was significantly higher than that in the control group ($p < 0.05$). The duration of the first stage of labor was significantly shorter ($p < 0.05$). The incidences of uterine inertia and urinary retention were both significantly lower in the observation group than in the control group ($p < 0.05$). There were no significant differences in neonatal Apgar scores or neonatal intensive care unit (NICU) transfer rates between the two groups ($p > 0.05$). *Conclusion*: Intraspinal anesthesia combined with acupoint injection at Zusanli and Sanyinjiao can increase the rate of vaginal delivery, shorten the first stage of labor, and reduce obstetric interventions in full-term primiparas, without increasing adverse maternal or neonatal outcomes.

Keywords: Acupoint injection; Intraspinal anesthesia; Primiparous women; Labor outcomes

Online publication: Dec 10, 2025

1. Introduction

Childbirth is a natural physiological process for women of reproductive age, while labor pain is one of the most intense and unforgettable pains experienced during vaginal delivery [1]. The physiological basis of labor pain mainly involves neuro-reflex pain caused by uterine contractions, cervical dilation, and fetal descent [2]. For primiparous women, the labor process is usually longer and cervical dilation progresses more slowly, resulting in more prolonged pain. The effectiveness of analgesic management is therefore crucial for both maternal and

neonatal safety as well as for improving the childbirth experience.

Epidural analgesia (EA) is currently the most widely used and effective method of labor analgesia in clinical practice. However, potential adverse effects such as prolonged labor and urinary retention remain major clinical concerns [3–5]. Consequently, developing multimodal analgesic strategies that ensure adequate pain relief while promoting smooth labor progression and minimizing intervention has become a focus of current research.

Acupoint stimulation, a key component of traditional Chinese medicine, regulates body functions through the neuro–endocrine–immune network, exerting multi-target and holistic regulatory effects. Studies have shown that acupuncture may participate in the regulation of labor through multiple mechanisms, including activating the hypothalamic–pituitary–adrenal (HPA) axis to promote the release of endogenous opioid peptides such as β-endorphin and enkephalin, thereby relieving pain; regulating autonomic nervous system function to reduce sympathetic excitability and improve the maternal stress response during labor; and stimulating oxytocin secretion to enhance the coordination of uterine contractions [6–9]. Zusanli (ST36) and Sanyinjiao (SP6) are commonly used acupoint combinations in obstetrics and gynecology. Acupoint injection uses the continuous mechanical stimulation of hypotonic injection water to prolong and enhance the effect of acupuncture [10].

Based on these theoretical foundations, this study aimed to investigate the effects of epidural analgesia combined with acupoint injection at Zusanli and Sanyinjiao on labor progression and delivery outcomes in full-term primiparous women, in order to provide clinical evidence for optimizing perinatal analgesic management.

2. Materials and methods

2.1. Study population

This retrospective cohort study consecutively collected data from women who delivered in the Department of Obstetrics at the Third Affiliated Hospital of Sun Yat-sen University between July and December 2023 using the hospital's electronic medical record system.

The study was approved by the Ethics Committee of the Third Affiliated Hospital of Sun Yat-sen University, and all procedures adhered to the principles of medical ethics. Patient information was anonymized during data collection, management, and analysis to ensure confidentiality and privacy protection.

2.1.1. Inclusion criteria

(1) Full-term pregnancy (37–42 weeks of gestation)
(2) Singleton pregnancy with cephalic presentation in primiparas
(3) Willingness to undergo vaginal delivery with spontaneous onset of labor
(4) Administration of epidural labor analgesia after cervical dilation ≥ 1 cm

2.1.2. Exclusion criteria

(1) Severe pregnancy complications or comorbidities (such as severe preeclampsia, serious cardiopulmonary disease, or diabetic ketoacidosis)
(2) Cesarean delivery performed before the onset of labor due to social reasons, fetal distress, or other medical indications
(3) Incomplete clinical data or missing key variables
(4) Analgesic method was changed or analgesia failed during labor

2.2. Grouping and analgesic methods

According to the analgesic regimen, the participants were divided into a control group (n = 193) and an observation group (n = 110). The control group received epidural analgesia (EA) only. When regular uterine contractions occurred and the cervix was dilated to approximately 1 cm, puncture was performed at the L2–3 or L3–4 intervertebral space. A 1 mL dose of sufentanil citrate injection (batch No. 21A09171A2; Yichang Humanwell Pharmaceutical Co., Ltd., China) was first administered intrathecally. The epidural catheter was then inserted cephalad and secured with 4 cm retained in the epidural space, followed by connection to an electronic patient-controlled analgesia (PCA) pump. The pump parameters were set as follows: total volume 120 mL, containing ropivacaine 75 mg and sufentanil 45 μg; background infusion rate 6 mL/h; bolus dose 8 mL; and lockout interval 15 minutes. In the observation group, within 30 minutes after confirming effective analgesia with the same EA procedure as in the control group, acupoint injection was performed bilaterally at Zusanli (ST36, located one finger-breadth lateral to the anterior crest of the tibia) and Sanyinjiao (SP6, located 3 cm above the tip of the medial malleolus). After routine skin disinfection, the needle was inserted vertically and rapidly and 1 mL of sterile water was slowly injected at each acupoint, for a total of 4 mL across four sites.

2.3. Outcome measures

This study included both primary and secondary outcome measures. The primary outcome was the mode of delivery (vaginal delivery or cesarean section). Secondary outcomes included four aspects.

(1) Duration of labor, including the first, second, and third stages, determined according to Obstetrics and Gynecology (9th edition) [11].

(2) Incidence of epidural anesthesia–related adverse events, including uterine inertia and urinary retention. Uterine inertia was defined as insufficient uterine contractions requiring oxytocin administration to assist labor, and urinary retention referred to difficulty in urination or the need for indwelling catheterization during labor.

(3) Neonatal outcomes, including birth weight, Apgar scores at 1, 5, and 10 minutes, and NICU transfer rate.

(4) Maternal baseline characteristics, including gestational age, height, pre-delivery weight, maternal age, history of abortion or induced labor, educational level, employment and marital status, as well as the presence of gestational diabetes mellitus (GDM) and gestational hypertension.

2.4. Statistical analysis

Data were analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Measurement data conforming to a normal distribution were expressed as mean ± standard deviation (SD), and comparisons between groups were performed using the independent-samples *t* test. Categorical data were expressed as counts and percentages [n (%)], and comparisons between groups were performed using the chi-square (χ^2) test. A p value of < 0.05 was considered statistically significant.

3. Results

3.1. Comparison of general clinical characteristics between the two groups

There were no statistically significant differences between the two groups in terms of gestational age, maternal age, height, pre-delivery weight, educational level, occupation, marital status, number of abortions or induced

labors, gestational diabetes mellitus, or gestational hypertension ($p > 0.05$). These results indicate that the baseline characteristics of the two groups were balanced and comparable (**Table 1**).

Table 1. Comparison of general data between the two groups of parturients

Variable	Observation group (n = 110)	Control group (n = 193)	t/χ^2	p
Gestational week	39.53 (0.93)	39.42 (0.93)	-0.915	0.361
Height (cm)	158.75 (5.00)	159.69 (5.28)	-1.533	0.126
Pre-delivery weight (kg)	65.14 (8.94)	66.37 (8.44)	-1.149	0.251
Maternal age (years)	28.57 (3.12)	28.86 (3.41)	0.726	0.468
Inductions or abortion times			0.679	0.712
None	92 (83.6%)	154 (79.8%)		
Once	13 (11.8%)	28 (14.5%)		
Twice or more	5 (4.5%)	11 (5.7%)		
Education level			0.077	0.994
High school or below	18 (16.4%)	30 (15.5%)		
College	35 (31.8%)	64 (33.2%)		
Bachelor	52 (47.3%)	90 (46.6%)		
Master or above	5 (4.5%)	9 (4.7%)		
Employed	98 (88.3%)	164 (85.0%)	0.650	0.420
Married	105 (95.5%)	185 (95.9%)	0.027	0.869
Gestational diabetes	15 (13.6%)	28 (14.5%)	0.044	0.834
Gestational hypertension	3 (2.7%)	4 (2.1%)	0.133	0.715

Note: Values are presented as mean (SD) or n (%). Independent samples *t*-test and chi-square test were used for group comparisons. $p < 0.05$ indicates statistical significance.

3.2. Comparison of delivery modes between the two groups

The vaginal delivery rate in the observation group was 90.9%, which was significantly higher than that in the control group (82.4%) ($p < 0.05$), indicating that epidural anesthesia combined with acupoint injection helped improve the vaginal delivery rate among primiparous women. The duration of the first stage of labor in the observation group was 584.19 ± 266.52 minutes, significantly shorter than that in the control group (744.66 ± 256.53 minutes, $p < 0.05$), whereas no significant differences were found between the two groups in the duration of the second and third stages of labor ($p > 0.05$). These findings suggest that the combined use of acupoint injection can effectively shorten the first stage of labor and promote labor progression. Regarding anesthesia-related adverse events, the incidence of uterine inertia in the observation group was 60.0%, lower than that in the control group (73.0%, $p < 0.05$), and the incidence of urinary retention was also lower in the observation group (64.0% vs. 79.4%, $p < 0.05$). Overall, these results indicate that epidural anesthesia combined with acupoint injection not only increases the rate of vaginal delivery and shortens the first stage of labor but also reduces the risk of anesthesia-related adverse events (**Table 2**).

Table 2. Comparison of labor outcomes between groups

Variable	Observation group (n = 110)	Control group (n = 193)	t/χ^2	p
Vaginal delivery	100 (90.9%)	159 (82.4%)	4.103	0.043
First stage of labor (min)	584.19 (266.52)	744.66 (256.53)	-2.446	0.015
Second stage of labor (min)	67.16 (56.86)	78.02 (51.05)	-1.555	0.121
Third stage of labor (min)	10.27 (2.42)	10.53 (3.78)	-0.673	0.502
Oxytocin augmentation	60 (60%)	116 (73%)	4.720	0.030
Urinary retention	64 (64%)	150 (79.4%)	8.034	0.005

Note: Values are presented as mean (SD) or n (%). Independent samples *t*-test and chi-square test were used for group comparisons. $p < 0.05$ indicates statistical significance.

3.3. Comparison of neonatal outcomes

There were no statistically significant differences between the two groups in neonatal birth weight, Apgar scores at 1, 5, and 10 minutes, or the rate of neonatal transfer to the NICU ($p > 0.05$). These results indicate that epidural anesthesia combined with acupoint injection can improve delivery outcomes without increasing the risk of adverse neonatal outcomes (**Table 3**).

Table 3. Comparison of neonatal outcomes between groups

Variable	Observation group (n = 110)	Control group (n = 193)	t/χ^2	p
Neonatal weight (kg)	3.17 (0.29)	3.10 (0.33)	-1.841	0.067
1-min Apgar score	9.94 (0.37)	9.92 (0.34)	-0.339	0.735
5-min Apgar score	9.97 (0.286)	10 (0.00)	1.326	0.320
10-min Apgar score	9.98 (0.191)	10 (0.00)	1.326	0.186
Transfer to NICU	13 (11.8%)	29 (15%)	0.604	0.437

Note. NICU: neonatal intensive care unit. Values are presented as mean (SD) or n (%). Independent samples *t*-test and chi-square test were used for group comparisons. $p < 0.05$ indicates statistical significance.

4. Discussion

The results of this study showed that epidural anesthesia combined with acupoint injection of sterile water at Zusanli (ST36) and Sanyinjiao (SP6) significantly increased the vaginal delivery rate in full-term primiparous women, shortened the duration of the first stage of labor, and reduced the incidence of anesthesia-related adverse events such as uterine inertia and urinary retention. There were no statistically significant differences between the two groups in neonatal birth weight, Apgar scores, or the rate of neonatal transfer to the neonatal intensive care unit (NICU), suggesting that this combined analgesic approach can improve maternal delivery outcomes without increasing the risk of adverse neonatal outcomes.

The results of this study showed that the cesarean section rate in the observation group was significantly lower than that in the control group (9.1% vs. 17.6%), and the duration of the first stage of labor was also notably shorter. These findings are consistent with the meta-analysis conducted by Shui Linhui et al., which reported that acupuncture combined with epidural analgesia significantly reduced the risk of conversion to cesarean section (OR

= 0.45) [12]. In addition, the present study further observed smoother labor progression in the observation group compared with the control group. Previous studies have suggested that epidural analgesia may delay cervical dilation to some extent [13]. However, the combined analgesic protocol used in this study not only reduced the cesarean section rate but also shortened the duration of labor, suggesting that the addition of acupoint injection may help alleviate or even counteract the potential delaying effect of pharmacological analgesia on labor progression. The underlying mechanism may be related to the synergistic stimulation of Zusanli (ST36) and Sanyinjiao (SP6), which can promote the synthesis and release of endogenous oxytocin and prostaglandins through neurohumoral pathways, thereby enhancing the coordination and efficiency of uterine contractions and facilitating cervical dilation and fetal descent [6,7,14]. Therefore, while maintaining effective analgesia, this combined approach not only avoids interference with normal labor but may also promote its physiological progression.

This study found that the incidences of uterine inertia and urinary retention were significantly lower in the observation group than in the control group, demonstrating the potential clinical advantages of the combined analgesic approach. The reduced incidence of uterine inertia supports the aforementioned hypothesis that acupoint injection may enhance the intensity and rhythmicity of uterine contractions, thereby promote labor progression and lowering the risk of uterine inertia, which is consistent with previous findings [6,15,16]. The decreased incidence of urinary retention may be attributed to two factors. On the one hand, the shorter duration of labor in the observation group reduced bladder distension and voiding difficulty associated with prolonged labor; on the other hand, acupoint stimulation may partially counteract the inhibitory effects of epidural anesthesia on bladder sensation and function, thereby improving maternal spontaneous urination and comfort [17]. The reduction in these adverse reactions not only helps optimize the delivery process and lower the risk of infection but also enhances the overall childbirth experience, reflecting a patient-centered approach to obstetric care.

The results of this study showed no significant differences between the two groups in neonatal Apgar scores, the rate of neonatal transfer to the NICU, further confirming the good maternal and neonatal safety of the combined analgesic regimen. The sterile water used for acupoint injection has a simple composition and contains no heterologous proteins; it exerts its effects solely through local physical stimulation, which ensures a high level of safety [7,18]. These findings are consistent with the review by Zheng Xiaoying et al., which emphasized that acupuncture and related techniques for labor analgesia offer the advantages of minimal invasiveness and fewer side effects [8].

The innovation of this study lies in its systematic evaluation of the clinical value of combining acupoint injection of sterile water at Zusanli (ST36) and Sanyinjiao (SP6) with epidural analgesia. This method is simple to perform and provides a sustained “needling sensation” at the acupoints, requiring less manpower than traditional acupressure or electrostimulation, making it well suited for implementation in delivery rooms. However, as a retrospective study, the present research cannot completely eliminate selection bias and the influence of potential confounding factors. In addition, data on maternal analgesic satisfaction (e.g., VAS scores) and total analgesic drug consumption were not collected, preventing a comprehensive assessment of the analgesic efficacy and cost-effectiveness of the combined method. Future studies should include prospective, large-sample randomized controlled trials and dynamically monitor serum hormone levels such as oxytocin and prostaglandins to further elucidate the mechanisms and clinical value of this combined analgesic strategy.

5. Conclusion

This study demonstrates that epidural anesthesia combined with acupoint injection of sterile water at Zusanli (ST36) and Sanyinjiao (SP6) is a safe and effective adjunctive method for labor analgesia in full-term primiparous women. This approach can increase the rate of vaginal delivery, shorten the first stage of labor, and reduce the need for interventions such as oxytocin administration and catheterization, without increasing the risk of adverse neonatal outcomes. Overall, this combined analgesic technique helps optimize the labor process and improve maternal and neonatal outcomes, and it merits further clinical application and validation.

Disclosure statement

The authors declare no conflict of interest.

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