

Clinical effect of moxibustion combined with acupoint application on early prevention of postpartum urinary retention in women with epidural analgesia and vaginal delivery

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Abstract: Background: Epidural analgesia increases postpartum urinary retention (PPUR) risk. This study assessed a combined acupuncture and acupoint application therapy for the prevention of PPUR. **Objective:** Through a retrospective cohort study, the effect of acupuncture combined with acupoint application therapy on preventing early PPUR in parturients who received epidural analgesia and delivered vaginally in a real clinical setting was evaluated. **Method:** In a retrospective cohort of 464 parturients receiving epidural analgesia, 240 received acupuncture (Shenque, Qihai) plus acupoint application (Shenque, Guanyuan, bilateral Shuidao) starting 2 hours postpartum for two days, while 224 received routine care. Outcomes included PPUR incidence (inability to void within 6 hours or residual volume ≥ 150 mL), time to first void, residual volume, and catheterization rate. **Results:** The intervention group showed significantly lower PPUR incidence (11.67% vs. 25.89%, $p < 0.01$), earlier voiding (3.52 ± 1.21 h vs. 5.37 ± 1.67 h, $p < 0.01$), reduced residual volume (85.63 ± 31.74 mL vs. 128.95 ± 45.21 mL, $p < 0.01$), and lower catheterization (4.17% vs. 11.16%, $p < 0.05$). Multivariate analysis confirmed reduced PPUR risk (OR=0.393, 95% CI: 0.206 - 0.749). No serious adverse events occurred. **Conclusion:** Acupuncture combined with acupoint application may effectively reduce PPUR and improve postpartum bladder recovery with good safety.

Keywords: Acupoint patch; Epidural analgesia; Moxibustion; Postpartum urinary retention; Prevention

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INTRODUCTION

Postpartum urinary retention (PPUR) is a common complication following vaginal delivery, clinically defined as the inability to void spontaneously within six hours after delivery or a post-void residual bladder volume exceeding 150 mL measured by ultrasound. (Plöger *et al.*, 2024a). This condition causes significant physical discomfort and psychological distress (Al-khlaiwi *et al.*, 2025; Nutaitis *et al.*, 2023a), while increasing risks of urinary tract infections, bladder dysfunction and postpartum hemorrhage (Baruch *et al.*, 2025; Dolezal *et al.*, 2022). Epidural analgesia provides effective pain relief (Bonarska *et al.*, 2025) and significantly increases PPUR risk through its inhibitory effect on sacral nerves (S2-S4) that control bladder function (Cambise *et al.*, 2024).

Current management strategies remain predominantly reactive, focusing on post-symptom interventions such as timed voiding encouragement, behavioral techniques, and catheterization. (Li, Zhu and Xiao 2020; Zhu *et al.*, 2022). These approaches demonstrate variable efficacy and may introduce additional risks, including infection and patient discomfort (Atkins *et al.*, 2020; Gad and AbdelAziz 2021), highlighting the need for effective preventive measures. Moxibustion and acupoint application therapy represent promising non-pharmacological approaches for preventing

postpartum voiding dysfunction (Li, Ji and Ma 2025). According to traditional Chinese medicine theory, PPUR primarily results from qi and blood deficiency following childbirth (Chen *et al.*, 2020), with modern medical procedures potentially exacerbating this condition (Elsevier 2020). Moxibustion applies thermal stimulation to promote meridian circulation and restore physiological functions (Solovchuk, Deng and Sheu 2020), while acupoint application enables sustained pharmacological effects through transdermal absorption, (Lv *et al.*, 2025).

The combined intervention plan designed in this study aims to integrate the immediate physical thermal stimulation of moxibustion and the continuous chemical pharmacological stimulation of acupoint application, seeking a synergistic and enhanced effect. In terms of acupoint selection, the main focus is on the main acupoints on the lower abdomen that are adjacent to the bladder, such as Guanyuan (CV4), which is a well-known fu-organs acupoint of the small intestine, a junction point of the three yin meridians and the yin meridian and is effective in replenishing primordial Qi and warming the kidneys and strengthening yang (Fang *et al.*, 2022; Guo *et al.*, 2025). Qihai (CV6), the place where the innate vital energy gathers, when stimulated, can strengthen the body's vital energy and prevent collapse, as well as warm the lower part of the body. Zhongji (CV3), a point of the bladder's acupoint, is where the Qi of the bladder organ directly spreads to the surface of the body. Stimulating this point can directly regulate bladder

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function (Guo *et al.*, 2025). For selecting acupoints in the distal parts of the lower limbs, the focus is on overall regulation. The Sanyinjiao (SP6) acupoint is often chosen. This point is the convergence point of the three meridians: the foot's Taiyin spleen, Jueyin liver and Shaoyin kidney. One point connects three meridians, excelling in regulating Qi and blood and unblocking the water pathways. In addition, the Zusanli (ST36) acupoint, which is the confluence and lower confluence point of the foot's Sanming stomach meridian, is also used. The stomach meridian has abundant qi and blood. Applying moxibustion to this point can strengthen the spleen and stomach, nourish qi and blood, and replenish the source of life and metabolism, thereby nourishing the kidney Qi of the primordial nature (Zhong *et al.*, 2020). The formula for traditional Chinese medicine patches usually follows the principle of strengthening the body's Qi, promoting blood circulation, warming the yang energy, and facilitating water drainage. They use astragalus to nourish the middle Qi and raise the sagging lower body, and atracylodes to tonify the spleen, dry dampness, and facilitate water drainage. In addition, borneol, with its fragrant and penetrating properties, is used to promote transdermal absorption. Together, these ingredients strengthen the body's Qi, tonify the spleen, warm yang energy, promote Qi circulation, and facilitate water drainage and urination (Liang *et al.*, 2020).

However, there are methodological challenges in evaluating the true efficacy of this combination therapy in complex clinical scenarios. Previous research has primarily investigated single therapies, with limited evidence regarding combined applications for high-risk populations receiving epidural analgesia. Well-designed randomized controlled trials, while methodologically rigorous, may not fully reflect the real-world complexity of clinical practice. Retrospective cohort studies can provide valuable complementary evidence by evaluating the effectiveness of interventions in routine care settings.

We therefore conducted a retrospective cohort study to evaluate the effectiveness of combined moxibustion and acupoint application therapy in preventing PPUR among women receiving epidural analgesia. By comparing outcomes between the intervention and conventional care groups, we aim to provide practical evidence to optimize postpartum nursing strategies and inform future research directions.

MATERIALS AND METHODS

General information

This study adopted a retrospective cohort design, systematically collecting the medical records of 464 parturients who were hospitalized in our hospital and underwent vaginal delivery after receiving epidural labor analgesia from February 2024 to January 2025. All the parturients had full-term singleton pregnancies and received standard epidural analgesia during the labor

process. Accordingly, on the basis of whether they received moxibustion combined with acupoint application after delivery, the selected cases were naturally divided into two groups: 240 parturients received this combined treatment measure (exposure group) and the remaining 224 parturients only received conventional postpartum measures (non-exposure group), as shown in Fig. 1. The grouping of the exposed versus non-exposed groups was not based on randomization or investigator intent but rather depended entirely on the care programme actually provided in clinical practice. Specifically, the puerpera (intervention group) who received "Moxibustion combined with acupoint application" usually followed the following clinical pathway: stable postnatal vital signs, after the obstetrician assessed that there were no contraindications (such as allergy to the application ingredients, local skin damage, etc.), the nurses in the ward provided the combined treatment according to the established nursing plan of the department. The women who did not receive the treatment (control group) may be due to the following reasons: non-treatment-time delivery (e.g., at night), on-duty nurse staffing constraints, or patient preferences. Importantly, the factors that determine whether to receive this intervention are primarily related to immediate clinical operations and resources, rather than to clinical characteristics directly related to the patient's prognosis or the risk of urinary retention.

Inclusion and exclusion criteria

Inclusion criteria (Elsevier 2024; Olszynska *et al.*, 2023): (1) First-time vaginal delivery of a single fetus; (2) Gestational age of 37 weeks or more but less than 42 weeks; (3) Received continuous epidural analgesia during the labor process; (4) Fetus in cephalic presentation and delivered vaginally (including natural delivery and delivery assisted by forceps or fetal head vacuum extractor); (5) Complete and intact clinical medical records.

Exclusion criteria (Pan *et al.*, 2024): (1) Pre-existing urinary system diseases or history of urinary retention before delivery; (2) Previous history of major pelvic surgeries or neurological diseases that may affect bladder function; (3) Complicated with severe pregnancy-related complications (such as severe preeclampsia, placental abruption, etc.); (4) Experienced postpartum massive hemorrhage (estimated blood loss ≥ 1000 milliliters) or required blood transfusion treatment; (5) Had third-degree or higher perineal lacerations; (6) History of allergy to moxa paste; (7) And those whose key observation indicators in medical records are not fully recorded.

Treatment method

Method operation

In terms of treatment methods, both groups of pregnant women received the standard postpartum care protocol, which included regular monitoring of vital signs, perineal wound care, encouragement for early ambulation and standardized urination management.

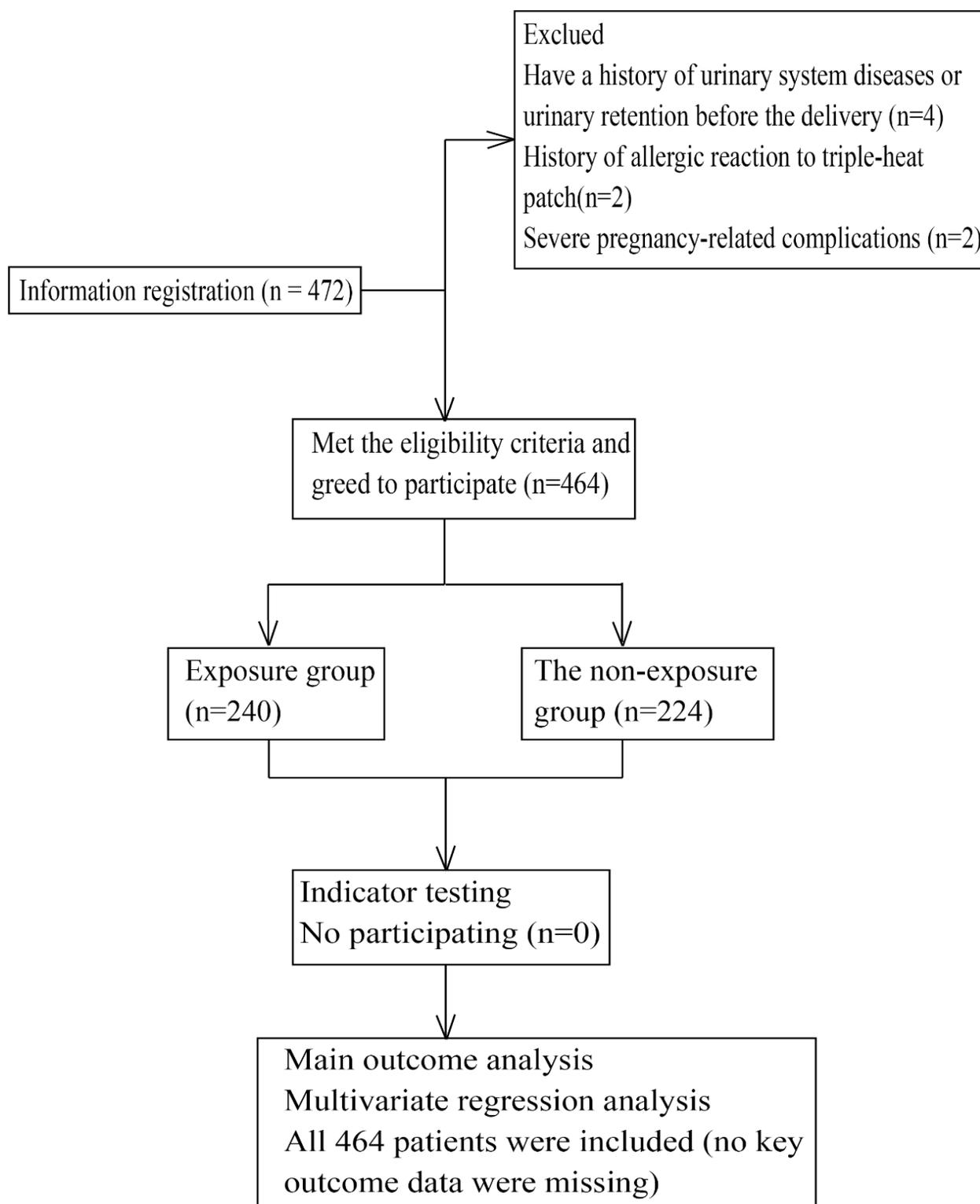


Fig. 1: Flowchart In this study, through a retrospective analysis, women who underwent vaginal delivery and received epidural analgesia and met the criteria were divided into the combined intervention group and the conventional care group based on whether they actually received moxibustion combined with acupoint application after delivery. Subsequently, the differences in core indicators such as the incidence of postpartum urinary retention and the time of the first spontaneous urination between the two groups were systematically compared to evaluate the preventive effect of this combined intervention plan.

The urination management measures for the non-exposure group mainly consisted of urging the postpartum women to urinate at regular intervals (such as reminding and assisting the women to try to urinate every 2 hours), providing a private urination environment, and using behavioral induction methods such as listening to running water sounds or washing the perineum with warm water. On this basis, the exposure group began receiving combined moxibustion and acupoint application 2 hours after delivery (Liu and Chien 2023).

(1) *Acupuncture and acupoint plaster application*: Explain in detail to the parturient the purpose, process, and possible warm sensations of the operation, obtain their informed consent, and cooperation. Assist the parturient to assume a comfortable supine position, slightly bend the legs, relax the abdomen, expose the acupuncture sites (Shenque acupoint, Qihai acupoint), and cover other areas with a blanket to keep warm. Confirm the acupoints using the international standard for acupoint positioning. Shenque acupoint is in the center of the navel; Qihai acupoint is in the lower abdomen, on the anterior midline, 1.5 inches below the navel (approximately equal to two horizontal fingers of the patient's own body measurement). It adopts a clock-seat type single-hole warm Moxibustion Box; manufacturer: [Bohai Sea (Tianjin) Medical Technology Co., Ltd., BH-01]. The standard moxa stick (18mm × 200mm; Nanyang Wanbei Aicheng factory) was ignited and fixed in the moxibustion box. Lightly ignite the clean mugwort stick. The operator holds the mugwort stick and positions the end of the mugwort fire against the acupoint to be treated, keeping 2 to 3 centimeters from the skin surface for smoldering. It is advisable for the parturient to feel warm and comfortable without burning pain. During the operation, ask the parturient about their sensations at any time and adjust the distance of the mugwort stick promptly according to their sensations to prevent burns. Treat the Shenque and Qihai acupoints one by one, each continuously for 15 minutes. After the acupuncture treatment, insert the mugwort stick into the extinguishing bottle to completely extinguish it. Use a piece of gauze to gently wipe the skin of the acupuncture site.

(2) *Traditional Chinese medicine patch formula*: After the moxibustion is completed, maintain the position and prepare for the patch application. The patch medication is made by grinding equal parts of astragalus, atractylodes, and camphor into extremely fine powder (through a 100-mesh sieve). All medicinal materials were purchased from Hunan Qianjin Medicinal Materials Co., Ltd. and were stored in sealed containers. When using, take an appropriate amount of the powder, mix it with fresh ginger juice to form a thick paste. The consistency of the paste should be such that when pressed, it forms a ball and does not fall apart when touched. Locate the acupuncture points according to the prescribed positions. Besides the already located Shenque point and Qihai point, add the Guanyuan point (3 inches below the navel) and the bilateral Shuidao

points (3 inches below the navel, 2 inches lateral to the anterior midline). Take an appropriate amount of the prepared ointment (about 1-1.5 grams), roll it into a circular cake with a diameter of approximately 1 centimeter, and place it in the center of the sterile, anti-allergic patch. Then apply it to the acupuncture points, gently pressing the edges to make it fixed and flat. Check if all the patches are firmly attached and instruct the parturient to keep the application area dry. Prepare the ointment immediately with ginger juice. Mold it into a circular ointment cake with a diameter of approximately 1 centimeter, place it in the center of the special anti-allergic adhesive tape (Guangzhou Unique Medical Co., Ltd.), and apply it on the corresponding acupoints. Fix it with a sterile patch at the corresponding acupuncture points and leave it for 4 - 6 hours before removing it by itself. This treatment is administered once daily for 2 consecutive days (Chen *et al.*, 2023).

(3) *Sitz bath method*: The parturient sits on the toilet, with the operator on the right side of the parturient. The left hand supports the parturient's right shoulder blade, and the thumb of the right hand is placed on the diuresis acupoint. Perform a counter-clockwise massage for about 10 seconds. Then, from the abdomen downward and backward, start with light pressure and gradually increase the intensity, pressing in a progressive manner. Let the parturient relax and urinate freely during the pressing process. Repeat this process until the bladder is emptied.

(4) In this study, a portable bladder scanner (Verathon BVI 9400) was used to standardize the measurement of the residual urine volume (PVR) of all the parturients. The PVR measurement was conducted within 5 minutes after the parturient reported having completed the first voluntary urination. The parturient was in the standard supine position, with the legs naturally straightened, and the lower abdomen was fully exposed. The operator (a trained nurse) applied an adequate amount of coupling agent on the scanner probe. The probe was placed longitudinally above the pubic symphysis, with the probe marking point facing the parturient's head. After maintaining the probe perpendicular to the skin and applying slight pressure to ensure good contact, the scan button was pressed. The instrument would automatically perform the first scan. Subsequently, the probe angle was slightly adjusted (slightly tilted to the left or right), and the second and third scans were conducted. The instrument would automatically calculate and display the average residual urine volume (mL) of the three scans, which was recorded as the final PVR value.

All the intervention measures are carried out by a fixed group of specially trained obstetric nurses. The training includes standard acupoint positioning method, operation norms, and safety precautions for moxibustion, as well as the process of preparing and applying ointment. After the training, a unified assessment is conducted to ensure the

consistency of the operation techniques. Each treatment was recorded by a nurse on a standardized nursing record sheet. Detailed records were maintained for all protocol deviations, including premature self-removal of the moxibustion device by participants or unscheduled interruptions of treatment. During the study period, patients in the intervention group were more than 95% compliant with the protocol, and no serious treatment bias occurred.

Treatment duration and treatment course

(1) *Treatment timing*: The initiation time of the first treatment is of vital importance. To achieve early prevention, all treatments are performed within 2 hours of delivery.

(2) *Treatment frequency and duration*: The combined treatment of moxibustion and acupoint application is performed once daily. Considering that postpartum urinary retention typically occurs within 6 to 12 hours after delivery, the treatment course in this study is set to a continuous 2-day regimen to ensure coverage of the high-risk period.

Notes for attention

To ensure the safety and effectiveness of the treatment, the following precautions must be strictly followed during the operation:

(1) *Strict screening of contraindications*: Before treatment, the condition of the pregnant woman needs to be evaluated. Absolute contraindications include: damage, ulceration, edema, redness, swelling, or unknown rashes on the skin at the acupuncture site; the pregnant woman has a clear history of allergy to the smoke of mugwort, ginger, or the applied drugs (Astragalus, Atractylodes, Benzoin); the pregnant woman has high fever, coma, or unconsciousness. Relative contraindications require cautious assessment or delayed treatment, such as extreme fatigue, extreme hunger, or overfullness of the pregnant woman.

(2) *Prevent scalding*: During the acupuncture process, the operator must be present throughout, maintain concentration, constantly remove the mugwort ashes, and ask the pregnant woman about her feelings. Do not fix the mugwort stick in one place; it can be slightly rotated. For pregnant women with dulled sensation (such as those whose anesthesia has not completely subsided), be extra vigilant. In necessary cases, the operator can place a finger beside the acupoint to sense the temperature.

(3) *Skin care and allergy observation*: Before applying the patch, it is necessary to confirm that the skin is intact. Inform the pregnant woman and her family that mild redness, itching, and warmth may occur after patch application, which is a normal drug-penetration reaction. However, if there is obvious pain, unbearable itching, blisters, or widespread redness, immediately remove the patch by yourself and report to the researchers. The patch

application time should not be too long; remove it according to the specified time (4 - 6 hours).

(4) *Individualized principle and priority of comfort*: Throughout the entire treatment process, the comfort of the parturient should always be the primary principle. If the parturient experiences any discomfort during the treatment, such as palpitations, nausea, or fever, the operation should be immediately halted, and the parturient should be allowed to rest. Warm water should be provided for consumption. If necessary, the treatment should be terminated based on the situation.

(5) *Record and report*: Detailed records should be kept of the start and end times of each treatment, the parturient reactions, and any adverse events. For any adverse reactions that occur, their manifestations, handling measures, and outcomes should be truthfully recorded, and an analysis should be conducted.

Efficacy evaluation

The efficacy evaluation of the indicators focuses on preventing postpartum urinary retention as the core objective.

Main evaluation indicators

Incidence of postpartum urinary retention: assessed at 6 hours after delivery. The diagnostic criteria are as follows: Any of the following conditions can be used to diagnose postpartum urinary retention; (1) Inability to urinate voluntarily: Unable to urinate voluntarily within 6 hours after delivery; (2) Abnormal residual urine volume in the bladder: Although able to urinate voluntarily within 6 hours after delivery, a portable bladder scanner is used to measure the residual urine volume (Postvoid Residual Volume, PVR) immediately after urination and $PVR \geq 150$ mL. The number of cases meeting the above diagnostic criteria in both groups is recorded, and the incidence rate (%) for each group is calculated.

Postpartum urinary retention (PPUR) was used as the primary outcome measure. The diagnostic criteria for PPUR were: Inability to urinate spontaneously within 6 hours after delivery, or urinary residual volume ($PVR \geq 150$ mL measured by a portable bladder scanner (b-us) after spontaneous urination (Avondstondt, Hidalgo and Salamon 2020).

The choice of six hours postpartum as the time point for the assessment was based on the following reasons: First, a number of international guidelines and expert consensus recommended that women should not urinate for more than six hours after giving birth (Divakova et al., 2022); Bladder function should be evaluated during this period. Second, setting the assessment threshold at 6 hours would satisfy both the clinical need for early monitoring and intervention of bladder function and the 6-8-hour diagnostic window common in domestic clinical practice (Nutaitis et al., 2023b).

Secondary evaluation indicators

(1) *Time of first voluntary urination*: Record the interval from the delivery of the fetus to the first successful voluntary urination by the mother. Record it precisely in hours. The shorter the interval, the faster the bladder function recovers.

(2) *Residual urine volume after urination*: For mothers who can urinate voluntarily within 6 hours postpartum, measure the residual urine volume (PVR) using a portable bladder scanner within 5 minutes after their first urination. Record the measurement value in milliliters (mL). The lower the residual urine volume, the higher the bladder emptying efficiency and the better the functional recovery.

(3) *Rate of indwelling catheterization*: The proportion of cases that eventually require indwelling catheterization after experiencing urinary retention (diagnosed according to the above criteria) and ineffective use of behavioral induction and other methods. Record the number of cases requiring indwelling catheterization in both groups and calculate the catheterization rate (%) for each group. This indicator directly reflects the severity of urinary retention and the need for clinical intervention.

(4) *Assessment of clinical symptom improvement*: Evaluate the relief of subjective feelings such as lower abdominal distension and difficulty in urination after childbirth. Use the numerical rating scale (NRS) or classify them as "none, mild, moderate, severe" for assessment. Ask and record at time points such as 6 hours and 24 hours after childbirth, and compare comfort between the two groups of mothers.

Safety evaluation indicators

(1) *Incidence of adverse events*: Any adverse events that may be related to the intervention during or after treatment were closely observed and recorded. These include: Burns, scalds, and redness on moxibustion sites; skin irritation, itching, rashes, blisters, and any other unanticipated discomfort at the point of application. The type, incidence, severity, treatment, and outcome of adverse events were recorded in detail, and the causal relationship between adverse events and intervention measures was analyzed.

Efficacy evaluation criteria

After the research is completed, the therapeutic effect of each parturient can be comprehensively evaluated according to the following standards:

(1) *Complete recovery*: Urination is smooth within 6 hours after delivery, and the residual urine volume measured by B-ultrasound is less than 50 mL, and the abdominal distension pain disappears completely.

(2) *Effective*: Able to urinate on their own within 6 hours after delivery, but with some difficulty, or the residual urine volume is between 50 and 150 mL after urination, and the abdominal distension pain is significantly relieved.

(3) *Ineffective*: Unable to urinate on their own within 6 hours after delivery, or the residual urine volume is ≥ 150

mL, and catheterization is required. The clinical symptoms do not improve or even worsen.

Sample size calculation

Sample size estimation for this study was conducted using G*Power. Based on the primary outcome measure (the incidence of postpartum urinary retention), data from the study by Gaiying Cui *et al.* (Cui *et al.*, 2022) were used. It was estimated that the incidence of urinary retention in the non-exposed group would be approximately 14.67%, and the incidence in the exposed group was expected to be reduced to 5.67%. With $\alpha = 0.05$ (two-sided) and $\beta = 0.1$ (efficiency = 80%), using the formula for comparing two independent sample rates, it was calculated that each group would need at least 156 patients, and the minimum total sample size would be 317. Considering the possibility of missing medical records in retrospective studies, the sample size was expanded to at least 224 patients per group. This study ultimately included 464 patients (240 in the exposed group and 224 in the non-exposed group), meeting the sample size estimation requirements, and the actual test efficacy was higher than 80%.

Statistical analysis

The statistical analysis methods were carried out using professional statistical software. Firstly, descriptive analysis was conducted on the baseline data of the two groups of parturients. Quantitative data (such as age, gestational weeks, duration of labor and neonatal weight) were expressed as mean \pm standard deviation and the differences between the groups were compared using the independent sample t-test; qualitative data (such as the incidence of postpartum urinary retention, secondary outcome indicators and the incidence of skin adverse reactions) were expressed as the number of cases (percentage) and the differences between the groups were compared using the chi-square test. To accurately assess the impact of the combined intervention measures on the risk of postpartum urinary retention, after comparing the unadjusted crude rates between the two groups, a multivariable logistic regression analysis was conducted. Variables that may have confounding effects (such as maternal age, gestational weeks, duration of labor, neonatal weight and whether assisted delivery) were included in the model for adjustment to calculate the adjusted odds ratio and its 95% confidence interval. The Hosmer-Lemeshow test was used to evaluate model calibration. $p > 0.05$ indicated no significant difference between the predicted and observed probabilities. Variance expansion factor (VIF) was used to diagnose multicollinearity between independent variables. The VIF for all variables was < 2.0 , well below the commonly used cut-off value of 5, indicating that the collinearity problem was not serious and would not affect model stability. To validate the robustness of the results of the master model described above, we performed the following sensitivity analyses: Propensity score matching (PSM): We used whether to accept the joint intervention as the outcome variable; logistic regression

was used to calculate the propensity score for each patient. Subsequently, nearest-neighbor matching (calliper value = 0.02) was performed in a 1:1 ratio, and the difference in urinary retention incidence between the two groups was compared after successful matching. In order to evaluate the generalizability of the model, we used the leave-one-out method to validate the main logistic regression model internally. All statistical analyses were performed using two-tailed tests and differences were considered statistically significant if the P value was less than 0.05. For key outcome variables (such as incidence of postpartum uroschisis, time to first urination, and residual bladder output), if missing, the case was considered unavailable for primary outcome analysis and excluded. For categorical covariates, such as parity, the case was excluded from the multivariate model if it could not be inferred from medical records (i.e., the analysis was based on complete cases).

Ethical statement

This research plan has been reviewed and approved by the Suzhou University Affiliated Second Hospital Ethics Review Committee and approved [approval number: (2023)-12-A. This study is a retrospective study. All data are derived from the historical medical and nursing records archived in the hospital's electronic medical record system. The research process does not interfere with the original clinical diagnosis and treatment procedures, nor does it impose additional physical burdens or risks on the subjects. This study strictly adheres to the principle of confidentiality. All collected data are anonymized and analyzed only as numbers. Any information that may identify the patient (such as name, hospital number, ID number, contact information, etc.) is masked to ensure patient privacy is fully protected. This study was retrospective in design, and all analyses were based on de-identified historical medical records. The research process did not interfere with the original clinical diagnosis and treatment and posed no additional risks to the patients. Given the above circumstances and in accordance with the provisions of the Helsinki Declaration regarding the use of identifiable patient data for research, the ethics committee approved the exemption from obtaining the patients' informed consent. We undertake to strictly keep all patient data confidential and only use anonymized datasets during the analysis process.

RESULTS

Comparison of baseline information between the two groups of patients

Statistical analysis; Demographic characteristics: The age distribution of the two groups of mothers was similar. The average age of the exposed group was (29.75 ± 4.80) years and that of the non-exposed group was (29.71 ± 4.82) years ($t = 0.089$, $p = 0.929$). The overall average age was (29.73 ± 4.82) years, indicating that the population in this study was mainly composed of women of childbearing age. **Pregnancy and delivery characteristics:** The average

gestational weeks of the two groups were highly similar (exposed group: (38.98 ± 4.62) weeks vs. non-exposed group: (38.94 ± 4.52) weeks) and the overall average gestational week was (38.96 ± 1.82) weeks, which belongs to full-term pregnancy. In addition, indicators such as parity (proportion of primiparas: exposed group 77.08% vs. non-exposed group 76.79%), the duration of the first and second stages of labor, etc., showed no significant differences ($p > 0.05$). **Neonatal characteristics:** The birth weight of the newborns in the two groups was comparable (exposed group: (3.32 ± 0.40) kg vs. non-exposed group: (3.27 ± 0.30) kg), indicating that this important factor of fetal size was balanced between the groups. On all collected baseline characteristics, these included demographic characteristics (age, body mass index), obstetric characteristics (parity, gestational age, oxytocin use), duration of labor, epidural analgesia characteristics (total dose of ropivacaine, catheterization rate during labor), neonatal weight and comorbidities (gestational diabetes mellitus), there was no significant difference between the two groups (all $p > 0.05$), as shown in Table 1. This indicates that the two patient groups were balanced and comparable at the start of the study.

The incidence of postpartum urinary retention in the two groups of patients

In terms of the main outcome indicators, the incidence of postpartum urinary retention in the exposed group was 11.67% (28/240), significantly lower than that in the non-exposed group, which was 25.89% (58/224) and the difference was statistically significant ($\chi^2 = 15.530$, $p < 0.001$). The results of this study demonstrate that, compared with conventional treatment, the addition of moxibustion combined with acupoint application therapy significantly reduces the incidence of postpartum urinary retention in women receiving epidural analgesia, as shown in Table 2. Based on the primary outcome, the absolute risk difference was 14.22%, indicating that acupoint application reduced the absolute risk of postpartum urinary retention by 14.22 percentage points. The number of patients to be treated is $NNT = 7$, which means that, in clinical practice, each pair of 7 parturients receiving epidural analgesia can prevent 1 additional case of postpartum uroschisis by using this moxibustion combined with an acupoint application program.

Comparison of secondary indicators between the two groups of patients

In terms of secondary outcome indicators, the first spontaneous urination time of the exposed group of parturients was significantly earlier than that of the non-exposed group [(3.52 ± 1.21) hours vs. (5.37 ± 1.67) hours, 95% CI: (-2.114, -1.586), $t = -13.776$, $p < 0.001$]. The residual urine volume in the bladder after the first urination in the exposed group was also significantly less than that in the non-exposed group [(85.63 ± 31.74) mL vs. (128.95 ± 45.21) mL, 95% CI: (-50.41, -36.23), $t = -12.009$, $p < 0.001$]. Additionally, the indwelling catheterization rate in

the exposed group (4.17%) was significantly lower than that in the non-exposed group (11.16%) ($\chi^2 = 8.127$, $p = 0.004$), as shown in Table 3. The shorter initial urination time, less residual urine volume and lower catheterization rate collectively support the comprehensive effectiveness of the combined treatment. As shown in Table 4, at 6 hours postpartum, the NRS score for lower abdominal distension pain in the exposed group (2.15 ± 0.87) was significantly lower than that in the non-exposed group (3.94 ± 1.67) and the difference was statistically highly significant ($p < 0.001$). Although there was no difference in the baseline pain level before the intervention (2 hours postpartum) between the two groups of women, the degree of pain relief in the exposed group was significantly greater. Regarding the subjective perception of urinary difficulty, 81.25% of women in the exposed group reported "no/mild" difficulty with urination after treatment, significantly higher than in the non-exposed group (55.80%). On the contrary, only 2.92% of the women in the exposed group still felt "severe" difficulty, a proportion much lower than that in the non-exposed group (10.71%). Statistical tests showed that the differences in urinary difficulty distribution after treatment between the two groups were statistically significant ($p < 0.001$). Lower abdominal distension, pain and urinary difficulty are the most direct and painful symptoms of postpartum urinary retention for women. The reduction of nearly 2 points in the NRS score and the significant improvement in the degree of urinary difficulty mean that this therapy greatly enhances the immediate comfort of women, alleviates anxiety and fear caused by urinary disorders and has a positive promoting effect on early psychological adjustment and the emotional connection between mother and baby after childbirth.

The incidence of skin adverse reactions in the two groups of patients

In the exposed group, 3 cases (1.25%) of the parturients experienced mild skin adverse reactions (manifested as mild redness and itching at the application site), and all of them relieved spontaneously within 24 hours without special treatment. In the non-exposed group, no such adverse reactions occurred. There was no statistically significant difference in the incidence of adverse reactions between the two groups ($P = 0.093$), as shown in Table 5.

Multivariate logistic regression analysis

After conducting a multivariate regression analysis, it was found that receiving the combined treatment of moxibustion and acupoint application was an independent risk factor ($OR = 0.393$, $p = 0.005$), indicating that the risk of developing PPUR significantly decreased after receiving the combined treatment of moxibustion and acupoint application, as shown in Table 6.

DISCUSSION

Postpartum urinary retention (PPUR), a frequent complication following vaginal delivery, is clinically defined as the inability to void spontaneously within six

hours after childbirth or a post-void residual bladder volume exceeding 150 mL (Plöger *et al.*, 2024b). This condition leads to considerable maternal discomfort, including abdominal distension, pain, and emotional distress, while adversely affecting early postpartum recovery and mother-infant bonding. Furthermore, PPUR represents a well-established risk factor for urinary tract infections, potential long-term bladder dysfunction, and postpartum hemorrhage (Schrey-Petersen *et al.*, 2021). The widespread adoption of epidural analgesia is valued for its effective pain management during labor (Jiang *et al.*, 2023), concurrently influencing pelvic floor physiology and voiding reflexes. Local anesthetics administered via epidural block sacral nerve conduction, suppressing detrusor muscle reflexes and diminishing bladder sensation, thereby elevating the risk of urinary retention (Cao *et al.*, 2022). Epidemiological studies report a substantially higher incidence of PPUR among women receiving epidural analgesia compared to those without such intervention (Li *et al.*, 2023; Miyamoto *et al.*, 2024), highlighting the necessity of developing targeted preventive strategies for this patient population.

Current clinical management of postpartum urinary retention primarily involves routine nursing measures, including scheduled voiding prompts and techniques such as auditory stimulation or warm perineal irrigation to induce micturition, with catheterization reserved for confirmed cases. These approaches predominantly represent reactive management rather than proactive prevention. Furthermore, catheterization introduces not only procedural discomfort and anxiety but also elevates the risk of urinary tract infections (Li *et al.*, 2023). Consequently, developing an effective, non-invasive, and well-tolerated preventive strategy for high-risk patients receiving epidural analgesia would yield substantial practical value in optimizing perinatal outcomes and elevating obstetric care standards. Within this clinical context, traditional Chinese medicine techniques are gaining recognition in obstetric care. Moxibustion and acupoint application therapy offer particular promise as non-invasive modalities characterized by operational simplicity, favorable safety profiles and good patient acceptance (Gao *et al.*, 2024). From a traditional medicine perspective, postpartum urinary retention typically corresponds to "dysuria" patterns, primarily arising from qi and blood deficiency following delivery, leading to impaired bladder function (Lixia *et al.*, 2022). The insertion of epidural catheters may be considered an external factor that potentially disrupts meridian circulation. Moxibustion delivers thermal stimulation to specific acupoints to warm channels and promote qi flow, while acupoint application uses herbal formulations to provide sustained stimulation via transdermal absorption. These approaches offer complementary pathways for addressing postpartum voiding dysfunction. (Chen *et al.*, 2023).

Table 1: Comparison of baseline information between the two groups of patients

Baseline	Exposure group (n = 240)	Non-exposure group (n = 224)	Test	95%CI		Effect size	p -value	
				Lower	Upper			
Age	29.75 ± 4.80	29.71 ± 4.82	T test	-0.838	0.918	0.089	0.929	
Gestational weeks (weeks)	38.98 ± 4.62	38.94 ± 4.52	T test	-0.797	0.872	0.088	0.930	
Number of births (n, %)	<i>First-time mother</i>	185 (77.08)	172 (76.79)	Chi- squared		0.006	0.939	
	<i>Non-first- time mother</i>	55 (22.92)	52 (32.21)					
First stage of labor (h)	8.59 ± 2.62	8.72 ± 2.54	T test	-0.602	0.342	-0.541	0.589	
The second stage of labor (min)	51.87 ± 10.54	52.85 ± 13.25	T test	-3.166	1.186	-0.894	0.372	
Newborn weight (kg)	3.32±0.40	3.27±0.30	T test	-0.011	0.119	1.626	0.105	
BMI	26.62±3.38	26.54±3.45	T test	-1.380	1.700	1.786	0.417	
Oxytocin usage	152 (51.01)	146 (48.99)	Chi- squared			0.172	0.679	
Epidural type / Dosage	<i>Total dose of ropivacai ne (mg)</i>	84.94±17.75	86.32±18.85	T test	-0.553	0.693	0.798	0.825
	<i>Urination during childbirth</i>	219 (52.02)	202 (47.98)				0.158	0.691
Gestational diabetes	37 (54.41)	31 (45.59)				0.230	0.631	

Table 2: Comparison of the incidence of postpartum urinary retention between the two groups of patients

Parameters	Exposure group (n = 240)	Non-exposure group (n = 224)	Test	χ^2	p -value
The incidence of postpartum urinary retention	28 (11.67)	58 (25.89)	Chi-squared	15.530	<.001

Table 3: Comparison of secondary outcomes between the two groups of patients

Parameters	Exposure group (n = 240)	Non-exposure group (n = 224)	Test	95%CI		t/ χ^2	p - value
				Lower	Upper		
First time of voluntary urination (hours)	3.52 ± 1.21	5.37 ± 1.67	T test	-2.114	-	-	<.001
Post-micturition residual urine volume in the bladder (mL)	85.63 ± 31.74	128.95 ± 45.21	T test	-50.41	-	-	<.001
Rate of indwelling catheterization	10 (4.17)	25 (11.16)	Chi- squared			8.127	0.004

Table 4: Comparison of clinical efficacy between the two groups of patients

Parameters		Exposure group (n = 240)	Non-exposure group (n = 224)	Test	95%CI		t/ χ^2	p-value
					Lower	Upper		
Lower abdominal distension and pain NRS score	Before intervention (T1)	5.82 ± 1.75	5.79 ± 1.81	T test	-0.294	0.354	0.182	0.856
	After the intervention (T2)	2.15 ± 0.87	3.94 ± 1.67	T test	-2.029	-1.547	-14.584	<.001
Degree of difficulty in urination	Before intervention (T1)							
	No / minor	35 (14.58)	32 (14.29)		Chi-squared		0.018	0.991
	Moderate	125 (52.08)	118 (52.68)					
	Severe	80 (33.33)	74 (33.04)					
	After the intervention (T2)							
	No / Minor	195 (81.25)	125 (55.80)			36.241	<.001	
Moderate	38 (15.83)	75 (33.48)						
Severe	7 (2.92)	24 (10.71)						

Note: T1 refers to 2 hours after delivery, and T2 refers to 6 hours after delivery.

Table 5: The rate of skin adverse reactions in the two groups of patients

Parameters		Exposure Group (n = 240)	Non-exposure group (n = 224)	Test	χ^2	p-value
The incidence rate of skin disorders	Mild redness/itching	3 (1.25)	0 (0.00)	Chi-squared	2.818	0.093
	Blisters/burns	0 (0.00)	0 (0.00)			
	Local infection	0 (0.00)	0 (0.00)			
	Systemic reaction, n (%)	0 (0.00)	0 (0.00)			
	Other, n (%)	0 (0.00)	0 (0.00)			

Table 6: Multivariate logistic regression analysis

Parameters	B	Wald χ^2	df	OR	95% CI		p-value	VIF
					Lower	Upper		
Acupuncture combined with acupoint application therapy	-0.935	8.055	1	0.393	0.206	0.749	0.005	1.829
First time of voluntary urination (hours)	-0.056	0.221	1	0.946	0.751	1.192	0.638	2.333
Post-micturition residual urine volume in the bladder (mL)	0.002	0.262	1	1.002	0.994	1.011	0.609	2.159
Rate of indwelling catheterization	-0.088	0.042	1	0.915	0.391	2.143	0.839	1.027
Lower abdominal distension and pain NRS score (T ₂)	0.049	0.369	1	1.050	0.897	1.230	0.543	1.388
Degree of difficulty in urination (T ₂)	No / Minor	0.020	2	-	-	-	0.720	1.096
	Moderate	0.067	0.020	1	1.069	0.427	2.680	0.887
	Severe	-1.142	2.209	1	0.841	0.315	2.242	0.729

Note: The Hosmer-Lemeshow goodness-of-fit test was used to assess the goodness-of-fit of the logistic regression model, with χ^2 being 4.926 and p being 0.765.

Recent investigations have examined individual applications of moxibustion or acupoint therapy for postpartum urinary retention. For instance, Li *et al.*, (Li *et al.*, 2021), demonstrated that moxibustion alone can shorten time to first void, potentially through enhanced local circulation and neural recovery, while it is reported that acupoint application facilitates transdermal drug delivery to modulate bladder function (Tang *et al.*, 2023). However, these investigations typically feature limited sample sizes and seldom focus specifically on the high-risk epidural analgesia population. Although randomized controlled trials offer methodological rigor, their controlled conditions may not fully represent effectiveness in routine clinical settings. Consequently, combining the two modalities and evaluating their efficacy using real-world data represents a substantial advancement in this research domain. This study introduces an innovative approach by integrating moxibustion with acupoint application therapy as a combined preventive intervention for high-risk parturients receiving epidural analgesia. Through a large-scale retrospective cohort design, we systematically evaluated this combined modality's effect on both objective measures (including postpartum urinary retention incidence, time to first void, post-void residual volume and catheterization rates) and subjective symptoms (such as lower abdominal distension and voiding difficulty). This comprehensive assessment provides multidimensional evidence of the intervention's clinical utility through analysis of real-world data. The core finding of this study is that the combined intervention group significantly reduced the risk of urinary retention. What is particularly important is that we introduced two indicators: absolute risk difference (ARD = 14.22%) and the number needed to treat (NNT = 7). These provide intuitive and powerful evidence for clinical decision-making. NNT = 7 indicates that this prevention plan has extremely high clinical efficiency and cost-effectiveness. This figure is far superior to many medical preventive intervention measures and strongly supports its promotional value in clinical practice. The research results show that the incidence of postpartum urinary retention in the exposed group was 11.67%, significantly lower than 25.89% in the non-exposed group, and the difference was statistically highly significant ($\chi^2 = 16.817$, $p < 0.001$). It is consistent with the trend of previous studies on the prevention of postpartum voiding dysfunction through physical therapy, but it has expanded on the specific pathway of action. A 2022 paper reported that the point application of Tongniao plaster combined with hot compress could reduce the positive rate of urinary retention, but the intervention group still needed basic hot compress and acupuncture (Robinson 2022). In contrast, the scheme integrated moxibustion and acupoint application into a synergistic intervention, showing a better preventive effect. In contrast, the scheme integrated moxibustion and acupoint application into a synergistic intervention, showing a better preventive effect. This synergistic effect may arise from the physiologically

promoting mechanism of dual-mode intervention on the recovery of bladder function: sustained warm stimulation generated by moxibustion can promote vasodilation in the pelvic region by activating local thermoreceptors, improve the blood flow of the bladder wall to relieve the tissue edema and temporary nerve sexual dysfunction caused by prolonged labor and pressure on the fetal head, it may have a mild regulatory effect on the local nerve endings and further promote the early recovery of the contractile consciousness of the urinary muscle (Tang *et al.*, 2025; Yu, Wang and Wu 2024). Although there are no prospective studies fully consistent with this joint program, this result is consistent with the overall chain of evidence for physiotherapy in postpartum pelvic recovery. The intervention strategy in this field has advanced from single mode to a new level of multi-target co-regulation. In secondary outcome indicators, the first spontaneous urination time of the parturients in the exposed group was significantly earlier than that of the non-exposed group [3.52 ± 1.21 h vs. 5.37 ± 1.67 h, 95%CI: (-2.114, -1.586), $t = -13.776$, $p < 0.001$] and the residual urine volume in the bladder after the first urination in the exposed group was also significantly less than that in the non-exposed group [(85.63 \pm 31.74) mL vs. (128.95 \pm 45.21) mL, 95%CI: (-50.41, -36.23), $t = -12.009$, $p < 0.001$]. In addition, the rate of indwelling catheterization in the exposed group was significantly lower than that in the non-exposed group. This finding is supported by several studies focusing on the recovery of postpartum lower urinary tract function. For example, Authors (Guo *et al.*, 2024) also reported in their Randomized controlled trial that patients who used moxibustion in combination with acupoint application had earlier first micturition than patients in the single-intervention group, but their research focused on patients who had developed urinary retention. In this study, the intervention window was positioned in the prevention phase, highlighting the potential of the combined regimen to promote early natural recovery of bladder function. From a neurophysiology point of view, the Local anesthetic used in epidural analgesia temporarily blocks the conduction of the sacral (S2-S4) parasympathetic nervous system fibers, resulting in decreased awareness of the contractility of the urethral muscle and blunted bladder sensation (Linfield-Brown, Khullar and Cardozo 2025). In this study, the selected abdominal acupoints, such as Shenque and qihai, were anatomically located in the deep where the Pelvic splanchnic nerves and inferior ventral nerve plexus were located. The heat radiation effect of moxibustion and the continuous stimulation of application may regulate the coordination between detrusor and internal urethral sphincter through the surface-visceral reflex pathway, thus partially counteracts the neuroinhibitory effects of epidural anesthesia (Wang *et al.*, 2022). In addition, some studies suggest that similar interventions may further affect the relaxation-contraction cycle of bladder smooth muscle by modulating the release of mediators such as local nitric Oxide (NO) and

prostaglandin E2 (PGE 2), however, it still needs to be verified by urodynamic indexes and molecular biological tests in follow-up studies (Ridlon, Tlapa and Stietz 2025).

The intervention group demonstrated substantial improvement in clinical symptoms. At 6 hours postpartum, these patients showed a significantly greater reduction in abdominal distension scores than the non-exposed group, despite comparable baseline levels. Regarding voiding difficulty, 81.25% of intervention patients reported no or mild symptoms, compared with 55.8% in controls ($\chi^2 = 36.241, p < 0.001$), while only 2.92% reported severe difficulty, compared with 10.71% in the non-exposed group. These subjective improvements aligned with objective measures, confirming that the combined therapy enhances both functional recovery and patient comfort. After adjusting for confounding factors such as the mother's age, parity, duration of the second stage of labor, newborn weight, use of oxytocin, and total dose of epidural analgesic drugs, the adjusted odds ratio (Adjusted OR) of the multivariate regression analysis was 0.393. This indicates that, after excluding the influence of other factors, the risk of postpartum urinary retention in women who received the combined intervention was only 39.3% of that in women who did not receive this intervention. In other words, the risk was significantly reduced by 60.7%. This is a very significant and clinically meaningful protective effect. This finding provides a new perspective for the prevention of postpartum uroschisis: The use of non-pharmacologic, non-invasive physical interventions while focusing on obstetric management, it is expected to be an effective supplement to optimize the process of rapid postpartum rehabilitation. Although the present study was designed retrospectively and could not rigorously control for all potential confounding variables as rigorously as a randomized controlled trial, the findings are consistent with some physiological theories and clinical research evidence. Future studies could include urodynamic monitoring, pelvic electrophysiological assessment, and more sophisticated detection of inflammatory mediators, which is expected to reveal the specific pathway and key target of acupuncture combined with acupoint application for bladder function recovery. However, all these symptoms resolved spontaneously within 24 hours without the need for special treatment. This incidence rate is similar to results from previous studies on the external application of traditional Chinese medicine, indicating that the safety of this combined treatment is good and the risks are manageable ($p = 0.093$). Of course, in future clinical applications, individual differences still need to be considered. Those who are allergic to the application's components should use it with caution or avoid it altogether.

Limitations

This study has some limitations, which should be carefully considered when interpreting its results. First, the inherent limitations of its retrospective design are the main constraints to our conclusions. Although we did our best to

control known confounding variables through multivariate regression and sensitivity analyses, the possibility of residual confounding or unmeasured confounders cannot be ruled out. For example, we were unable to measure and adjust for factors such as maternal baseline bladder function, fluid intake during labor, or the frequency with which nurses urge urination; these unmeasured confounders may have influenced our results.

Second, the possibility of confounding indications cannot be completely ruled out. Although baseline characteristics were balanced between the two groups, the clinical pathway (EG, nurse schedule, resource availability) that determines which maternal to receive the combined intervention may be associated with certain unknown prognostic factors. Again, this is a single-center study with some specificity in patient population, standards of care, and procedures, which may limit the extrapolation of our findings to other medical settings. Finally, although we report good safety, surveillance for adverse events relies on medical record maintenance, and there may be cases of incomplete records or underestimation.

CONCLUSION

In conclusion, this study, based on a large sample of clinical data, has confirmed that the combination of moxibustion and acupoint application is a highly effective traditional Chinese nursing method that can significantly reduce the incidence of postpartum urinary retention in patients receiving epidural anesthesia, promote the early recovery of bladder function, and ensure safety. This combined therapy not only improves objective indicators but also significantly alleviates patients' subjective symptoms, enhancing their postpartum quality of life. This study provides high-quality clinical evidence for the combination of traditional Chinese and Western medicine in preventing postpartum urinary retention and is worthy of clinical application and promotion. Our findings point to several important directions for future investigation. To establish causality, a multicenter randomized controlled trial with standardized protocols is needed. Further mechanistic studies should incorporate urodynamic parameters and relevant biomarkers to clarify the physiological pathways involved. Additionally, formal cost-effectiveness analysis comparing this therapy to standard care would strengthen the case for its clinical implementation. Finally, extending follow-up to 6 weeks or 3 months postpartum would help determine the longevity of the observed benefits on voiding function and pelvic floor health.

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None

Authors' contributions

Hong Wei: Developed and planned the study, performed experiments and interpreted results. Edited and refined the manuscript with a focus on critical intellectual

contributions; Jianhong Xue: Participated in collecting, assessing and interpreting the data. Made significant contributions to date interpretation and manuscript preparation; Xiaying Zhang: Provided substantial intellectual input during the drafting and revision of the manuscript.

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Data availability statement

The data supporting the findings of this study are available from the corresponding author upon request.

Ethical approval

This research plan has been reviewed and approved by the Suzhou University Affiliated Second Hospital Ethics Review Committee. [(No. (2023)-12-A)].

Conflict of interest

The authors declare that they have no conflicts of interest.

Consent to participate

We secured a signed informed consent form from every participant.

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