





Original Research

Retrospective Analysis of Influencing Factors of Intrauterine Adhesions After Hysteroscopic Resection for Endometrial Polyps and Construction of a Nomogram Prediction Model

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Abstract

Background: This study aimed to explore the factors influencing the development of intrauterine adhesions (IUA) in patients with endometrial polyps (EP) following hysteroscopic resection. We also aimed to construct a nomogram model to predict the risk of postoperative IUA and validate its predictive accuracy. **Methods:** We conducted a retrospective analysis of data from 322 EP patients treated at our hospital between July 2022 and June 2024. The patients were randomly divided into a modeling group ($n = 248$) and a verification group ($n = 74$). Based on whether IUA occurred after hysteroscopic resection, the modeling group was further categorized into an IUA group and a non-IUA group. Data from the modeling group were collected and compared between the two subgroups. We used logistic regression to identify the factors contributing to postoperative IUA. The nomogram model was built using R software, and internal validation was conducted using receiver operating characteristic (ROC) curves, calibration curves, and decision curves. Additionally, we performed external validation using the verification group. **Results:** The incidence of postoperative IUA in the modeling group was 20.56% (51/248). Logistic regression analysis revealed that the use of intrauterine devices, history of pelvic inflammatory disease, previous curettage, history of pregnancy termination, and surgical duration were significant risk factors for the development of postoperative IUA ($p < 0.050$). The area under the curve (AUC) for both the modeling and verification groups was 0.815 (95% CI: 0.753–0.876) and 0.808 (95% CI: 0.747–0.870), respectively. The calibration curve indicated that the predicted probability of IUA occurrence closely matched the actual observed values. The decision curve analysis demonstrated that the predictive model had strong clinical applicability. **Conclusions:** The nomogram model, based on five independent risk factors—use of intrauterine devices, history of pelvic inflammatory disease, previous curettage, history of pregnancy termination, and surgical duration—has shown good predictive performance and significant clinical utility in assessing the risk of postoperative IUA in EP patients.

Keywords: endometrial polyps; hysteroscopic resection; intrauterine adhesions; influencing factors; nomogram

1. Introduction

Endometrial polyps (EP) are a common condition in gynecology, characterized by the hyperplasia of connective tissue in the basal layer of the endometrium, resulting in pedunculated growths that protrude into the uterine cavity. Symptoms can include abnormal uterine bleeding, and some patients may experience infertility, which can significantly impact their daily life [1,2]. Surgery is the primary treatment for EP, with hysteroscopic resection being favored in clinical practice due to its advantages of low invasiveness, minimal pain, and rapid postoperative recovery [3]. Despite being a minimally invasive procedure with less trauma compared to traditional surgery, intrauterine adhesions (IUA) may still occur postoperatively. Postoperative IUA can lead to menstrual disorders, pregnancy termination, and infertility [4]. Therefore, preventing IUA after surgery in EP patients is crucial. Current clinical research on postoperative IUA in EP patients mainly focuses on identifying the factors that contribute to its occurrence. To prevent IUA, strategies such as early second-

look hysteroscopy and the use of hormones to accelerate endometrial repair have been adopted. However, due to the lack of individualized risk prediction studies, the precision of these preventive measures remains limited. Recently, nomograms have emerged as valuable tools for predicting risk by integrating multiple variables and visualizing their relationships with risk events. This approach helps in identifying high-risk populations and enables more precise prevention strategies [5,6]. This study aims to construct a nomogram prediction model for the occurrence of IUA after hysteroscopic resection in EP patients, with the goal of enhancing the ability to prevent and control IUA. The report is presented as follows.

2. Materials and Methods

2.1 Clinical Data

We conducted a retrospective analysis of the data from patients with EP treated at our hospital between July 2022 and June 2024. The inclusion criteria were: ① diagnosis of EP according to relevant diagnostic criteria [7]; ② indi-



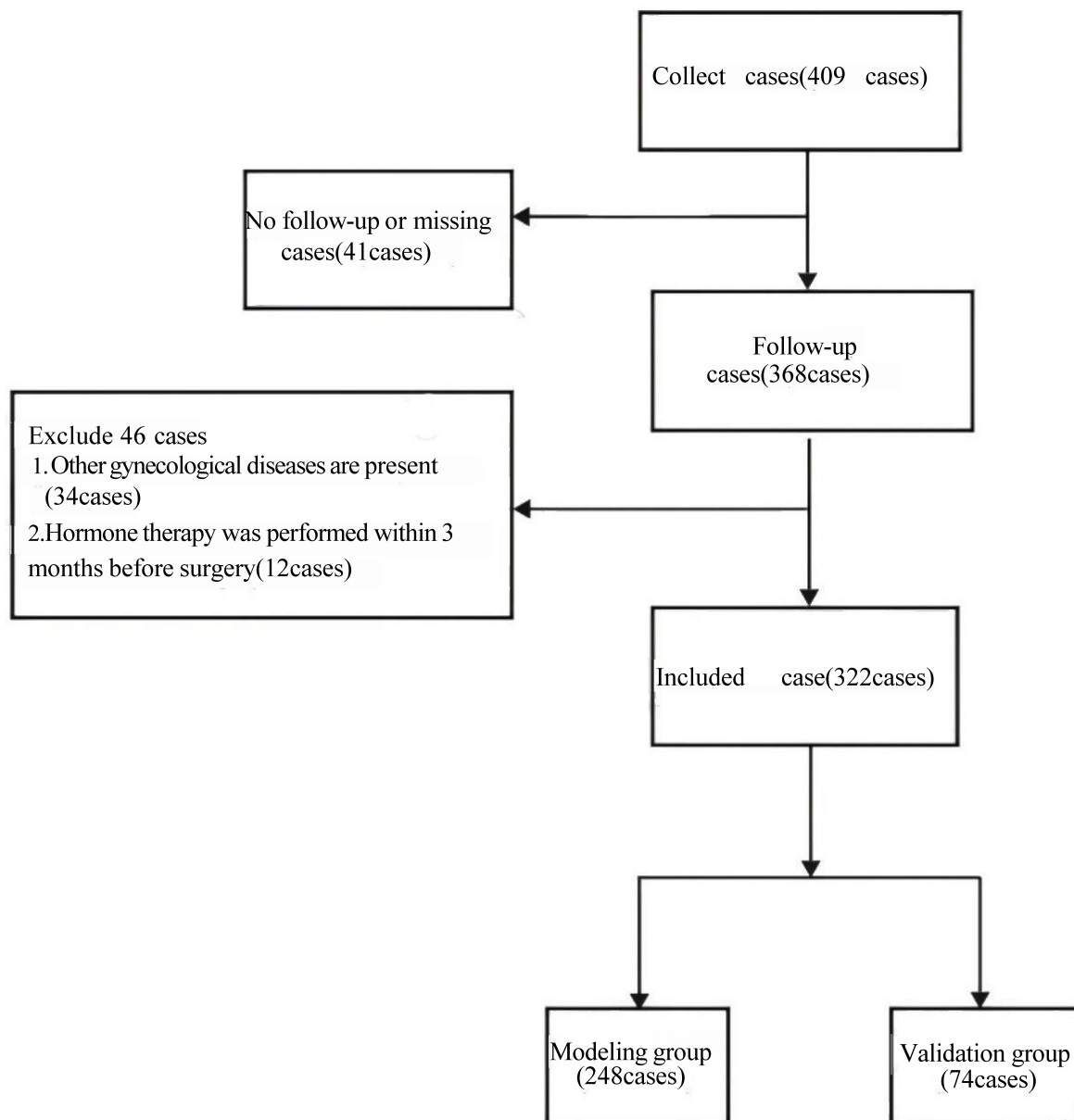


Fig. 1. Flow chart of subjects.

cations for hysteroscopic resection; ③ clear consciousness and no cognitive abnormalities; ④ complete clinical data available. The exclusion criteria were: ① presence of other gynecological diseases such as uterine fibroids; ② inability to tolerate hysteroscopic surgery due to severe systemic diseases; ③ abnormal immune system or associated infections; ④ hormonal therapy within the last 3 months prior to surgery; ⑤ women who are pregnant or breastfeeding. This study adhered to ethical medical standards.

2.2 Surgical Methods

The hysteroscopic resection of EP was performed by the same surgical team. The surgery was scheduled 3 to 5 days after the end of the menstrual period. The procedure was as follows: the patient was positioned in the lithotomy

position, and routine disinfection of the surgical area was performed. Anesthesia was administered, and once it took effect, a speculum was inserted, followed by dilation of the cervix to 9–10 mm. A hysteroscope was then inserted to examine the uterine cavity, assessing the location, number, and base width of the polyps. The polyp tissue was excised using an electro-surgical knife along the vascular base of the polyp, ensuring the surrounding normal endometrium was preserved. Finally, the uterine cavity was irrigated. Post-operatively, prophylactic antibiotics were administered for 1 day.

2.3 Determination and Grouping of IUA

A hysteroscopic examination was performed on all patients 6 months after their operation, to assess the pres-

Table 1. Comparison of data between the modeling group and the verification group.

Index	Modeling group (n = 248)	Verification group (n = 74)	χ^2/t value	<i>p</i> value
Age (years)			0.507	0.776
<30	52 (20.97)	13 (17.57)		
30–40	121 (48.79)	39 (52.70)		
>40	75 (30.24)	22 (29.73)		
Course of disease (years)	2.78 ± 0.69	2.85 ± 0.73	0.756	0.450
Body mass index (kg/m ²)	22.97 ± 3.02	22.81 ± 2.97	0.401	0.688
Complication				
Hypertension	69 (27.82)	23 (31.08)	0.297	0.586
Diabetes	46 (18.55)	11 (14.86)	0.531	0.466
Pregnancy times (times)			0.102	0.749
≤2	166 (66.94)	51 (68.92)		
>2	82 (33.06)	23 (31.08)		
Reproductive demand			0.383	0.536
Yes	134 (54.03)	43 (58.11)		
No	114 (45.97)	31 (41.89)		
Using contraceptive devices			0.322	0.570
Yes	103 (41.53)	28 (37.84)		
No	145 (58.47)	46 (62.16)		
History of pelvic inflammatory disease	63 (25.40)	21 (28.38)	0.262	0.609
History of cesarean section				
History of dilation and curettage (D&C)	98 (39.52)	26 (35.14)	0.462	0.497
History of pregnancy termination	61 (24.60)	21 (28.38)	0.429	0.512
History of polyps	69 (27.82)	24 (32.43)	0.590	0.443
Endometrial hyperplasia	92 (37.10)	25 (33.78)	0.270	0.603
Polyp diameter (cm)			0.238	0.626
≤1	106 (42.74)	34 (45.95)		
>1	142 (57.26)	40 (54.05)		
Number of polyps			0.582	0.446
Single shot	153 (61.69)	42 (56.76)		
Multiple	95 (38.31)	32 (43.24)		
Polyp location			2.099	0.552
Anterior wall	61 (24.60)	19 (25.68)		
Posterior wall	68 (27.42)	16 (21.62)		
Sidewall	63 (25.40)	17 (22.97)		
Cornu	56 (22.58)	22 (29.73)		
Operation time (min)	36.02 ± 4.34	35.78 ± 4.16	0.421	0.674
Intraoperative blood loss (mL)	19.70 ± 3.51	19.33 ± 3.29	0.807	0.420

ence of IUA. The criteria for determining IUA were as follows [8]: ① symptoms such as reduced menstrual flow or even amenorrhea, and periodic abdominal pain; ② hysteroscopic examination revealing central adhesions (anteroposterior wall adhesions with widened ends, with the occlusion of the uterine horn or loss of uterine cavity symmetry), peripheral adhesions (appearing as semi-curtain or crescent-shaped, with the occlusion of the uterine horn or loss of uterine cavity symmetry), and mixed adhesions (small obstructed cavities). Based on the presence or absence of IUA, the patients were divided into the IUA group and the non-IUA group.

2.4 Data Collection

Data were collected from our hospital's electronic medical records system, including age, disease duration, body mass index (BMI), comorbidities, number of pregnancies, fertility desires, use of intrauterine devices (IUDs), history of pelvic inflammatory disease, history of cesarean section, history of dilation and curettage (D&C), history of pregnancy termination, history of polyp disease, endometrial hyperplasia status, polyp diameter, number of polyps, location of polyps, surgery duration, and intraoperative blood loss.

Table 2. Comparison of baseline data between the IUA group and non-IUA group in the modeling group.

Index	IUA group (n = 51)	Non IUA group (n = 197)	χ^2/t value	<i>p</i> value
Age (years)			0.919	0.632
<30	9 (17.65)	43 (21.83)		
30–40	24 (47.06)	97 (49.24)		
>40	18 (35.29)	57 (28.93)		
Course of disease (years)	2.84 ± 0.71	2.76 ± 0.63	0.787	0.432
Body mass index (kg/m ²)	23.17 ± 3.14	22.92 ± 2.97	0.529	0.597
Complication				
Hypertension	16 (31.37)	53 (26.90)	0.403	0.526
Diabetes	12 (23.53)	34 (17.26)	1.054	0.305
Pregnancy times (times)			0.509	0.475
≤2	32 (62.75)	134 (68.02)		
>2	19 (37.25)	63 (31.98)		
Reproductive demand			2.063	0.151
Yes	23 (45.10)	111 (56.35)		
No	28 (54.90)	86 (43.65)		
The use of contraceptive devices			7.905	0.005
Yes	30 (58.82)	73 (37.06)		
No	21 (41.18)	124 (62.94)		
History of pelvic inflammatory disease	20 (39.22)	43 (21.83)	6.464	0.011
History of cesarean section	21 (41.18)	64 (32.49)	1.358	0.244
History of D&C	31 (60.78)	67 (34.01)	12.151	<0.001
History of termination of pregnancy	19 (37.25)	42 (21.32)	5.547	0.019
History of polyps	17 (33.33)	52 (26.40)	0.971	0.324
Endometrial hyperplasia	24 (47.06)	68 (34.52)	2.731	0.098
Polyp diameter (cm)			2.322	0.128
≤1	17 (33.33)	89 (45.18)		
>1	34 (66.67)	108 (54.82)		
Number of polyps			1.253	0.263
Single shot	28 (54.90)	125 (63.45)		
Multiple	23 (45.10)	72 (36.55)		
Polyp location			4.838	0.184
Anterior wall	14 (27.45)	47 (23.86)		
Posterior wall	11 (21.57)	57 (28.93)		
Sidewall	18 (35.29)	45 (22.84)		
Cornu	8 (15.69)	48 (24.37)		
Operation time (min)	38.21 ± 4.68	35.45 ± 4.08	4.174	<0.001
Intraoperative blood loss (mL)	20.35 ± 3.75	19.53 ± 3.36	1.516	0.131

IUA, intrauterine adhesions.

2.5 Statistical Methods

Data were analyzed using SPSS 25.0 software (IBM Corp., Armonk, NY, USA). Continuous variables that followed a normal distribution were described as mean ± standard deviation (SD) ($\bar{x} \pm s$) and analyzed using *t*-test. Categorical variables were described as [n (%)] and analyzed using χ^2 test. Logistic regression analysis was performed to identify factors influencing the occurrence of IUA in EP patients postoperatively. Variable selection was carried out using the stepwise forward selection method, with variables which had a *p*-value < 0.100 in univariate analysis being included in the multivariate model. A nomogram model for predicting IUA occurrence was constructed using the rms package in R software version 4.3.2 (R Foundation for Sta-

tistical Computing, Vienna, Austria). Receiver operating characteristic (ROC) curves were plotted, and the area under the curve (AUC) was calculated to evaluate the model's discrimination ability. The calibration curve was used to assess the model's consistency, and decision curve analysis was performed to evaluate its clinical applicability. A *p*-value of <0.050 was considered statistically significant.

3. Results

3.1 Basic Information of EP Patients and Postoperative Incidence of IUA

In this study, a total of 409 EP patients were initially collected from the electronic medical record system. After excluding 41 cases lost to follow-up, 46 cases were

Table 3. Univariate analysis of postoperative IUA occurrence in EP patients in the modeling group.

Index	OR (95% CI)	<i>p</i> value
Age	1.019 (0.535–1.942)	0.954
Course of disease	0.942 (0.510–1.740)	0.849
Body mass index	0.981 (0.534–1.801)	0.951
Hypertension	0.975 (0.535–1.776)	0.934
Diabetes	0.842 (0.423–1.675)	0.624
Pregnancy times	0.978 (0.532–1.799)	0.943
Reproductive demand	1.601 (0.909–2.821)	0.103
Using contraceptive devices	3.217 (1.780–5.815)	<0.001
History of pelvic inflammatory disease	2.792 (1.503–5.187)	0.001
History of cesarean section	1.201 (0.658–2.192)	0.551
History of D&C	3.498 (1.966–6.224)	<0.001
History of pregnancy termination	2.679 (1.406–5.105)	0.003
History of polyps	1.372 (0.759–2.480)	0.295
Endometrial hyperplasia	1.594 (0.891–2.853)	1.594
Polyp diameter	1.023 (0.553–1.893)	0.942
Number of polyps	0.984 (0.529–1.832)	0.984
Polyp location	1.296 (0.702–2.394)	0.407
Operation time	2.816 (1.558–5.090)	0.001
Intraoperative blood loss	1.503 (0.846–2.669)	0.164

OR, odds ratio; 95% CI, 95% confidence interval; EP, endometrial polyps.

Table 4. Assignment of independent variables.

Independent variable	Assignment instructions
The use of contraceptive devices	No = 0, Yes = 1
History of pelvic inflammatory disease	No = 0, Yes = 1
History of D&C	No = 0, Yes = 1
History of pregnancy termination	No = 0, Yes = 1
Surgical time	Actual measurement value

further excluded based on the exclusion criteria (34 cases with other gynecological diseases and 12 cases who had received hormonal treatment within the 3 months before their surgery). Ultimately, 322 EP patients were included in the study. These patients were randomly divided into a modeling group ($n = 248$) and a validation group ($n = 74$). A flowchart of the participants is shown in Fig. 1. In the modeling group of 248 patients, 51 developed IUA postoperatively, with an incidence rate of 20.56%. In the validation group of 74 patients, 14 developed IUA postoperatively, with an incidence rate of 18.92%.

3.2 Comparison of Data Between the Modeling Group and the Validation Group

There were no significant differences in the data between the modeling group and the validation group ($p > 0.050$), as shown in Table 1.

3.3 Comparison of Baseline Data Between the IUA Group and Non-IUA Group in the Modeling Group

In the IUA group, there were significant differences compared to the non-IUA group in terms of the use of IUDs,

history of pelvic inflammatory disease, history of D&C, history of pregnancy termination, and surgical duration ($p < 0.050$), as shown in Table 2.

3.4 Univariate Analysis of Postoperative IUA Occurrence in EP Patients in the Modeling Group

Univariate analysis showed that factors potentially associated with the occurrence of postoperative IUA in EP patients included the use of intrauterine devices, history of pelvic inflammatory disease, history of D&C, history of pregnancy termination, and surgical duration ($p < 0.050$), as shown in Table 3.

3.5 Multivariate Logistic Regression Analysis of IUA Occurrence in EP Patients After Hysteroscopic Resection

Using the occurrence of IUA (no = 0, yes = 1) in EP patients after hysteroscopic resection as the dependent variable and the five factors identified as potentially significant in the univariate analysis (Table 3) as independent variables (assignments shown in Table 4), a multivariate logistic regression analysis was conducted. Variable screening was performed using the stepwise forward method. It was found that the use of intrauterine devices (OR = 5.316), history

Table 5. Multivariate logistic regression analysis of IUA occurrence in EP patients after hysteroscopic resection.

Variable	β value	SE	Wald χ^2	p value	OR value	95% CI
The use of contraceptive devices	1.671	0.430	15.127	<0.001	5.316	2.290–12.336
History of pelvic inflammatory disease	1.401	0.443	9.987	0.002	4.059	1.702–9.678
History of D&C	1.670	0.419	15.917	<0.001	5.314	2.339–12.073
History of pregnancy termination	1.257	0.426	8.706	0.003	3.514	1.525–8.097
Surgical time	0.139	0.044	9.785	0.002	1.149	1.053–1.254
constant	-8.887	1.742	26.015	<0.001	<0.001	-

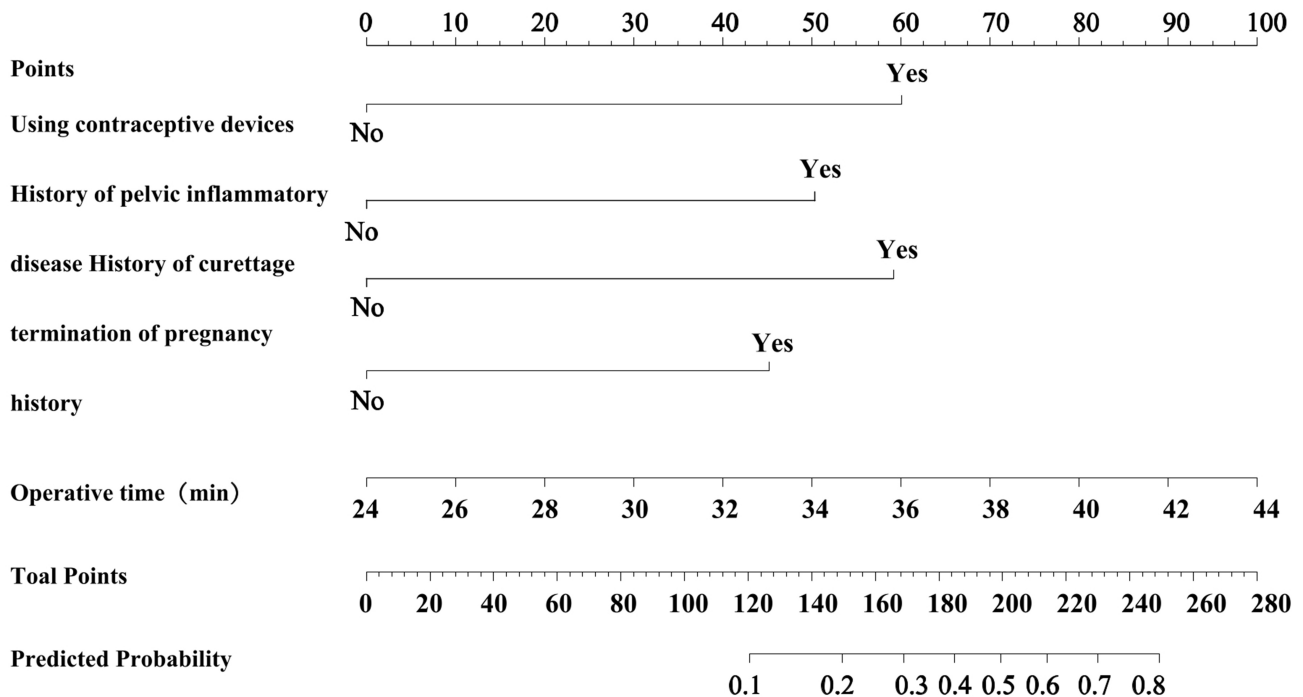


Fig. 2. Construction of nomogram model for IUA occurrence after hysteroscopic resection in EP patients.

of pelvic inflammatory disease (OR = 4.059), history of D&C (OR = 5.314), history of pregnancy termination (OR = 3.514), and surgical duration (OR = 1.149) were influencing factors for the occurrence of IUA in EP patients post-operatively ($p < 0.050$), as shown in Table 5.

3.6 Construction of a Nomogram Model for IUA Occurrence in EP Patients After Hysteroscopic Resection

A nomogram model was developed based on five key factors to predict the occurrence of IUA in patients with EP following hysteroscopic resection. The following points were assigned for each factor: 60 points for the use of intrauterine devices, 50.5 points for history of pelvic inflammatory disease, 59 points for history of D&C, 45 points for history of pregnancy termination, and for surgical duration, every additional 2 minutes beyond the baseline surgical time of 24 minutes, 10 points were assigned. When the score reached 44 points, the maximum score (100 points) was achieved. The total score corresponds to the predicted probability of IUA occurrence in EP patients after surgery, as shown in Fig. 2.

3.7 Internal Validation of the Nomogram Model

Internal validation showed that the model's predicted AUC was 0.815 (95% CI: 0.753–0.876), with a sensitivity and specificity of 80.40% and 70.10%, respectively (see Fig. 3A). The calibration curve demonstrated good fit (see Fig. 3B), and the Hosmer-Lemeshow (HL) test yielded $\chi^2 = 9.598$, $p = 0.294$, suggesting excellent predictive performance of the model. The decision curve analysis showed that the net benefit was highest when the model's threshold probability ranged from 6% to 78% (see Fig. 3C).

3.8 External Validation of the Model

External validation showed that the model's predicted AUC was 0.808 (95% CI: 0.747–0.870), with a sensitivity and specificity of 86.30% and 65.00%, respectively (see Fig. 4A). The calibration curve demonstrated good fit (see Fig. 4B), and the Hosmer-Lemeshow (HL) test yielded $\chi^2 = 9.701$, $p = 0.282$, indicating excellent predictive performance of the model. The decision curve showed that the net benefit was higher when the threshold probability of the model was between 8% and 77% (see Fig. 4C).

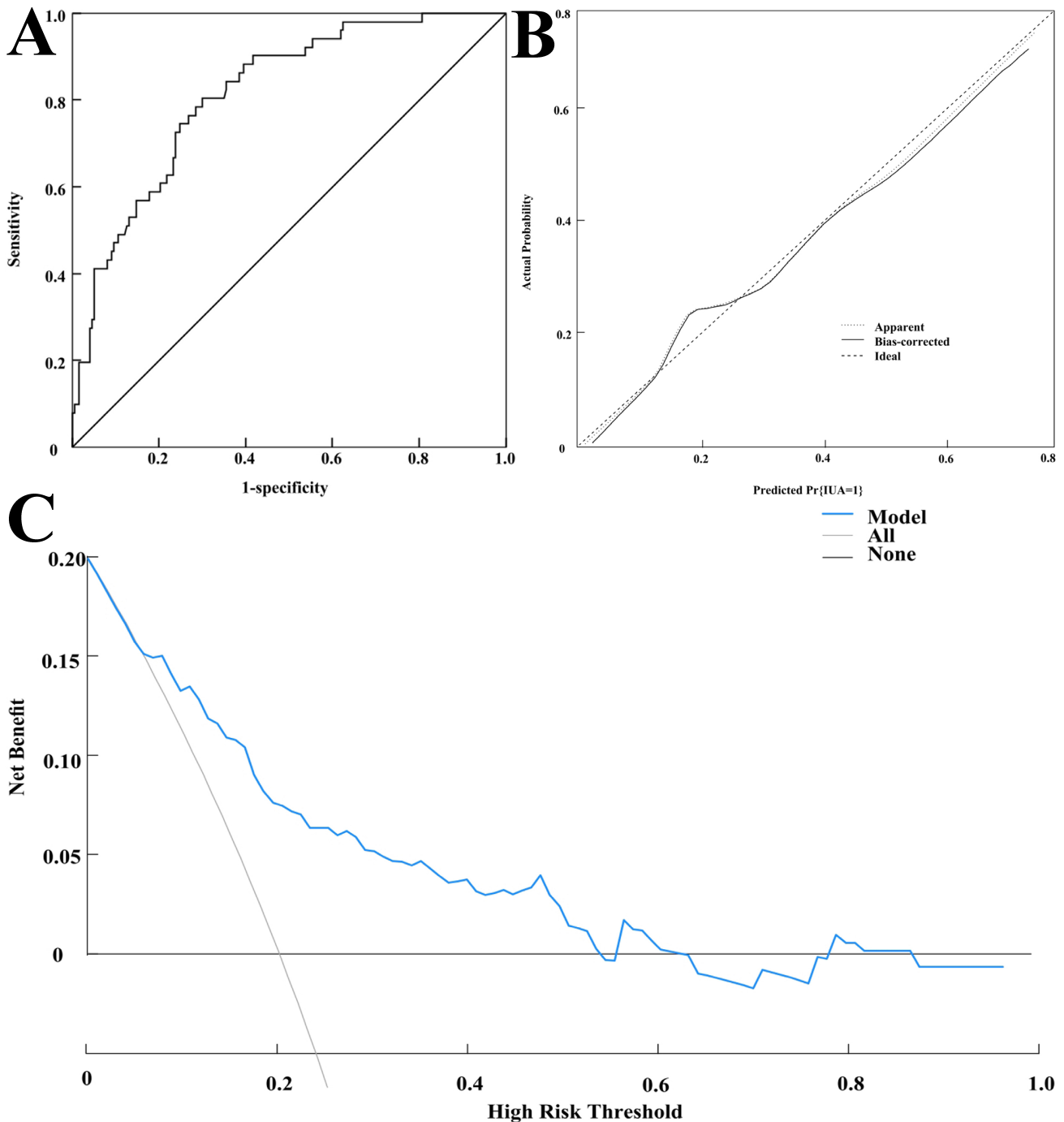


Fig. 3. Internal validation of the nomogram model. (A) Receiver operating characteristic (ROC) curve for internal validation of the model. (B) Calibration curve for internal validation of the model. (C) Decision curve of the modeling group.

4. Discussion

EP can occur in individuals of any age after adolescence and is associated with a variety of factors, including endocrine disorders, obesity, and inflammatory stimuli [9]. Hysteroscopic resection, which removes pathological tissues with minimal trauma, is the preferred treatment for EP. However, intraoperative manipulations during the procedure may lead to IUA. In this study, the incidence of postoperative IUA among 248 EP patients was found to be

20.56%, which aligns with the postoperative IUA incidence rates of 18%–25% reported by Takasaki *et al.* [4]. Patients with IUA often experience reduced menstrual flow or even amenorrhea, and severe cases may lead to infertility or adverse pregnancy outcomes [10,11]. Therefore, it is necessary to identify factors associated with postoperative IUA in EP patients and predict individual risks to enable targeted interventions.

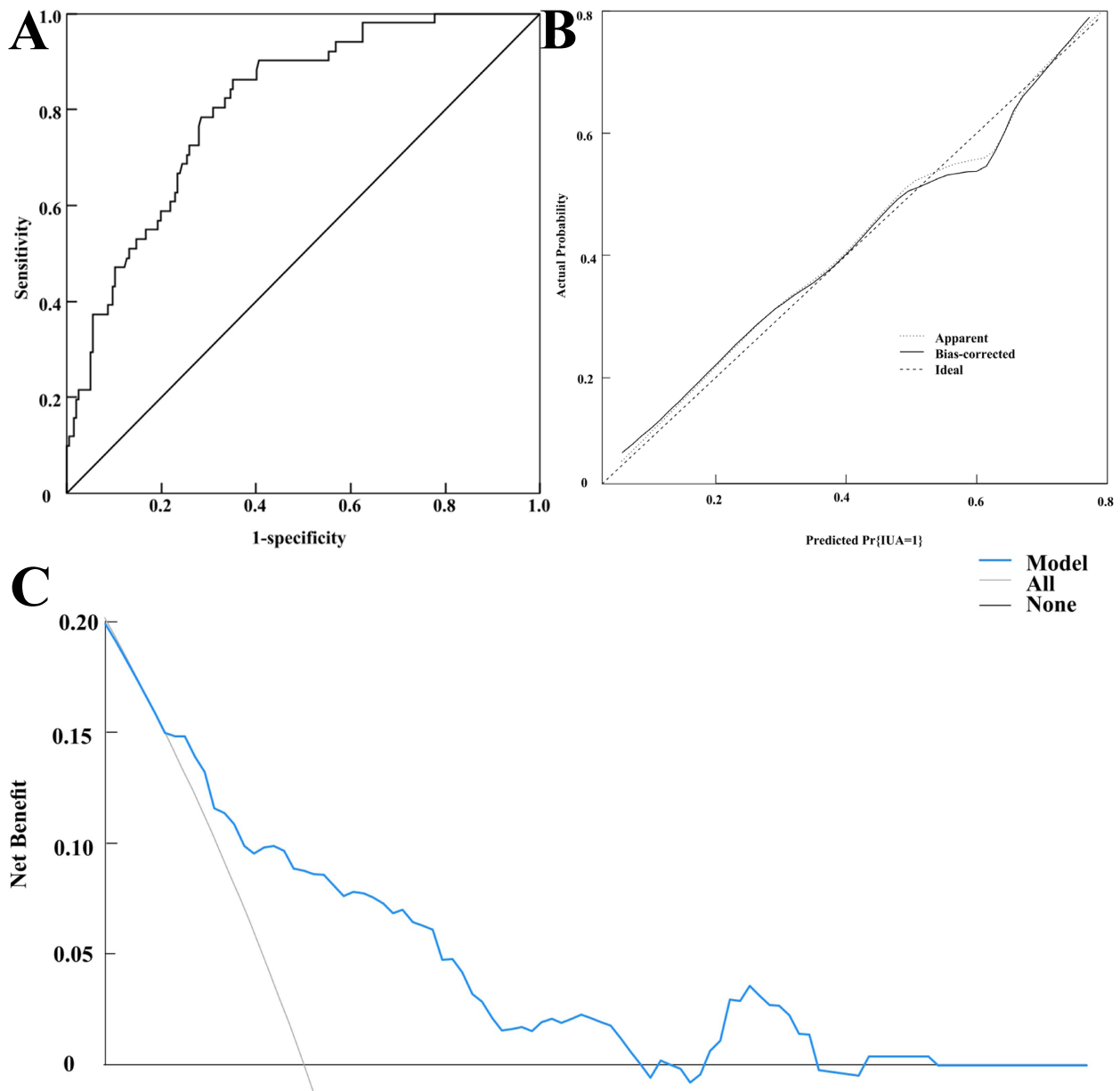


Fig. 4. External validation of the model. (A) ROC curve for external validation of the model. (B) Calibration curve for external validation of the model. (C) Decision curve of the verification group.

Our study found that the use of IUDs, history of pelvic inflammatory disease (PID), history of D&C, history of pregnancy termination, and surgical duration were significantly associated with postoperative IUA in EP patients. The mechanisms behind these associations are as follows: (1) IUDs can irritate the endometrium, reduce the activity of lytic enzymes, induce abnormal collagen fiber proliferation, and promote tissue scarring. These effects, combined with surgical stimulation, lead to excessive production of inflammatory factors, thereby contributing to the development of IUA [12,13]. Su *et al.* [14] reported that the risk of postoperative IUA in EP patients using an IUD was 2.08 times higher than in those who did not use one, which supports our findings. Therefore, a thorough assessment of the

risks and contraceptive benefits of IUDs is essential when selecting contraceptive methods. Non-invasive methods, such as oral contraceptives, which have minimal impact on the endometrium, should be prioritized, especially for patients with high-risk factors for IUA. (2) History of PID may cause long-term uncontrolled inflammation, damaging cervical and other tissues, thereby increasing IUA risk [15]. Strengthening gynecological health education, emphasizing the prevention of sexually transmitted infections (STIs), and providing appropriate treatment for existing PID are critical for controlling inflammation and minimizing tissue damage [16,17]. (3) History of D&C can damage the endometrial basal layer due to excessive negative pressure, disrupting epithelial regeneration and leading to

inadequate endometrial coverage, which heightens the risk of IUA [18,19]. Surgeons should perform curettage gently, carefully identify lesion locations, and avoid excessive endometrial damage [20]. (4) History of pregnancy termination may impair endometrial epithelial growth and stromal cell development, predisposing patients to IUA [21,22]. (5) Prolonged surgical duration in EP patients reflects more complex conditions, severe tissue destruction, and greater surgical difficulty, resulting in higher postoperative IUA risk [23,24]. Surgeons should optimize surgical plans and shorten the surgical duration as much as possible through preoperative simulation to minimize tissue damage and improve efficiency to prevent IUA.

To accurately identify high-risk patients for postoperative IUA following hysteroscopic resection, we constructed a nomogram prediction model. Each variable in the model was assigned a score that reflects its impact on IUA risk. The total score, derived from the sum of individual scores, corresponds to the predicted probability of IUA occurrence. Our model demonstrated strong discrimination (AUC of 0.815 in the training cohort, with a sensitivity and specificity of 80.40% and 70.10%, respectively; AUC of 0.808 in the validation cohort, with a sensitivity and specificity of 86.30% and 65.00%, respectively) and calibration (Hosmer-Lemeshow test: $\chi^2 = 9.598$, $p = 0.294$ for the training cohort; $\chi^2 = 9.701$, $p = 0.282$ for the validation cohort). Decision curve analysis confirmed its clinical applicability. Limitations of this study include insufficient data collection, which may have led to incomplete screening of potential predictors, and the single-center design with a relatively small sample size, limiting the generalizability of the model. Future multicenter prospective studies with larger sample sizes are needed to further enhance the model's applicability.

5. Conclusions

The use of IUDs, history of PID, curettage, termination of pregnancy, and surgical duration are independent risk factors for postoperative IUA in EP patients after hysteroscopic resection. The constructed nomogram model effectively predicts IUA risk, providing a valuable tool for identifying high-risk patients and guiding early, precise interventions. This study's strength lies in the development of the first risk prediction model for IUA based on quantifiable indicators, demonstrating strong clinical applicability. Both internal and external validations were conducted to ensure the robustness and generalizability of the model. However, due to its single-center, retrospective nature, and the relatively small sample size, the model's applicability to other settings is limited. Therefore, future prospective multicenter studies are necessary to optimize the model and enhance its external validity.

Availability of Data and Materials

Data is available from the corresponding author on reasonable request.

Author Contributions

LL and JY designed the research study and wrote the manuscript. LL and WL performed the research. LL, WL and JY collected data, SL analyzed the data. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript. All authors agree to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

This study was conducted in accordance with the guidelines of the Declaration of Helsinki and approved by the Ethics Committee of Ganzhou Maternal and Child Health Care Hospital (approval number: 202510). Informed consent was obtained from all patients or their families/legal guardians prior to participation.

Acknowledgment

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Conflict of Interest

The authors declare no conflict of interest.

References

- [1] Vaduva CC, Constantinescu C, Serbanescu M, Dara L, Oancea MD, Carp-Veliscu A. The association between endometrial polyps, chronic endometritis, and IVF outcomes. *European Review for Medical and Pharmacological Sciences*. 2023; 27: 8895–8904. https://doi.org/10.26355/eurrev_202309_33810.
- [2] Hu Y, Xiang Y, Huang W. Endometrial polyps effect on pregnancy outcomes in infertile women with minimal/mild endometriosis: A retrospective study. *The Journal of Obstetrics and Gynaecology Research*. 2023; 49: 2946–2951. <https://doi.org/10.1111/jog.15794>.
- [3] Tekin S, Ocal A, Sisman E, Bilginer C, Cetin A. Histological assessment of endometrial polyps resected by hysteroscopy. *European Review for Medical and Pharmacological Sciences*. 2024; 28: 3241–3250. https://doi.org/10.26355/eurrev_202404_36052.
- [4] Takasaki K, Henmi H, Ikeda U, Endo T, Azumaguchi A, Nagasaka K. Intrauterine adhesion after hysteroscopic myomectomy of submucous myomas. *The Journal of Obstetrics and Gynaecology Research*. 2023; 49: 675–681. <https://doi.org/10.1111/jog.15499>.
- [5] Wang Z, Shi Y, Zhang L, Wu L, Fang Q, Huiling L. Nomogram for predicting swallowing recovery in patients after dysphagic stroke. *Journal of Parenteral and Enteral Nutrition*. 2022; 46: 433–442. <https://doi.org/10.1002/jpen.2115>.
- [6] Sun D, Yi S, Zeng F, Cheng W, Xu D, Zhao X. Developing and validating a prediction model of live birth in patients with moderate-to-severe intrauterine adhesions: a new approach with endometrial morphology measurement by 3D transvaginal ultra-

- sound. *Quantitative Imaging in Medicine and Surgery*. 2024; 14: 995–1009. <https://doi.org/10.21037/qims-23-1014>.
- [7] Raz N, Feinmesser L, Moore O, Haimovich S. Endometrial polyps: diagnosis and treatment options - a review of literature. *Minimally Invasive Therapy & Allied Technologies: MITAT: Official Journal of the Society for Minimally Invasive Therapy*. 2021; 30: 278–287. <https://doi.org/10.1080/13645706.2021.1948867>.
- [8] Li W, Li Y, Zhao X, Cheng C, Burjoo A, Yang Y, *et al.* Diagnosis and treatment of cervical incompetence combined with intrauterine adhesions. *Annals of Translational Medicine*. 2020; 8: 54. <https://doi.org/10.21037/atm.2019.12.148>.
- [9] Jee BC, Jeong HG. Management of endometrial polyps in infertile women: a mini-review. *Clinical and Experimental Reproductive Medicine*. 2021; 48: 198–202. <https://doi.org/10.5653/cerm.2020.04119>.
- [10] Sun D, Mao X, Zhang A, Gao B, Huang H, Burjoo A, *et al.* Pregnancy patterns impact live birth rate for patients with intrauterine adhesions after hysteroscopic adhesiolysis: a retrospective cohort study. *Frontiers in Physiology*. 2022; 13: 822845. <https://doi.org/10.3389/fphys.2022.822845>.
- [11] Zhang X, Liu W, Zhou Y, Qiu J, Sun Y, Li M, *et al.* Comparison of therapeutic efficacy of three methods to prevent re-adhesion after hysteroscopic intrauterine adhesion separation: a parallel, randomized and single-center trial. *Annals of Palliative Medicine*. 2021; 10: 6804–6823. <https://doi.org/10.21037/apm-21-1296>.
- [12] Abel MK, Wald K, Cedars MI, Noel M. Uterine synechiae after intrauterine device use: a case series. *Journal of Assisted Reproduction and Genetics*. 2021; 38: 2625–2629. <https://doi.org/10.1007/s10815-021-02173-6>.
- [13] Li R, Li H, Zhang J, Li H. Rectum migration of an intrauterine device. *Journal of Minimal Access Surgery*. 2021; 17: 113–115. https://doi.org/10.4103/jmas.JMAS_268_19.
- [14] Su L, You L, Huang HP. Risk Factors of Intrauterine Adhesion after Hysteroscopic Resection of Endometrial Polyps. *Zhongguo Yi Xue Ke Xue Yuan Xue Bao. Acta Academiae Medicinae Sinicae*. 2017; 39: 812–816. <https://doi.org/10.3881/j.issn.1000-503X.2017.06.013>. (In Chinese)
- [15] Chen L, Xiao S, He S, Tian Q, Xue M. Factors that impact fertility after hysteroscopic adhesiolysis for intrauterine adhesions and amenorrhea: a retrospective cohort study. *Journal of Minimally Invasive Gynecology*. 2020; 27: 54–59. <https://doi.org/10.1016/j.jmig.2018.12.023>.
- [16] Hufstetler K, Llata E, Miele K, Quilter LAS. Clinical Updates in Sexually Transmitted Infections, 2024. *Journal of Women's Health*. 2024; 33: 827–837. <https://doi.org/10.1089/jwh.2024.0367>.
- [17] Dean G, Soni S, Pitt R, Ross J, Sabin C, Whetham J. Treatment of mild-to-moderate pelvic inflammatory disease with a short-course azithromycin-based regimen versus ofloxacin plus metronidazole: results of a multicentre, randomised controlled trial. *Sexually Transmitted Infections*. 2021; 97: 177–182. <https://doi.org/10.1136/sextrans-2020-054468>.
- [18] Chung JPW, Chau OSY, Law TSM, Ng K, Ip PNP, Ng EYL, *et al.* Incidence of intrauterine adhesion after ultrasound-guided manual vacuum aspiration (USG-MVA) for first-trimester miscarriages: a prospective cohort study. *Archives of Gynecology and Obstetrics*. 2024; 309: 669–678. <https://doi.org/10.1007/s00404-023-07280-6>.
- [19] Xia W, Wang Q, Liu M, Lu S, Yu H, Yin H, *et al.* Antifouling and Injectable Granular Hydrogel for the Prevention of Postoperative Intrauterine Adhesion. *ACS Applied Materials & Interfaces*. 2023; 15: 44676–44688. <https://doi.org/10.1021/acsami.3c07846>.
- [20] Moore O, Tzur T, Vaknin Z, Rabbi ML, Smorgick N. Hysteroscopy-assisted suction curettage for early pregnancy loss: does it reduce retained products of conception and post-operative intrauterine adhesions? *Archives of Gynecology and Obstetrics*. 2024; 309: 205–210. <https://doi.org/10.1007/s00404-023-07238-8>.
- [21] Carbonnel M, Pirtea P, de Ziegler D, Ayoubi JM. Uterine factors in recurrent pregnancy losses. *Fertility and Sterility*. 2021; 115: 538–545. <https://doi.org/10.1016/j.fertnstert.2020.12.003>.
- [22] Shen M, Duan H, Chang Y, Lin Q. Prevalence and risk factors of intrauterine adhesions in women with a septate uterus: a retrospective cohort study. *Reproductive Biomedicine Online*. 2022; 44: 881–887. <https://doi.org/10.1016/j.rbmo.2022.02.004>.
- [23] Chen F, Gong YX, Xiao JJ, Jiang NH, Chen LM, Sui L. Construction and evaluation of intrauterine adhesion model in rats by different methods of mechanical injury. *Archives of Gynecology and Obstetrics*. 2023; 308: 281–290. <https://doi.org/10.1007/s00404-023-06926-9>.
- [24] Wagenaar LP, Hamerlynck TW, Radder CM, Peters LW, Weyers S, Schoot BC, *et al.* Hysteroscopic morcellation vs. curettage for removal of retained products of conception: a multicenter randomized controlled trial. *Fertility and Sterility*. 2023; 120: 1243–1251. <https://doi.org/10.1016/j.fertnstert.2023.08.956>.