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Feasibility and Safety of the Day Surgery Model for Myomectomy in Giant Uterine Myoma: A Propensity Score-Matched Study

Abstract

Background Uterine myoma is the most common benign tumor of the female reproductive system, with a prevalence of 70%–80%. Conventional myomectomy often requires 3–5 days of hospitalization; however, whether the day surgery model can be safely applied to myomectomy for giant uterine myoma (maximum myoma diameter ≥8 cm) still lacks sufficient evidence-based medical evidence.

Methods We retrospectively reviewed patients with giant uterine myoma admitted to the day surgery ward and the general ward between October 2020 and October 2025. There were 133 patients in the day surgery group and 149 in the conventional group. Following propensity score matching to balance baseline characteristics between the two groups, clinical and economic outcomes were compared. Multiple linear regression was used to identify factors associated with intraoperative blood loss and operative time, and multivariable logistic regression to identify factors associated with delayed discharge in the day surgery group.

Results After PSM, the day surgery group had less intraoperative blood loss (50 [170] vs 100 [213] mL, P=0.001), shorter operative time (130 [66] vs 150 [76] min, P=0.024), shorter hospital stay (24.00 [0.33] vs 120.00 [47.58] h, P<0.001), lower total cost (12,864.34 [2,520.49] vs 20,240.73 [4,854.74] CNY, P<0.001), and higher satisfaction (100.00% vs 92.31%, P=0.028) than the conventional group. Incidence of postoperative discomfort and postoperative complications did not differ significantly; no unplanned reoperation or unplanned readmission within 30 days occurred. Number of myomas and concomitant ovarian cystectomy were independent factors associated with intraoperative blood loss. Number of myomas, concomitant ovarian cystectomy, myoma weight, surgical approach, and BMI were independent factors associated with operative time. The delayed discharge rate was

21.80% in day surgery group; concomitant ovarian cystectomy and a greater number of myomas were independent risk factors for delayed discharge.

Conclusions Under strict patient selection, standardized ERAS protocols, and close follow-up, day surgery was safe and feasible for myomectomy in patients with giant uterine myoma. It was associated with less intraoperative blood loss, shorter operative time and hospital stay, and lower costs, without observed increases in postoperative complications or unplanned readmission.

Keywords Giant uterine myoma． Myomectomy． day surgery

Introduction

Uterine myomas are the most common benign tumors of the female reproductive system, with a prevalence of 70%–80%. For women of reproductive age who desire future fertility, myomectomy is usually the preferred uterine-sparing surgical option. However, conventional myomectomy often requires 3–5 days of hospitalization, which not only consumes substantial medical resources but also imposes a considerable burden on patients. Day surgery is defined as a model of care in which surgery or procedures are completed and the patient is discharged within one working day (i.e., within 24 h); it is a form of ambulatory surgical care and does not include procedures performed in clinics or outpatient settings [1]. Compared with conventional hospitalization, day surgery offers advantages such as greater efficiency, improved patient convenience, and lower costs [2]. Studies have shown that various gynecological procedures, including hysterectomy and myomectomy, can be safely performed in the day surgery setting [3,4]. However, whether day surgery can be applied to myomectomy for giant uterine myoma remains underexplored.

In China, a single myoma with a maximum diameter ≥8 cm is generally defined as a giant uterine myoma [5]. For such patients with larger tumor volume and increased surgical

difficulty, evidence regarding the applicability of the day surgery model to this population remains insufficient. A retrospective cohort study by Alton et al., which included 403 patients undergoing minimally invasive myomectomy (median myoma weight 204 g), showed that 88% (356 cases) achieved same-day discharge, with a 48-hour readmission rate of only 0.6% (2 cases, both due to postoperative fever), a cumulative 3-month readmission rate of 1.4% (5 cases), and no readmissions requiring reoperation or involving life-threatening conditions [6]. Another study based on the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database, which included 8,100 patients undergoing minimally invasive myomectomy, reported that the same-day discharge rates for patients with small myoma burden (≤4 myomas and ≤250 g) and large myoma burden (≥5 myomas or >250 g) were 64.6% and 56.8%, respectively; the complication rates among same-day discharge patients were 3.0% for small myoma burden and 3.5% for large myoma burden, unplanned reoperation rates were 0.2% and 0.4%, and readmission rates were 0.9% and 1.0%, respectively; all of which were low in absolute terms[7]. However, some studies have indicated that large myomas may increase the risk of delayed discharge, with risk factors including myoma weight (512.0 vs 310.1 g, $P<0.001$), myoma diameter (9.01 vs 7.77 cm, $P<0.001$), and number of myomas (6.59 vs 5.57, $P=0.021$) [8]. These findings suggest that whether day surgery can be safely implemented in patients with giant uterine myoma still requires further validation.

Currently, in China, only hysteroscopic myomectomy and ultrasound-guided myoma ablation have been reported in the day surgery setting; no studies have yet investigated day surgery for myomectomy in patients with giant uterine myoma. Therefore, this study retrospectively reviewed the clinical data of 133 patients with giant uterine myoma who underwent myomectomy under a day surgery management protocol and 149 comparable patients receiving conventional inpatient management at our hospital, in order to systematically assess the feasibility and safety of the day surgery model for this procedure. This study aims to provide preliminary evidence for the clinical implementation of day

surgery for myomectomy in patients with giant uterine myoma and to promote the rational application of the day surgery model in a broader patient population.

Methods

Study design and participants

This retrospective cohort study was conducted at Chengdu Women's and Children's Central Hospital, China. It aimed to evaluate the clinical and economic outcomes of myomectomy for giant uterine myoma under a day surgery model and to assess the feasibility and safety of this model in patients with giant uterine myoma relative to conventional inpatient care. The study population comprised patients who underwent laparoscopic or open myomectomy for giant uterine myoma between October 2020 and October 2025 in the day surgery ward and a single medical team in the general ward. Eligible patients were aged 18–65 years with uterine myoma, had American Society of Anesthesiologists (ASA) physical status I-II, a maximum myoma diameter ≥8 cm, and admission hemoglobin ≥80 g/L, were available for follow-up, had a family caregiver during the first postoperative week, and lived within a 1-hour drive of the hospital. Patients were excluded if they had severe medical or surgical comorbidities (ASA class III or higher), severe pelvic adhesions, or acute inflammation.

Data Collection

Clinical data were retrospectively retrieved from the institutional electronic medical record system. Demographic and clinical variables included age, body mass index (BMI), comorbidities, ASA physical status, and history of pelvic surgery. All included patients were ASA I–II. ASA status was fully concordant with comorbidity status (no comorbidity = ASA I; any comorbidity = ASA II); therefore, ASA status was not entered as a separate variable in the statistical analyses.

Operative variables included surgical approach; concomitant procedures (ovarian cystectomy, adhesiolysis, and intrauterine surgery); myoma characteristics (the maximum

diameter of the largest myoma, location of the largest myoma, number of myomas, and myoma weight); operative time; intraoperative blood loss; conversion to laparotomy rate; and incidence of adjacent organ injury.

Postoperative variables included length of hospital stay; incidence of postoperative discomfort (non-infectious fever, moderate-to-severe pain, nausea and vomiting, abdominal distension, and urinary irritation symptoms); incidence of postoperative complications graded according to the Clavien–Dindo classification; unplanned reoperation rate; and 30-day unplanned readmission rate. Satisfaction was assessed at the 1-month postoperative follow-up using a 5-point Likert scale and was dichotomized as satisfied ("very satisfied" or "satisfied") versus dissatisfied (all other responses).

The primary endpoints were intraoperative blood loss, operative time, conversion to laparotomy rate, incidence of postoperative discomfort, incidence of postoperative complications, unplanned reoperation rate, and 30-day unplanned readmission rate. The secondary endpoints were length of hospital stay, total cost, and satisfaction.

Day-care myomectomy pathway

The day-care pathway was adapted from our previously described institutional protocol [Frontiers in Medicine, 2025; DOI: 10.3389/fmed.2025.1625351].

A standardized institutional pathway was developed and implemented for day-care myomectomy. The pathway comprised four sequential components. First, outpatient eligibility assessment was performed by gynecologists, who confirmed the indication for uterine-preserving myomectomy and reviewed preoperative imaging and hemoglobin/iron status. Eligible patients completed preoperative testing in the outpatient setting, and an anesthesiologist independently assessed fitness for day-care surgery. Second, the operative date was scheduled through telephone, WeChat, or the online scheduling platform. Third, eligibility was reconfirmed on the day of surgery. The procedure, expected recovery course, and discharge plan were discussed with the patient, and written informed consent was obtained before surgery. surgery was performed by senior gynecologic surgeons (associate chief physician or above). Fourth, discharge readiness

was assessed on the morning of postoperative day 1 with a complete blood count. Discharge was permitted when the following criteria were met: no marked abdominal distension (flatus was not mandatory), tolerance of oral fluids or a soft diet, spontaneous voiding, acceptable vaginal bleeding, a Post-Anesthetic Discharge Scoring System (PADS) score ≥9 with stable vital signs and no more than one mildly affected PADS domain, hemoglobin ≥70 g/L, and no significant abnormality in inflammatory markers. After discharge, electronic questionnaires were administered on postoperative days 1, 3, 8, and 15; a WeChat group was used to capture adverse events during the first 14 postoperative days, with prompt review and management by follow-up physicians; and outpatient reviews were scheduled at 1 week and 1 month after surgery.

Enhanced recovery after surgery protocol

The perioperative ERAS protocol consisted of preoperative, intraoperative, and postoperative components. Preoperatively, patients fasted for 6–8 h and received a carbohydrate-containing beverage 2 h before surgery, after which they remained nil by mouth. Routine hair removal, enema, and vaginal douching were omitted. Intraoperatively, forced-air warming was used to maintain normothermia; no abdominal drain was placed routinely; and a urinary catheter was not retained postoperatively. Ketorolac 30 mg was administered intravenously 30 min before the end of surgery. After wound closure, 0.3% ropivacaine 10 mL was infiltrated for incisional analgesia. Ramosetron 0.3 mg plus dexamethasone 5 mg were administered intravenously 30 min before the end of surgery for prophylaxis of postoperative nausea and vomiting. Postoperatively, after recovery from anesthesia, patients were assisted by family members to ambulate early and were encouraged to void spontaneously. A soft diet was initiated after recovery from anesthesia. For ward analgesia, diclofenac potassium 50 mg suppositories were administered rectally twice daily; if the pain score exceeded 3, oral ibuprofen suspension 10 mL was given three times daily; intramuscular tramadol hydrochloride 50–100 mg was administered as needed. For postoperative vomiting, ondansetron oral soluble film 8 mg or intramuscular metoclopramide hydrochloride 10 mg was given. Routine postoperative intravenous fluids

were not administered.

Conventional inpatient management

The conventional group received standard inpatient perioperative care. Patients were admitted one day before surgery and completed routine preoperative work-up. Umbilical preparation was performed when a transumbilical port was planned, and oral laxatives were given when necessary. Patients fasted for 8 h before surgery. Surgery was performed by senior gynecologic surgeons. An abdominal drain was placed intraoperatively when clinically indicated. An indwelling urinary catheter and a patient-controlled analgesia (PCA) pump were used routinely. The same antiemetic regimen as that used in the day-care group was applied. Postoperatively, intravenous fluids and prophylactic antibiotics were administered for 1 day. A liquid diet was initiated after recovery from anesthesia, and a regular diet was gradually resumed after the passage of flatus. The urinary catheter was removed and ambulation was encouraged on postoperative day 1. The abdominal drain and PCA pump were removed on postoperative day 2. Patients were discharged on postoperative day 3, with a total hospital stay of approximately 5 days. The conventional group received the same follow-up schedule and assessment instruments as the day-care group.

Statistical Analysis

All analyses were performed using SPSS version 22.0. Normality of continuous variables was assessed using the Kolmogorov–Smirnov test. Normally distributed variables are expressed as mean ± standard deviation and were compared between groups using the independent-samples t test; non-normally distributed variables are expressed as median (interquartile range) and were compared using the Mann–Whitney U test. Categorical variables are expressed as frequencies (percentages) and were compared using the chi-square test or Fisher's exact test. A two-tailed P value <0.05 was considered statistically significant.

After 1:1 nearest-neighbor propensity score matching (PSM, caliper 0.05) to balance baseline characteristics, log10-transformed intraoperative blood loss and operative time

were separately modeled as dependent variables. Candidate variables (univariable P<0.150) were entered into multivariable linear regression models using the enter method. Residual diagnostics, collinearity assessment, sensitivity analysis excluding influential observations (N=154), and bootstrap resampling (1,000 replicates) were performed. Coefficients were interpreted as percentage changes.

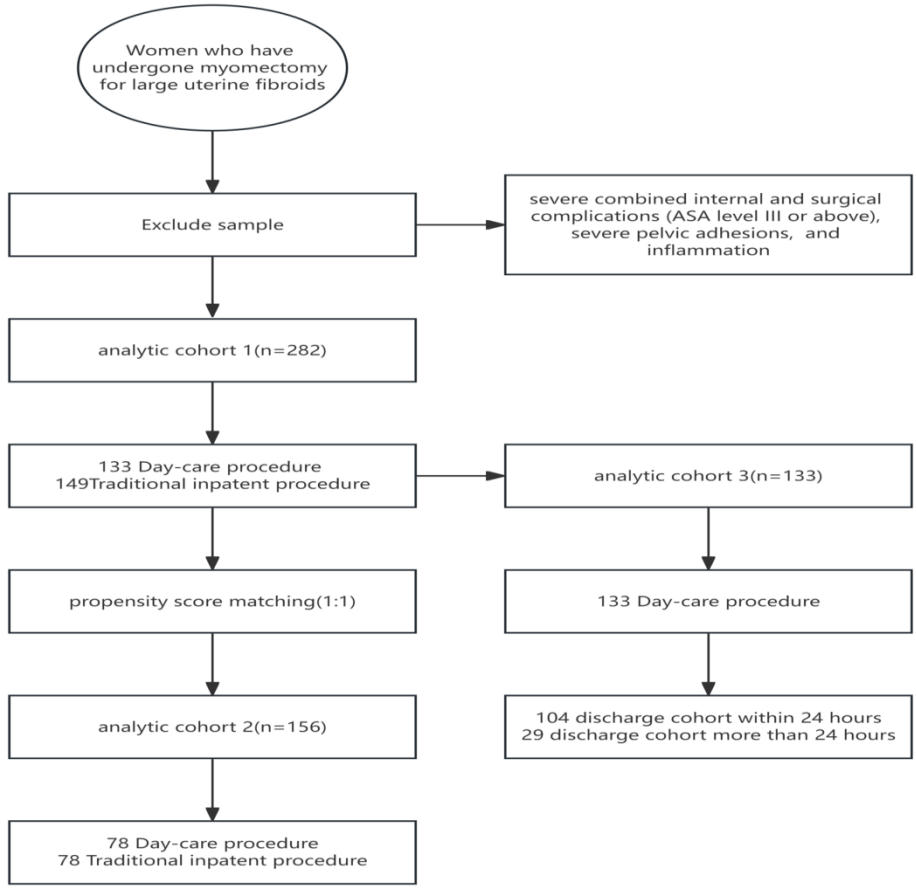
Delayed discharge (length of hospital stay >24 h) in the day surgery group was the dependent variable. Candidate predictors were screened using univariable logistic regression. Given the limited number of events (n=29), the events-per-variable (EPV) principle was strictly applied to mitigate overfitting; intraoperative blood loss, operative time, and postoperative abdominal distension were excluded as preoperative predictors. Multivariable logistic regression was then performed using forward stepwise selection with an entry criterion of P<0.05.

Results

The patient recruitment flow is shown in Figure 1. After excluding cases with severe medical or surgical comorbidities, severe pelvic adhesions, or acute inflammation, 133 patients in the day surgery group and 149 in the conventional group were eligible for analysis. The two groups differed significantly in age, concomitant adhesiolysis, and concomitant intrauterine surgery. Intraoperative blood loss was significantly lower and operative time significantly shorter in the day surgery group than in the conventional group, whereas the conversion to laparotomy rate did not differ (P=0.125). The incidence of postoperative discomfort in the day surgery group was 14.29% (19/133). Of these 19 patients, 3 (3/133, 2.26%) had non-infectious fever, compared with 15 patients (15/149, 10.07%) in the conventional group (P=0.007); no significant differences were observed in other discomforts between the two groups. Postoperative complications occurred in 10 patients (10/133, 7.52%) in the day surgery group, all of which were Clavien–Dindo grade I–II, including grade I in 1 patient

(1/133, 0.75%) and grade II in 9 patients (9/133, 6.77%), with no significant difference compared with the conventional group. The day surgery group had a shorter length of hospital stay, lower total cost, and higher satisfaction than the conventional group. No adjacent organ injury, unplanned reoperation, or 30-day unplanned readmission occurred in either group.

To balance baseline characteristics, PSM was performed using 1:1 nearest-neighbor matching with a caliper of 0.05, incorporating age, BMI, history of pelvic surgery, preoperative hemoglobin concentration, surgical approach, concomitant adhesiolysis, concomitant intrauterine surgery, myoma weight, and number of myomas. The final analysis included 156 patients (78 per group), and patient baseline characteristics are shown in Table 1. All baseline characteristics were balanced after matching. Conversion to laparotomy occurred in 0 patients in the day surgery group and 4 patients (4/78, 5.13%) in the conventional group (P=0.120); postoperative discomfort occurred in 14 patients (14/78, 17.95%) in the day surgery group and 14 patients (14/78, 17.95%) in the conventional group (P=1.000); and postoperative complications occurred in 7 patients (7/78, 8.97%) in the day surgery group and 10 patients (10/78, 12.82%) in the conventional group (P=0.441). The day surgery group had lower intraoperative blood loss (50 [170] vs 100 [213] mL; P=0.001), shorter operative time (130 [66] vs 150 [76] min; P=0.024), shorter length of hospital stay (24.00 [0.33] vs 120.00 [47.58] h; P<0.001), lower total cost (12,864.34 [2,520.49] vs 20,240.73 [4,854.74] CNY; P<0.001), and higher satisfaction (100.00% vs 92.31%; P=0.028). Details are shown in Table 2.



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242 Fig. 1 Study flow diagram of patient screening

243

244 Table 1 Description of the patient baseline characteristics and management mode

Vriable	Before PSM	After PSM
Age (years)	38.00(9.00)	40.00(7.00)
BMI(kg/m^2)	22.35(3.57)	22.66(3.39)
History of pelvic surgery	143(50.71%)	94(60.26%)
Hemoglobin concentration (g/L)	130.00(25.00)	129.00(25.00)
Surgical approach		
Laparoscopy	253(89.72%)	142(91.03%)
Laparotomy	29(10.28%)	14(8.97%)
Concomitant adhesiolysis	231(81.91%)	142(91.03%)
Concomitant intrauterine surgery	143(50.71%)	85(54.49%)
Myoma weight	2(2)	2(2)
Number of myomas	330(110)	325(100)
Management mode		
Day surgery procedure	133(47.16%)	78(50.00%)

Conventional procedure	149(52.84%)	78(50.00%)	

Data are presented as median (IQR) or *n* (%)

Table 2 Comparison of indicators between the day surgery group and the conventional group

In the 156 propensity score-matched patients, log10-transformed intraoperative blood loss was modeled as the dependent variable(Table 3). Variables with univariable P<0.15 were entered into a multivariable linear regression model. The model was significant (F=7.630, P<0.001; adjusted R^2=0.146), with no multicollinearity (all VIFs <1.6) and approximately normal residuals. Number of myomas (B=0.037, 95% CI: 0.017–0.057, P<0.001) and concomitant ovarian cystectomy (B=0.262, 95% CI: 0.058–0.467, P=0.012) were independently associated with intraoperative blood loss. After excluding two influential observations (N=154), the associations for number of myomas (B=0.048, 95% CI: 0.022–0.074, P<0.001) and concomitant ovarian cystectomy (B=0.266, 95% CI: 0.062–0.470, P=0.011) remained materially unchanged, whereas the association with myoma weight was no longer significant (P=0.236). Bootstrap resampling (1,000 replicates) showed that the 95% CIs for number of myomas (0.021–0.074; P=0.001) and concomitant ovarian cystectomy (0.081–0.446; P=0.010) excluded zero, with negligible bias.

Table 3 Multivariable analysis of factors associated with log10-transformed intraoperative blood loss

Vriable	B	95%CI	β	P	VIF
Maximum myoma diameter	0.021	-0.027～0.070	0.080	0.389	1.541
Number of myomas	0.037	0.017～0.057	0.285	<0.001	1.133
Myoma weight	0.000395	-0.000042～0.000832	0.167	0.076	1.586
Concomitant ovarian cystectomy	0.262	0.058～0.467	0.190	0.012	1.016

Dependent variable: lg(intraoperative blood loss). For concomitant ovarian cystectomy, “not performed” was used as the reference category

Among the 156 patients after PSM, log10-transformed operative time was modeled as the dependent variable(Table 4). Variables with univariable P<0.15 were entered into a

multivariable linear regression model. The model was statistically significant (F=10.517, P<0.001; adjusted R^2=0.329), with no substantial multicollinearity (all VIFs <1.3). Number of myomas (B=0.015, 95% CI: 0.010–0.021, P<0.001), concomitant ovarian cystectomy (B=0.152, 95% CI: 0.090–0.215, P<0.001), myoma weight (B=0.000206, 95% CI: 0.000090–0.000322, P=0.001), surgical approach (B=0.126, 95% CI: 0.041–0.210, P=0.004), and BMI (B=0.010, 95% CI: 0.002–0.018, P=0.018) were independently associated with operative time; age (P=0.744), comorbidities (P=0.715), and concomitant intrauterine surgery (P=0.072) were not. Residual diagnostics identified two influential observations (maximum Cook's distance 0.692, leverage 0.707, standardized residual 3.239). After excluding these observations (N=154), model fit improved (F=11.380, P<0.001; adjusted R^2=0.352), and the direction and significance of number of myomas, concomitant ovarian cystectomy, myoma weight, surgical approach, and BMI remained materially unchanged; concomitant intrauterine surgery reached borderline significance (B=0.044, P=0.050). Bootstrap resampling with 1,000 replicates confirmed that the 95% CIs for these five core variables excluded zero, with negligible bias; the 95% CI for concomitant intrauterine surgery included zero (−0.002 to 0.087, P=0.070).

Table 4 Multivariable analysis of factors associated with log10-transformed operative time

Vriable	B	95%CI	β	P	VIF
Age	-0.001	-0.005～0.003	-0.024	0.744	1.250
BMI	0.010	0.002～0.018	0.176	0.018	1.256
Comorbidities	0.009	-0.038～0.055	0.026	0.715	1.126
Number of myomas	0.015	0.010～0.021	0.354	<0.001	1.069
Myoma weight	0.000206	0.000090～0.000322	0.260	0.001	1.269
Surgical approach	0.126	0.041～0.210	0.215	0.004	1.239
Concomitant ovarian cystectomy	0.152	0.090～0.215	0.329	<0.001	1.073
Concomitant intrauterine surgery	0.042	-0.004～0.087	0.124	0.072	1.083

*Dependent variable: lg(operative time). For comorbidities, "none" was used as the reference category; for

surgical approach, “Laparotomy” was used as the reference category; and for concomitant ovarian cystectomy and concomitant intrauterine surgery, “not performed” was used as the reference category

Among the 133 day surgery patients, 104 (104/133, 78.20%) were discharged within 24 h (median length of stay 23.84 [0.50] h), and 29 patients (29/133, 21.80%) had delayed discharge (48.00 [18.54] h). Compared with the ≤24-h discharge group, the delayed discharge group had a higher rate of concomitant ovarian cystectomy (31.03% vs 11.54%; P=0.024), more myomas (3 [5] vs 1 [2]; P=0.017), greater intraoperative blood loss (100 [350] vs 50 [170] mL; P=0.043), longer operative time (150.00 [103.00] vs 127.50 [54.00] min; P=0.042), and a higher incidence of abdominal distension (20.69% vs 0; P<0.001). No significant differences were found in conversion to laparotomy, the remaining individual postoperative discomforts (non-infectious fever, moderate-to-severe pain, nausea and vomiting, and urinary irritation symptoms), postoperative complications, total cost, or satisfaction (Table 5).

Table 5 Comparison of indicators between the ≤24-h discharge group and the delayed discharge group

To identify independent risk factors for delayed discharge after myomectomy for giant uterine myoma, variables with a P value <0.05 in univariable analysis (concomitant ovarian cystectomy and number of myomas) were entered into a multivariable logistic regression model with forward stepwise selection, and both variables were retained in the final model. The model was statistically significant (Omnibus χ^2=16.120, P<0.001; Nagelkerke R^2=0.176), and the Hosmer–Lemeshow test indicated good model fit (χ^2=2.780, P=0.734). Concomitant ovarian cystectomy (OR=4.167, 95% CI: 1.488–11.673, P=0.007) and a greater number of myomas (OR=1.208, 95% CI: 1.063–1.374, P=0.004) were independent risk factors for delayed discharge (Table 6).

Table 6 Multivariable logistic regression analysis of factors associated with delayed discharge

Variable	B	S.E.	Wald	P	OR(95%CI)

Concomitant ovarian cystectomy	1.427	0.526	7.375	0.007	4.167(1.488~11.673)
Number of myomas	0.189	0.066	8.347	0.004	1.208(1.063~1.374)

Discussion

Feasibility, Safety, and Efficiency of Day Surgery for Giant Uterine Myoma

In contrast to prior investigations that have largely centered on small-to-medium myomas and laparoscopic approaches, the present study enrolled patients with giant uterine myoma (maximum myoma diameter ≥8 cm), including a subset managed by open surgery, thereby providing perioperative evidence for the day surgery model in this high-burden population. After PSM, the day surgery group had lower intraoperative blood loss, shorter operative time, significantly reduced length of hospital stay and total cost, and higher satisfaction (all $P<0.05$), whereas the conversion to laparotomy rate (0/78), incidence of postoperative discomfort (14/78, 17.95%), and incidence of postoperative complications (7/78, 8.97%) did not differ significantly from those in the conventional group. These findings suggest that, under the current framework of patient selection and perioperative management, the day surgery model for myomectomy in giant uterine myoma did not entail significantly worsened safety outcomes in exchange for efficiency gains. It should be noted, however, that this effect should be interpreted as a conditional effect following PSM adjustment for measured confounding, rather than as a universally generalizable effect that can be achieved by indiscriminately transferring patients with giant uterine myoma to the day surgery pathway.

Day surgery is not merely a reduction in length of stay but a reorganization of the care pathway based on ERAS principles. ERAS attenuates surgical stress and postoperative organ dysfunction through multimodal analgesia, goal-directed fluid management, avoidance of unnecessary drains, early oral intake, and early mobilization [9], and is associated with shorter length of stay and fewer unplanned readmissions [10]. Gynecologic ERAS guidelines emphasize that outcome improvement depends on adherence to the full pathway rather than

on any single intervention [11]. Giant uterine myoma is characterized by rich vascularity and a substantial tumor burden, making intraoperative blood loss and operative time key determinants of eligibility for discharge within 24 h. In this study, the day surgery group still had lower intraoperative blood loss and shorter operative time after PSM, possibly reflecting efficiency gains from the day surgery pathway in preoperative assessment, procedure selection, intraoperative workflow coordination, and operating room resource allocation. However, ERAS adherence, surgeon experience, and intraoperative adhesion severity were not recorded, so these differences cannot be attributed solely to the day surgery model; more plausibly, they reflect the combined contributions of the pathway, case selection, surgeon decision-making, and process optimization. In China, expansion of day surgery has been facilitated by catalogue-based management and policy initiatives; however, for myomectomy in giant uterine myoma, the boundaries of indications, discharge assessment criteria, and emergency treatment protocols still require local definition according to institutional capacity.

Safety outcomes are central to evaluating the feasibility of day surgery for giant uterine myoma. After matching, postoperative complications occurred in 8.97% (7/78) of the day surgery group and 12.82% (10/78) of the conventional group, with no significant difference; all were Clavien–Dindo grade I–II, and neither group had adjacent organ injury, unplanned reoperation, or unplanned readmission within 30 days. These findings were compared with existing evidence. In an NSQIP-based study of 8,100 minimally invasive myomectomies, patients with a large myoma burden (≥5 myomas or >250 g) had a same-day discharge rate of 56.8%; among same-day discharges, complication, unplanned reoperation, and readmission rates were 3.5%, 0.4%, and 1.0%, respectively. After adjustment, 30-day complication rates did not differ between same-day discharge and admitted patients, regardless of myoma burden [7]. In 816 laparoscopic-assisted myomectomies reported by Danilyants et al., myoma weight was comparable between the ambulatory surgery center (ASC) and outpatient hospital (396.2 [438.8] vs 461.5 [466.6] g; P=0.0643), as were intraoperative complications (4.9% vs 3.4%; P=0.4430), postoperative complications (4.9% vs 5.9%; P=0.6288), and conversion to laparotomy (0 vs 0.9%) [12]. The 24-hour discharge rate in our cohort (78.20%) is not

directly comparable with the NSQIP “same-day discharge” metric because of differing definitions; under a same-day definition, no patient was discharged on the day of surgery. Nevertheless, this cohort achieved a relatively high 24-hour discharge rate despite a greater myoma burden, with no unplanned reoperation or readmission within 30 days, suggesting that rigorously selected patients with giant myoma can be safely managed in the day surgery pathway. However, the matched sample comprised 156 patients with few complication events, yielding wide confidence intervals; the data are therefore insufficient to claim noninferiority of day surgery versus conventional inpatient care. The conversion to laparotomy rate was 0 vs 5.13% (4/78) (P=0.120); given the small number of events and the absence of a noninferiority design, clinically meaningful differences cannot be excluded. Safety conclusions should therefore be restricted to preoperatively selected patients managed with standardized discharge assessment and postoperative follow-up.

The composition of postoperative discomfort should be interpreted cautiously given the characteristics of giant myoma and the day surgery pathway. Before matching, non-infectious fever was significantly less frequent in the day surgery group (3/133, 2.26%) than in the conventional group (15/149, 10.07%; P=0.007); after matching, this difference was not significant. The higher rate of non-infectious fever in conventional inpatients may relate to prolonged bed rest, low-grade inflammatory irritation from indwelling urinary catheters and drains, and differences in fluid administration and thermoregulation; however, temperature curves, inflammatory markers, and catheter duration were not systematically recorded, precluding causal inference. Reported rates of PONV after gynecologic laparoscopy vary widely with anesthetic regimen, opioid use, and antiemetic prophylaxis. Here, “postoperative discomfort” was a composite endpoint rather than a PONV-specific endpoint, and monitoring was confined to the inpatient and early postoperative periods, possibly missing delayed PONV after discharge; the low composite rate should therefore not be interpreted as an independent antiemetic or analgesic advantage of day surgery. Regarding cost-effectiveness, Lee et al. reported lower total hospitalization costs in the day surgery group [13]; in our matched cohort, costs were approximately 36.44% lower in the day surgery group, mainly

from reduced bed charges, nursing fees, and fluid administration. Satisfaction was 100.00% (78/78) versus 92.31% (72/78) (P=0.028), a significant difference; however, because day surgery inherently involves expectation management around discharge within 24 h, satisfaction comparisons should be interpreted cautiously.

Factors Associated with Intraoperative Blood Loss and Comparison with Previous Evidence

The present study showed that number of myomas and concomitant ovarian cystectomy were robustly associated with intraoperative blood loss, whereas the association with myoma weight was susceptible to extreme values and remained unstable. Each additional myoma was associated with an approximately 8.9% increase in intraoperative blood loss, and concomitant ovarian cystectomy with an approximately 82.9% increase. These findings are consistent with several recent high-quality studies. In a multivariable analysis of 242 patients undergoing robotic myomectomy, Lee et al. identified number of myomas as the most important risk factor for estimated blood loss: patients with 5–9 myomas had a 151% increase in the odds of blood loss >320 mL (OR=2.51, 95% CI: 1.16–5.42), and those with ≥10 myomas had a 547% increase (OR=6.47, 95% CI: 1.87–22.33), whereas myoma weight was not significantly correlated with blood loss [14]. Delli Carpini et al. similarly confirmed that the presence of 3–4 myomas on preoperative ultrasound independently predicted increased intraoperative blood loss and hemoglobin decline, and emphasized the value of preoperative myoma counting for identifying high-bleeding-risk patients and optimizing preoperative hemoglobin reserve [15]. In 139 patients undergoing laparoscopic myomectomy, Lu et al. reported that hidden blood loss accounted for 86.3% of total blood loss, and that number of myomas (β=0.172, P=0.006) and total myoma volume (β=0.002, P=0.002) independently predicted hidden blood loss, indicating that number of myomas affects not only visible bleeding but also hidden blood loss [16].

Concomitant ovarian cystectomy increases blood loss by creating an additional highly vascularized dissection surface and requiring additional pelvic adhesiolysis, thereby prolonging operative time and cumulative blood loss; it may also reflect more complex pelvic

pathology. Notably, neither maximum myoma diameter nor myoma weight reached statistical significance, suggesting that in giant myoma, number of myomas may be the key determinant of blood loss rather than the size or weight of a single myoma. This may be because the inclusion criterion restricted maximum myoma diameter to ≥8 cm, limiting within-group variability and allowing the marginal effect of maximum diameter to be obscured by number of myomas; although myoma weight correlates with total volume, the cumulative wound area of multiple myomas may better reflect the biological burden associated with blood loss. The adjusted R^2 for the blood loss model was 0.146, indicating that a substantial proportion of variance remained unexplained and may be attributable to pelvic adhesion severity, surgeon experience, and intraoperative hemostatic technique; future studies incorporating more comprehensive preoperative and intraoperative parameters may improve predictive performance.

Factors Associated with Operative Time and Comparison with Previous Evidence

The present study identified number of myomas, concomitant ovarian cystectomy, myoma weight, surgical approach, and BMI as independent factors associated with operative time; concomitant intrauterine surgery showed only a borderline association after excluding extreme values and requires validation in larger samples. The effects of number of myomas and myoma weight were consistent with previous multivariable evidence. Won et al. reported that ≥4 myomas was an independent risk factor for prolonged operative time (>147.4 min) (OR=7.479, 95% CI: 4.083–13.699, P<0.001) [17], and Hsu et al., Movilla et al., Haworth et al., and Zhou et al. also identified myoma number or burden as an important predictor [18-21]. In a 10-year cohort of 584 robot-assisted laparoscopic myomectomies, Park et al. confirmed that BMI, number of myomas, and total myoma weight were independently associated with operative time, with number of myomas showing the strongest association (R^2=0.330) [22]. In our study, each additional myoma was associated with an approximately 3.5% increase in operative time and each 100 g increase in myoma weight with an approximately 4.8% increase, supporting multiple myomas and large myoma burden as stable drivers of prolonged

operative time.

The independent effect of BMI has also been quantified. Liu et al. reported that each 1 kg/m^2 increase in BMI was associated with an approximately 1.7-min increase in operative time (β =1.65, 95% CI: 0.11 – 3.18, P=0.036) [23]; our corresponding estimate was approximately 3.0 min, comparable in direction and magnitude. As a readily available preoperative indicator, BMI is useful for reserving additional operative and anesthesia time for obese patients.

The effect of surgical approach was clear in comparative studies. Bokhari et al. found that the laparoscopic approach was independently associated with a 90.49-min increase in operative time versus open surgery (95% CI: 70.03 – 110.95, P<0.001) [24]. In our study, the laparoscopic approach corresponded to an approximately 43.7-min prolongation; the smaller absolute increment may reflect the uniformly giant myomas, the already long operative time in the open group, limited matched sample size, and heterogeneity within the laparoscopic group. In observational designs, surgical approach also reflects case complexity and surgeon preference and should not be interpreted as a causal effect. For concomitant ovarian cystectomy, direct quantification is limited, but concurrent two-site surgery requires additional capsular dissection, hemostasis, and suturing, and a corresponding prolongation of operative time is clinically expected.

Predictors of Delayed Discharge in the Day Surgery Group

In this study, the delayed discharge rate in the day surgery group was 21.80% (29/133). Multivariable logistic regression identified concomitant ovarian cystectomy and a greater number of myomas as independent risk factors for delayed discharge; both may contribute to delayed discharge through increased intraoperative blood loss and operative time and through delayed bowel function recovery. The association between number of myomas and delayed discharge is consistent with existing evidence: in a high-volume center where same-day discharge was standardized, Moawad et al. found that the delayed discharge group had a significantly greater number of resected myomas than the same-day discharge group (6.59 vs

5.57, P=0.021) [8]. Because our model was restricted to preoperatively available variables (number of myomas and planned concomitant ovarian cystectomy), it serves as a preoperative risk stratification tool rather than a post hoc explanation of outcomes. These findings support incorporating these two variables into preoperative eligibility assessment and surgical scheduling, reserving observation resources for high-risk patients rather than categorically excluding those with combined surgery or multiple myomas from the day surgery pathway. Limitations include the single-center design, the limited number of events in subgroup analyses, and the wide confidence intervals of the odds ratios; intraoperative and postoperative variables were excluded to avoid reverse causation, so the model identifies preoperative risk markers rather than causal relationships. Heterogeneity in risk within combined surgery (e.g., cyst pathology and adhesion severity) warrants further investigation.

Conclusions

For rigorously selected patients with giant uterine myoma, the day surgery model may be applied to laparoscopic and selected open myomectomy: it was associated with infrequent, predominantly mild short-term complications, faster recovery, shorter hospital stay, and higher satisfaction. However, the limited number of cases limits our ability to demonstrate noninferiority versus conventional inpatient care; these findings should therefore be restricted to preoperatively selected patients managed with standardized discharge assessment and emergency treatment protocols. Number of myomas and concomitant ovarian cystectomy may inform preoperative risk stratification and scheduling. Given the single-center retrospective design and selection bias, future multicenter prospective studies are needed to confirm long-term safety and applicability.

Abbreviations

NSQIP National Surgical Quality Improvement Program

BMI Body mass index

ASA American Society of Anesthesiologists

SOP standardized operating procedure

ERAS Enhanced Recovery After Surgery

PADS Post-Anesthetic Discharge Scoring System

PONV postoperative nausea and vomiting

PCA patient-controlled analgesia

VTE Venous thromboembolism

SPSS Statistical Package for the Social Sciences

PSM Propensity score matching

EPV Events per variable

SD standard deviation

IQR interquartile range

VIFs Variance inflation factors

CI Confidence interval

OR Odds ratio

ASC ambulatory surgery center

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Data availability The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate Our research was conducted in accordance with the Declaration of Helsinki. The Ethics committee of Chengdu Women's and Children's Central Hospital approved the protocol, and the approval number is 2026(161). Because of the retrospective design, the requirement for informed consent was waived for all individual participants.

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Competing interests The authors declare no competing interests.

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Table 2 Comparison of indicators between the day surgery group and the conventional group

Vriable	Before PSM				After PSM			
	Day surgery group(n=133)	Conventional group(n=149)	Statistic(t/ Z/χ^2)	P	Day surgery group(n=78)	Conventional group(n=78)	Statistic (t/Z/χ^2)	P
Age (years)	39.69±6.14	37.71±6.60	2.598	0.010	38.00(7.00)	40.50(8.50)	-0.071	0.943
BMI(kg/m^2)	22.06(3.33)	22.43(4.10)	-1.161	0.246	22.89(3.43)	22.08(3.82)	-1.017	0.309
History of pelvic surgery	70(52.63%)	73(48.99%)	0.372	0.542	46(58.97%)	48(61.54%)	0.107	0.744
Comorbidities	54(40.60%)	62(41.61%)	0.030	0.863	33(42.31%)	38(48.72%)	0.646	0.421
Hemoglobin concentration (g/L)	128.00(29.00)	132.00(22.00)	-1.182	0.237	125.50(28.00)	131.50(25.00)	-1.262	0.207
Surgical approach			2.882	0.090			0.760	0.383
Laparoscopy	115(86.47%)	138(92.62%)			72(92.31%)	70(89.74%)		
Laparotomy	18(13.53%)	11(7.38%)			6(7.69%)	8(10.26%)		
Concomitant procedures								

Ovarian cystectomy	21（15.79%）	23（15.44%）	0.007	0.935	10(12.82%)	14(17.95%)	0.788	0.375
Adhesiolysis	88(66.17%)	143(95.97%)	42.147	<0.001	70(89.74%)	72(92.31%)	0.314	0.575
Hysteroscopic surgery	79(59.40%)	64(42.95%)	7.604	<0.001	42(53.85%)	43(55.13%)	0.026	0.872
Location of the largest myoma			2.298	0.317			-	0.575
Subserosal	7(5.26%)	12(8.05%)			3(3.85%)	5(6.41%)		
Intramural	116(87.22%)	120(80.54%)			67(85.90%)	62(79.49%)		
Other	10(7.52%)	17(11.41%)			8(10.26%)	11(14.10%)		
Maximum myoma diameter (cm)	9.10(1.85)	9.10(1.80)	-0.277	0.781	8.90(1.63)	9.10(1.88)	-0.548	0.584
Intraoperative characteristics								
Number of myomas	2(3)	2(2)	-1.097	0.273	1(3)	2(2)	-0.417	0.677
Myoma weight (g)	330(100)	320(105)	-0.894	0.371	330(93)	320(123)	-0.353	0.724
Intraoperative blood loss (mL)	80(170)	100(200)	-3.144	0.002	50(170)	100(213)	-3.236	0.001
Operative time (min)	130(60)	145(69)	-2.887	0.004	130(66)	150(76)	-2.259	0.024
Conversion to laparotomy	0	4(2.68%)	-	0.125	0	4(5.13%)	-	0.120
Postoperative characteristics								
Postoperative discomfort	19(14.29%)	27(18.12%)	0.757	0.384	14(17.95%)	14(17.95%)	0.000	1.000
Non-infectious fever	3(2.26%)	15(10.07%)	7.176	0.007	2(2.56%)	6(7.69%)	-	0.276
Moderate-to-severe pain	5(3.76%)	4(2.68%)	-	0.739	3(3.85%)	3(3.85%)	-	1.000
Nausea and vomiting	3(2.26%)	0	-	0.104	3(3.85%)	0	-	0.245
Urinary irritative symptoms	2(1.50%)	2(1.34%)	-	1.000	1(1.28%)	1(1.28%)	-	1.000
Abdominal distension	6(4.51%)	6(4.03%)	0.040	0.841	5(6.41%)	4(5.13%)	-	1.000
Postoperative complications	10(7.52%)	16(10.74%)	0.870	0.351	7(8.97%)	10(12.82%)	0.594	0.441
Grade I	1(0.75%)	4(2.68%)	-	0.375	1(1.28%)	3(3.85%)	-	0.620
Grade II	9(6.77%)	12(8.05%)	0.169	0.681	6(7.69%)	7(8.97%)	0.084	0.772
Length of hospital	24.00(0.40)	120.00(47.35)	-14.502	<0.001	24.00(0.33)	120.00(47.58)	-10.803	<0.001

stay (h)								
Total cost (CNY)	12822.88(2741.82)	19474.49(4091.33)	-13.294	<0.001	12864.34(2520.49)	20240.73(4854.74)	-9.747	<0.001
Satisfaction	132(99.25%)	141(94.63%)	-	0.039	78(100.00%)	72(92.31%)	-	0.028

Data are presented as mean±SD, median (IQR) or *n* (%)

Table 5 Comparison of indicators between the ≤24-h discharge group and the delayed discharge group

Variable	All patients (n=133)	24-h discharge group (n=104)	Delayed discharge group (n=29)	Statistic ($t/\chi^2/Z$)	P
Length of hospital stay (h)	24.00(0.40)	23.84(0.50)	48.00(18.54)	-	-
Age (years)	39.69±6.14	39.56±6.53	40.17±4.54	-0.581	0.563
BMI (kg/m^2)	22.06(3.33)	22.05(3.50)	22.49(2.62)	-0.913	0.361
History of pelvic surgery	70(52.63%)	53(50.96%)	17(58.62%)	0.534	0.465
Comorbidities	54(40.60%)	38(36.54%)	16(55.17%)	3.265	0.071
Hemoglobin concentration (g/L)	128.00(29.00)	129.50(27.00)	115.00(45.00)	-1.929	0.054
Surgical approach				2.499	0.114
Laparoscopy	115(86.47%)	93(89.42%)	22(75.86%)		
Laparotomy	18(13.53%)	11(10.58%)	7(24.14%)		
Concomitant procedures					
Ovarian cystectomy	21(15.79%)	12(11.54%)	9(31.03%)	5.099	0.024
Adhesiolysis	88(66.17%)	66(63.46%)	22(75.86%)	1.558	0.212
Hysteroscopic surgery	79(59.40%)	60(57.69%)	19(65.52%)	0.576	0.448
Location of the largest myoma				-	1.000
Subserosal	7(5.26%)	6(5.77%)	1(3.45%)	0.001	0.980
Intramural	116(87.22%)	90(86.54%)	26(89.66%)	0.017	0.897
Other	10(7.52%)	8(7.69%)	2(6.90%)	0.000	1.000
Maximum myoma diameter (cm)	9.10(1.85)	9.10(1.75)	8.90(2.25)	-1.110	0.267
Intraoperative characteristics					
Number of myomas	2(3)	1(2)	3(5)	-2.391	0.017
Myoma weight (g)	330(100)	330(98)	350(130)	-1.582	0.114
Intraoperative blood loss (mL)	80(170)	50(170)	100(350)	-2.025	0.043
Operative time (min)	130.00(60.00)	127.50(54.00)	150.00(103.00)	-2.034	0.042
Postoperative characteristics					

Postoperative discomfort	19(14.29%)	9(8.65%)	10(34.48%)	10.336	0.001
Non-infectious fever	3(2.26%)	2(1.92%)	1(3.45%)	-	0.525
Moderate-to-severe pain	5(3.76%)	4(3.85%)	1(3.45%)	-	1.000
Nausea and vomiting	3(2.26%)	2(1.92%)	1(3.45%)	-	0.525
Urinary irritative symptoms	2(1.50%)	1(0.96%)	1(3.45%)	-	0.390
Abdominal distension	6(4.51%)	0	6(20.69%)	-	<0.001
Postoperative complications	10(7.52%)	6(5.77%)	4(13.79%)	1.104	0.293
Grade I	1(0.75%)	1(0.96%)	0	-	1.000
Grade II	9(6.77%)	5(4.81%)	4(13.79%)	1.653	0.199
Total cost (CNY)	12822.88(2741.82)	12720.49(2633.45)	13171.55(3571.87)	-1.477	0.140
Satisfaction	132(99.25%)	104(100.00%)	28(96.55%)	-	0.218

666 Data are presented as mean±SD, median (IQR) or *n* (%)