

Does prior cesarean section increase the risk of periumbilical adhesions in total laparoscopic hysterectomy?

Mehmet Bölükbaşı¹, Funda Bölükbaşı², Sercan Kantarcı³,
Ahkam Göksel Kanmaz⁴, Emrah Töz⁴, Abdurrahman Hamdi İnan³

1 Department of Obstetrics and Gynecology, Menemen State Hospital, Turkish Ministry of Health, Izmir, Türkiye

2 Department of Obstetrics and Gynecology, Faculty of Medicine, Katip Çelebi University, Izmir, Türkiye

3 Department of Obstetrics and Gynecology, University of Health Sciences, Tepecik Training and Research Hospital, Izmir, Türkiye

4 Department of Obstetrics and Gynecology, Health Science University, Izmir City Hospital, Izmir, Türkiye

KEY WORDS

cesarean section,
laparoscopic entry,
periumbilical
adhesions, total
laparoscopic
hysterectomy,
visceral slide

ABSTRACT

INTRODUCTION Periumbilical adhesions may complicate laparoscopic entry and increase the risk of intraoperative injury, yet the isolated effect of prior cesarean section (CS) remains unclear.

AIM We aimed to evaluate the association between a history of CS and periumbilical adhesions in total laparoscopic hysterectomy, and assess the value of the visceral slide.

MATERIALS AND METHODS A total of 100 patients undergoing total laparoscopic hysterectomy were enrolled and divided into 2 groups: individuals with a history of CS and those with no prior abdominal surgeries. Preoperative visceral slide and intraoperative adhesion assessment were performed. Perioperative outcomes were recorded and a multivariable analysis was conducted.

RESULTS Adhesions were more frequent in the CS group (22% vs 10%; $P = 0.06$) than the individuals without a history of abdominal surgery. A history of CS was not an independent predictor of adhesions (odds ratio, 0.468; $P = 0.23$). No major entry-related complications occurred. Perioperative outcomes were similar between the groups. The visceral slide showed low sensitivity (25%) but high specificity (100%).

CONCLUSIONS A history of CS alone does not significantly increase periumbilical adhesions or compromise entry safety in total laparoscopic hysterectomy. Routine modification of the entry strategy may not be necessary. The visceral slide is useful for confirming adhesions, but does not exclude them.

INTRODUCTION Laparoscopic surgery has become the preferred approach in gynecologic practice due to its well-established advantages over laparotomy, including reduced postoperative pain, shorter hospital stay, lower risk of wound complications, and faster recovery.^{1,2} Despite these benefits, laparoscopic procedures are not without risks, and a substantial proportion of complications occur during abdominal entry. Previous reports indicate that many major vascular and bowel injuries occur during abdominal access, highlighting the critical importance of safe entry techniques in laparoscopic surgery.³

One of the most important factors complicating laparoscopic entry is the presence of intra-abdominal adhesions. Adhesions are fibrotic

bands that develop as part of the peritoneal healing process following surgical or inflammatory insults, and may distort normal anatomical relationships.⁴ Previous abdominal surgery is a well-established risk factor for adhesion formation, and these adhesions may increase the risk of complications during laparoscopic access, particularly in blind entry techniques, such as Veress needle insertion.⁵

Cesarean section (CS) is the most commonly performed abdominal operation in women worldwide, with increasing rates reported globally over the past decades.⁶ Adhesion formation following cesarean delivery, most commonly involving the uterus, bladder, and anterior abdominal wall, has been well documented.⁷ However,

Correspondence to:

Sercan Kantarcı, MD, Department of Obstetrics and Gynecology, Health Sciences University, Tepecik Training and Research Hospital, Kazımdirlik Neighborhood, 7 Sanayi St., 35100 Bornova, Izmir, Türkiye, phone: +90 232 373 1930, email: sercan.kntrc@gmail.com
Received: April 30, 2026.

Revision accepted: May 26, 2026.

Published online: June 24, 2026.

Wideochir Inne Tech Maloinwazyjne.

2026; 21 (2): 191-196

doi:10.20452/witm.2026.18035

Copyright by the Author(s), 2026

whether a history of CS—particularly when performed via the Pfannenstiel incision—results in clinically significant adhesions in the periumbilical region remains unclear. This uncertainty may influence surgeons' choice of entry technique or site, and may lead to unnecessary use of alternative entry points, potentially increasing procedural complexity. Although several studies have evaluated adhesion formation following abdominal surgery, data specifically addressing the isolated effect of CS on periumbilical adhesions and the safety of umbilical entry are limited.⁸ Furthermore, noninvasive methods, such as the preoperative visceral slide, have been proposed to predict adhesions, with relatively high reported sensitivity, although their clinical utility remains under investigation.⁹

In clinical practice, a history of CS is often perceived as a limiting factor during laparoscopic surgery, particularly for less experienced surgeons, leading to hesitation during abdominal entry and, in some cases, conversion to laparotomy. However, these concerns are largely based on assumptions rather than evidence, focusing on isolated CS history. This prospective study, specifically evaluating a homogenous total laparoscopic hysterectomy cohort, is therefore of particular importance. Based on our hypothesis that a history of CS does not significantly increase periumbilical adhesions or entry-related complications, our findings aim to challenge this perception and support safer, evidence-based laparoscopic entry strategies.

AIM The aim of this study was to evaluate the effect of a history of CS on the development of periumbilical adhesions and the associated risk of complications during umbilical entry, which represents the initial step of laparoscopic surgery.

MATERIALS AND METHODS Patient selection

The sample size was calculated using G*Power software (Heinrich Heine University, Düsseldorf, Germany) based on periumbilical adhesion incidence of 8.6% reported by Nezhat et al.⁹ Assuming a medium effect size (0.3), power of 95%, and 2-sided α of 0.05, the minimum required sample was determined to be 70 patients. To increase statistical robustness, 100 individuals were included. Eligible participants consisted of patients with no prior abdominal surgery or those with a history of CS performed via the Pfannenstiel incision only.

The inclusion criteria were: laparoscopic surgery for benign gynecologic indications, procedures and follow-up performed at the same institution, and benign preoperative and postoperative pathology results. The exclusion criteria comprised: suspected or confirmed malignancy, patient withdrawal, a history of abdominal surgery other than CS, ectopic pregnancy treated with methotrexate, prior intra-abdominal infection, peritonitis, pelvic inflammatory disease, presence of umbilical hernia, and CS performed with an incision other than the Pfannenstiel approach.

Data concerning patient demographics and intraoperative findings were collected and recorded by the primary surgeon using a standardized data collection form.

Surgical technique All patients underwent a preoperative umbilical visceral slide. A 5.2 MHz abdominal ultrasound probe was placed sagittally over the umbilical region, and the participants were instructed to perform deep breathing. The sliding movement between the parietal and visceral peritoneum was evaluated dynamically during respiration. A displacement greater than 1 cm was considered normal sliding, whereas displacement below 1 cm or no sliding was deemed abnormal. For diagnostic analysis, abnormal or absent sliding was accepted as a positive finding for suspected periumbilical adhesions.

All surgical procedures were performed under general anesthesia following standard preoperative preparation, with the patients in the dorso-lithotomy position. Abdominal entry was performed through the umbilicus. Correct placement of the Veress needle was confirmed when the initial intra-abdominal pressure was below 10 mm Hg. Pneumoperitoneum was established up to 15 mm Hg, and a 10-mm trocar was inserted through the umbilicus. Additional ports were placed at standard anatomical landmarks according to the surgeon's preference.

Periumbilical adhesions were assessed intraoperatively using a standardized macroscopic adhesion grading system based on their extent, density, and anatomical involvement. The adhesions were classified as grade 0 (no adhesions), grade 1 (thin and easily separable adhesions), grade 2 (localized dense adhesions), grade 3 (extensive dense adhesions), and grade 4 (severe adhesions with fixation of intra-abdominal organs to the abdominal wall). All intraoperative findings were systematically documented by the operating surgeon during surgery. All procedures were performed using a standardized surgical protocol to minimize operator-dependent bias.

Ethics This prospective observational study was conducted in accordance with the Declaration of Helsinki at the Department of Obstetrics and Gynecology, Izmir Tepecik Training and Research Hospital, University of Health Sciences, Türkiye, between July 1, 2022, and July 31, 2023, following approval from the institutional ethics committee (2022/10/1). All participants were informed about the study objectives and methodology, and written informed consent was obtained prior to enrollment. The patients were also informed of their right to withdraw from the study at any time.

Statistical analysis Statistical analyses were performed using SPSS Statistics software, version 29 (IBM Corp., Armonk, New York, United States). Normality was assessed using the Kolmogorov–Smirnov test. Continuous variables were compared using the *t* test

TABLE 1 Baseline characteristics of the study groups

Parameter	No previous abdominal surgery (n = 50)	Cesarean section history (n = 50)	Test value	P value	
Age, y, mean (SD)	50.26 (7.91)	49.64 (7.04)	0.414	0.68	
Height, cm, mean (SD)	162.06 (5.23)	160.68 (4.39)	1.428	0.16	
Weight, kg, mean (SD)	72.32 (10.16)	66.86 (8.68)	2.889	0.005	
BMI, kg/m ² , mean (SD)	27.53 (3.55)	25.9 (3.2)	2.424	0.02	
Gravidity	3 (0–9)	3 (2–7)	1.528	0.13	
Parity	2 (0–8)	3 (2–5)	2.084	0.04	
Number of cesarean sections	1	–	–	–	
	2	–	–	–	
	3	–	–	–	
	4	–	–	–	
Comorbidities	Hypertension	9 (18)	5 (10)	10.088	0.12
	Hypertension + hypothyroidism	0	2 (4)		
	Diabetes mellitus	7 (14)	2 (4)		
	Hypertension + diabetes mellitus	6 (12)	8 (16)		
	Hypothyroidism	1 (2)	5 (10)		
	Breast cancer	1 (2)	0		
	Cardiac disease	0	1 (2)		
	None	26 (52)	27 (54)		
Smoking status	Smoker	19 (38)	23 (46)	0.369	0.54
	Nonsmoker	31 (62)	27 (54)		

Data are presented as number (percentage) or median (min–max) unless indicated otherwise. Test values correspond to the relevant statistical test used for comparison (the *t* test, Mann–Whitney test, or χ^2 test, as appropriate).

Abbreviations: BMI, body mass index

or Mann–Whitney test, as appropriate, and presented as mean (SD) or median (min–max). Categorical variables were analyzed using the χ^2 test or the Fisher exact test. A multivariable logistic regression analysis was performed to identify independent predictors of periumbilical adhesions; due to the limited number of events, a reduced model including prior CS and body mass index (BMI) was used. The results were expressed as odds ratios (ORs) with 95% CIs. A *P* value below 0.05 was considered significant.

RESULTS Baseline demographic and clinical characteristics of the study groups are presented in **TABLE 1**. There were no differences between the patients with no prior abdominal surgery and those with a history of CS in terms of age, height, or gravidity. However, body weight and BMI were higher in the patients without prior abdominal surgery than those with a CS history (*P* = 0.005 and *P* = 0.02, respectively). In contrast, parity was higher in the CS group (*P* = 0.04). In this cohort, 50% of the patients had 1 prior CS, while 28%, 18%, and 4% had 2, 3, and 4 cesarean deliveries, respectively. The distribution of comorbidities and smoking status was comparable between the groups (*P* = 0.12 and *P* = 0.54, respectively). Overall, the groups were similar in terms of most baseline characteristics, indicating a relatively homogeneous study population (**TABLE 1**).

Preoperative transumbilical ultrasound findings showed no difference between the groups in terms of presence of the visceral slide. Similarly, the distribution of umbilical skin incision type and entry-related injuries during primary trocar placement were similar in both groups (*P* = 0.44 and *P* > 0.99, respectively). No major complications were observed in either cohort. Entry pressure values were comparable between the groups (*P* = 0.46). Periumbilical adhesions were observed in 10% of the patients without prior abdominal surgery and 22% of the individuals with a history of CS (*P* = 0.06). Among the patients with adhesions, all were omental in origin, and the need for adhesiolysis was similar in both groups (*P* > 0.99). Furthermore, no differences were found between the cohorts in terms of operative time, time to gas and stool passage, or length of hospital stay. These findings suggest that prior CS does not significantly impact intraoperative or early postoperative outcomes in laparoscopic surgery. Clinical outcomes and intraoperative findings are summarized in **TABLE 2**.

A reduced multivariable logistic regression analysis was performed to evaluate independent predictors of periumbilical adhesions. Due to the limited number of adhesion events, a parsimonious model including CS history and BMI was constructed. Prior CS was not found to be an independent risk factor for periumbilical adhesions

TABLE 2 Surgical outcomes and entry-related parameters of the study population

Parameter		No previous abdominal surgery (n = 50)	Cesarean section history (n = 50)	Test value	P value	
Preoperative transumbilical ultrasound findings	Sliding	49 (98)	47 (94)	–	0.61	
	No sliding	1 (2)	3 (6)	–		
Umbilical skin incision	Vertical	45 (90)	48 (96)	–	0.44	
	Transverse	5 (10)	2 (4)	–		
Injury during primary trocar placement	None	46 (92)	45 (90)	–	>0.99	
	Omentum injury	4 (8)	5 (10)	–		
	Major complications	0	0	–		
	Entry pressure, mm Hg	3.86 (1–8)	3.6 (1–7)	0.738		0.46
Adhesions	None	45 (90)	39 (78)	–	–	
	Thin or filmy adhesions	4 (8)	4 (8)	6.803		0.06
	Localized dense adhesions	0	6 (12)	–		
	Extensive dense adhesions	1 (2)	1 (2)	–		
Omentum adhesion		5 (100)	11 (100)	–	–	
Adhesiolysis	No	0	2 (18.2)	–	>0.99	
	Yes	5 (100)	9 (81.8)	–		
Operative time, min		87.5 (50–200)	90 (40–150)	0.57	0.57	
Time to gas/stool passage, h		14 (10–25)	14 (10–28)	1.112	0.27	
Length of hospital stay, h		24 (24–48)	24 (24–48)	0.244	0.81	

Data are presented as number (percentage) or median (min–max). Test values correspond to the relevant statistical test used for comparison (the t test, Mann–Whitney test, or χ^2 test, as appropriate).

(OR, 0.468; 95% CI, 0.134–1.632; $P = 0.23$). Similarly, BMI was not associated with adhesion formation either, although a trend toward association was observed (OR, 0.849; $P = 0.08$; TABLE 3).

The diagnostic performance of the visceral slide was evaluated in relation to intraoperatively confirmed periumbilical adhesions. The absence of sliding demonstrated sensitivity of 25% and specificity of 100%. The positive predictive value was 100%, indicating that all patients without sliding had adhesions, while the negative predictive value was 87.5%. These findings suggest that although the visceral slide has limited sensitivity and may fail to detect a substantial proportion of adhesions, it has excellent specificity and is highly reliable in confirming the presence of adhesions when sliding is absent.

DISCUSSION Our study demonstrated that a history of CS alone does not significantly increase the incidence of periumbilical adhesions or the risk of entry-related complications during laparoscopic surgery for benign gynecologic conditions. Although a higher rate of adhesions was observed in the CS group, this difference did not reach significance. Importantly, the multivariable analysis further confirmed that CS was not an independent predictor of adhesion formation, which suggests that prior cesarean delivery, in the absence of other abdominal surgeries, may not represent a clinically relevant risk factor for umbilical entry.

Although laparoscopic entry is widely recognized as the most critical step of minimally-invasive surgery, the perceived risk is often more

influenced by a surgical history than objective evidence. In particular, prior abdominal operations are commonly considered a potential barrier to safe entry, leading surgeons—especially those in the initial stage of their learning curve—to adopt more conservative strategies, such as alternative entry sites or even conversion to laparotomy.¹⁰ However, this cautious approach may not always be supported by evidence, as the relationship between specific types of prior surgery and entry-related complications remains incompletely defined.¹¹ Therefore, distinguishing between different surgical histories is essential to avoid unnecessary modifications in surgical technique and optimize patient safety.

CS-related adhesion formation has been well described in the literature, with most studies demonstrating that adhesions predominantly develop in the pelvic and lower abdominal regions, particularly between the uterus, bladder, and anterior abdominal wall.^{12,13} These adhesions are largely attributed to localized surgical trauma and subsequent peritoneal healing responses confined to the site of incision. However, whether such adhesions extend to or significantly affect the periumbilical region remains unclear, as data specifically addressing this anatomical area are scarce. In the present study, although the rate of adhesions was higher in the patients with a history of CS, this difference did not reach significance. More importantly, this association disappeared after multivariable adjustment, suggesting that the observed difference may not represent an independent effect but rather be influenced by potential confounding factors. This finding is consistent

TABLE 3 Multivariable logistic regression analysis of independent predictors of periumbilical adhesions

Variable	B	SE	OR (Exp(B))	95% CI	P value
Delivery history (NSD vs CS) ^a	-0.76	0.637	0.468	0.134–1.632	0.23
BMI	-0.164	0.094	0.849	0.706–1.02	0.08

a CS was selected as the reference category (0) in the logistic regression model.

Abbreviations: CS, cesarean section; NSD, normal spontaneous delivery; OR, odds ratio; see TABLE 1

with the anatomical consideration that Pfannenstiel incisions are restricted to the lower abdomen and do not exert a substantial impact on the periumbilical peritoneum. Therefore, assuming an increased risk of periumbilical adhesions based solely on a history of CS may not be clinically justified, and modifying entry strategies on this basis alone might be unnecessary.

Another important finding of our study is the absence of major entry-related complications in either group, regardless of the history of CS. Although minor omental injuries were observed, no bowel or vascular injuries occurred during umbilical entry. Importantly, all intraoperatively detected adhesions were omental in origin, and no bowel adhesions or dense visceral adhesions involving the periumbilical region were identified. This may partly explain the absence of major entry-related complications in the study population, and suggests that prior cesarean delivery performed via the Pfannenstiel incision may be associated predominantly with limited omental adhesions rather than severe adhesions involving critical intra-abdominal organs. This finding is clinically relevant, as a substantial proportion of major complications in laparoscopic surgery are known to occur during the initial entry phase, particularly during Veress needle insertion or primary trocar placement.^{14,15} Despite these concerns, the results of the current study indicate that umbilical entry can be performed safely in patients with a history of CS. In addition, entry pressure, type of skin incision, and operative time were comparable in the study groups, suggesting that prior cesarean delivery does not significantly increase the technical difficulty of laparoscopic entry. These findings support the notion that, in the absence of additional abdominal surgical history, routine modification of entry technique or the use of alternative entry sites may not be necessary.

The diagnostic value of the visceral slide in predicting intra-abdominal adhesions has been reported with varying results in the literature. Previous studies have suggested that the slide may serve as a useful tool in the assessment of adhesions and may provide guidance in surgical planning.^{16,17} However, the reported diagnostic performance parameters have shown considerable variability across studies. In our analysis, the visceral slide demonstrated high specificity but limited sensitivity, which suggests that it may be more useful as a confirmatory tool when abnormal or absent sliding is detected, whereas normal sliding alone may not be sufficient to reliably exclude

the presence of periumbilical adhesions. This discrepancy may largely be attributed to differences in the type and anatomical localization of prior surgical interventions within the study populations. Many studies in the literature have included patients with a history of midline or upper abdominal surgeries, which are more likely to involve the periumbilical region and thereby influence the diagnostic performance of the visceral slide. In contrast, the present study specifically evaluated individuals with a history of CS performed via the Pfannenstiel incision, which is anatomically confined to the lower abdomen. This may explain the lower incidence of periumbilical adhesions and the limited sensitivity observed in this cohort. Therefore, the diagnostic performance of the visceral slide appears to depend on the anatomical characteristics of surgical history. Importantly, as laparoscopy has evolved from a selective technique into a preferred surgical approach and has been shown to be safely applicable even in the presence of adhesive or inflammatory pelvic pathology, the importance of preoperative adhesion assessment for ensuring safe abdominal entry has further increased.¹⁸

Strengths and limitations This study has several notable strengths, including its prospective design, the use of a standardized surgical technique, and the inclusion of a homogeneous patient population limited to benign gynecologic laparoscopic procedures. In addition, the evaluation of both intraoperative findings and preoperative assessment tools provides a comprehensive perspective on entry safety. However, certain limitations should be acknowledged. The relatively small number of adhesion events may have limited the statistical power of the multivariable analysis and diagnostic evaluation. Furthermore, the study was conducted at a single center, which may restrict the generalizability of the findings, and the diagnostic performance of the visceral slide was not the primary outcome of the study.

CONCLUSIONS In conclusion, a history of CS alone does not appear to increase the risk of periumbilical adhesions or compromise the safety of umbilical entry in laparoscopic gynecologic surgery. Our findings suggest that routine modification of entry techniques based solely on the history of cesarean delivery may not be necessary. The visceral slide demonstrates high specificity but limited sensitivity, indicating its value in confirming rather than excluding adhesions. These

results may contribute to more evidence-based surgical decision-making and help avoid unnecessary alterations in laparoscopic practice.

ARTICLE INFORMATION

ACKNOWLEDGMENTS None.

FUNDING None.

CONTRIBUTION STATEMENT MB: study conception and design. MB and AI: surgical procedures. ET: data collection. SK: data analysis and interpretation, postoperative follow-up, data verification, and critical revision of the manuscript. AGK, AHİ, and FB: supervision and critical guidance throughout the study. MB and SK: writing of the first draft. All authors reviewed and commented on the previous versions of the manuscript. All authors read and approved the final manuscript.

CONFLICT OF INTEREST None declared.

AI STATEMENT Artificial intelligence was used solely for language editing and improving the clarity of the manuscript.

OPEN ACCESS This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License (CC BY-NC-SA 4.0), allowing third parties to copy and redistribute the material in any medium or format and to remix, transform, and build upon the material, provided the original work is properly cited, distributed under the same license, and used for noncommercial purposes only.

HOW TO CITE Bölükbaşı M, Bölükbaşı F, Kantarcı S, et al. Does prior cesarean section increase the risk of periumbilical adhesions in total laparoscopic hysterectomy? *Wideochir Inne Tech Maloinwazyjne.* 2026; 21: 191-196. doi:10.20452/wiitm.2026.18035

JOURNAL INFORMATION

Videosurgery and Other Miniinvasive Techniques is an official journal of the Videosurgery Foundation.

REFERENCES

- 1 Giannini A, Cuccu I, D'Auge TG, et al. The great debate: surgical outcomes of laparoscopic versus laparotomic myomectomy. A meta-analysis to critically evaluate current evidence and look over the horizon. *Eur J Obstet Gynecol Reprod Biol.* 2024; 297: 50-58. [↗](#)
- 2 Pickett CM, Seeratan DD, Mol BWJ, et al. Surgical approach to hysterectomy for benign gynaecological disease. *Cochrane Database Syst Rev.* 2023; 8: CD003677. [↗](#)
- 3 Watrowski R, Kostov S, Alkatout I. Complications in laparoscopic and robotic-assisted surgery: definitions, classifications, incidence and risk factors - an up-to-date review. *Wideochir Inne Tech Maloinwazyjne.* 2021; 16: 501-525. [↗](#)
- 4 Stratakis K, Kalogiannis E, Thanopoulos A, et al. Mechanisms and therapeutic approaches for peritoneal adhesions: a comprehensive review. *Chirurgia (Bucur).* 2023; 118: 113-126. [↗](#)
- 5 Maskal S, Ellis R, Prabhu A, et al. Injuries incurred from minimally invasive access for abdominal surgery. *Surg Endosc.* 2023; 37: 5368-5373. [↗](#)
- 6 Betran AP, Ye J, Moller AB, Souza JP, et al. Trends and projections of caesarean section rates: global and regional estimates. *BMJ Glob Health.* 2021; 6: e005671. [↗](#)
- 7 Hesselman S, Högberg U, Råssjö EB, et al. Abdominal adhesions in gynaecologic surgery after caesarean section: a longitudinal population-based register study. *BJOG.* 2018; 125: 597-603. [↗](#)
- 8 Güven E, Dura MC, Aktürk H, Güraslan H. Safety of laparoscopic entry points in patients with a history of abdominal surgery: a research article. *Cureus.* 2023; 15: e47244. [↗](#)
- 9 Nezhat CH, Dun EC, Katz A, Wieser FA. Office visceral slide test compared with two perioperative tests for predicting periumbilical adhesions. *Obstet Gynecol.* 2014; 123: 1049-1056. [↗](#)
- 10 Ahmad G, Baker J, Finnerty J, et al. Laparoscopic entry techniques. *Cochrane Database Syst Rev.* 2019; 1: CD006583. [↗](#)
- 11 Taliento C, Pontrelli G, Rondoni A, et al. Major and minor complications in Veress needle and direct trocar insertion for laparoscopic closed-entry techniques: an updated systematic review and meta-analysis. *Langenbecks Arch Surg.* 2023; 408: 152. [↗](#)
- 12 Park SY, Lee JH, Choi JS, et al. Laparoscopically assisted vaginal hysterectomy for women with anterior wall adherence after caesarean section. *JSL.* 2014; 18: e2014.00315. [↗](#)
- 13 Tulandi T, Agdi M, Zarei A, et al. Adhesion development and morbidity after repeat caesarean delivery. *Am J Obstet Gynecol.* 2009; 201: 56.e1-56.e6. [↗](#)
- 14 David-Montefiore E, Rouzier R, Chapron C, et al; Collegiale d'Obstétrique et Gynécologie de Paris-Ile de France. Surgical routes and complications of hysterectomy for benign disorders: a prospective observational study in French university hospitals. *Hum Reprod.* 2007; 22: 260-265. [↗](#)

15 Jansen FW, Kolkman W, Bakkum EA, et al. Complications of laparoscopy: an inquiry about closed- versus open-entry technique. *Am J Obstet Gynecol.* 2004; 190: 634-638. [↗](#)

16 Limperg T, Chaves K, Jesse N, et al. Ultrasound visceral slide assessment to evaluate for intra-abdominal adhesions in patients undergoing abdominal surgery: a systematic review and meta-analysis. *J Minim Invasive Gynecol.* 2021; 28: 1993-2003.e10. [↗](#)

17 Lee M, Kim HS, Chung HH, et al. Prediction of intra-abdominal adhesions using the visceral slide test: a prospective observational study. *Eur J Obstet Gynecol Reprod Biol.* 2017; 213: 22-25. [↗](#)

18 Karabulut A, Kantarcı S, Karabulut SS, et al. Risk factors for complicated tubo-ovarian Abscess surgery. *JSL.* 2026; 30: e2025.00131. [↗](#)