



2023

Section: Obstetrics and Gynecology

Ante natal prediction of intra pelvic adhesion prior to caesarean section

Samar Hassan Hussein

Department of obstetrics and gynecology, Faculty of Medicine, Al-Azhar University, Assuit Branch,
Samar211219@gmail.com

Faisal moustafa Ali

Department of obstetrics and Gynecology, Faculty of medicine for Girls, Al-Azhar University, Assuit, Egypt

Mahmoud Mohamed Ahmed Fouad

Department of obstetrics and gynecology, Faculty of Medicine, Al-Azhar University, Assuit Branch

Follow this and additional works at: <https://aimj.researchcommons.org/journal>



Part of the [Medical Sciences Commons](#), [Obstetrics and Gynecology Commons](#), and the [Surgery Commons](#)

How to Cite This Article

Hussein, Samar Hassan; Ali, Faisal moustafa; and Fouad, Mahmoud Mohamed Ahmed (2023) "Ante natal prediction of intra pelvic adhesion prior to caesarean section," *Al-Azhar International Medical Journal*: Vol. 4: Iss. 9, Article 29.

DOI: <https://doi.org/10.58675/2682-339X.2043>

This Original Article is brought to you for free and open access by Al-Azhar International Medical Journal. It has been accepted for inclusion in Al-Azhar International Medical Journal by an authorized editor of Al-Azhar International Medical Journal. For more information, please contact dryasserhelmy@gmail.com.

ORIGINAL ARTICLE

Ante Natal Prediction of Intra Pelvic Adhesion Prior to Cesarean Section

Samar Hassan Hussein ^{a,*}, Faisal Moustafa Ali ^b, Mahmoud Mohamed Ahmed Fouad ^a

^a Department of Obstetrics and Gynecology, Faculty of Medicine, Al-Azhar University, Assiut Branch, Egypt

^b Department of Obstetrics and Gynecology, Faculty of Medicine for Girls, Al-Azhar University, Assiut, Egypt

Abstract

Background: One of the most frequent obstetric procedures is the cesarean section (CS). Abdominal adhesion formation is thought to be at risk due to CS.

Aim: To evaluate intrapelvic adhesion with prior CS or any other pelvic surgery was predicted using clinical data and an ultrasound sliding sign.

Patients and methods: This cross-sectional study, conducted between 2019 and 2022 enrolled 500 pregnant-women with previous-pelvic surgery and planned to CS. A thorough history and clinical evaluation were done. Preoperative evaluation of striae gravidarum severity using Davey score. An ultrasound assessment for the sliding sign was done. Intraoperatively, the severity of intrapelvic adhesion was determined by Nair's scoring system.

Results: The sliding sign was positive in 355 (71%). Intrapelvic adhesions were found in 245 (49%) women and 90 (18%) women had dense adhesion. Predictors for intrapelvic adhesions were depressed scar, greater than or equal to three previous CS, abdominal stria, and negative sliding sign. The best predictor was the negative sliding sign with 71.9 % overall accuracy. Also, the only predictor of dense intrapelvic adhesion was greater than or equal to three previous CS with an overall accuracy was 72.1% for the prediction of dense intrapelvic adhesion.

Conclusion: We present a rapid and easy-to-perform method to identify intra-abdominal adhesions in women undergoing cesarean delivery. The best accuracy was achieved with sliding status, depressed scar and greater than 3 three CSs. Multi-center future studies are required to confirm these findings.

Keywords: Cesarean section, Intrapelvic adhesion, Nair's score, Sliding sign

1. Introduction

Cesarean sections (CS) can save lives and help to avoid unfavorable obstetric outcomes.¹ The risks of this type of delivery have been rising along with rates, and these risks now include both short- and long-term complications from intraperitoneal adhesions, including bladder and bowel injury, infertility, and chronic pelvic pain.²

Intraabdominal adhesions are well-known CS complications that harm the pelvic and abdominal organs, cause patient morbidity, and make it difficult to perform subsequent CS procedures.³ As the surgeon decides where to perform the procedure,

anticipating adhesions is crucial. It also plays a part in the preoperative evaluation intended to reduce intraoperative complications.⁴

Sadly, there is no perfect method for avoiding adhesions or spotting them before surgery.⁵ In order to consider a vaginal birth after cesarean section (VBAC) or when requesting a CS for nonmedical reasons, pregnant women must be carefully counselled about their options and associated implications, especially before and during their first pregnancy after their first CS.⁶

The current work was designed to predict pelvic adhesion before caesarean section in patient with

Accepted 22 March 2023.
Available online 12 January 2024

* Corresponding author at: Al-Azhar University, 1 ElMokhayam El Daem St., Nasr City, Cairo, 11884, Egypt.
E-mail address: Samar211219@gmail.com (S.H. Hussein).

<https://doi.org/10.58675/2682-339X.2043>

2682-339X/© 2023 The author. Published by Al-Azhar University, Faculty of Medicine. This is an open access article under the CC BY-SA 4.0 license (<https://creativecommons.org/licenses/by-sa/4.0/>).

previous CS or any other pelvic surgery by clinical and ultrasound examination.

2. Patients and methods

2.1. Study setting and design

A cross sectional observational study was done in period from March 2019 to March 2022. Total coverage sample technique was conducted where all women who met the selection criteria were enrolled in the study.

Any pregnant women who had previous pelvic surgery and planned for CS and came for follow up during the study period was recruited. Any patient with one of more of the following was excluded; primigravida without pelvic surgery and patient who had any risk factors for pelvic adhesion (diabetes mellitus (DM), endometriosis, pelvic inflammatory disease, and history of peritonitis) were included.

A total of 500 pregnant women were attending Al Azhar University Hospital Assiut and Luxor International Hospital were enrolled. All of them were subjected to thorough history taking with attention to obstetric history and any history of pelvic operation. Complete physical examination was done.

The Davey scoring system was used to determine how severe the striae gravidarum were, and the total striae score was divided into the following categories: Zero is known as 'no striae'; 1–2 are known as 'mild striae'; and 3–8 are referred to as 'severe striae'.⁷ An exhaustive evaluation of the CS scar was included; The CS scars were categorized as flat, elevated, or depressed in appearance. The scar's color was

classified as either the same as the surrounding skin, hyperpigmented, or hypopigmented. All women undergo transabdominal ultrasounds prior to CS delivery. Before the sonographic examination, patients were not required to empty their bladders; In patients with a full or empty bladder, intra-abdominal adhesions were evaluated without difficulty. Perpendicular to the transverse skin scar, the probe was positioned just above it. When the uterus was sliding against the abdominal wall, the sliding sign was present; however, when there was no movement of the uterus under the fascia transversalis, the sliding sign was absent. The results of the general examination and ultrasound sliding-sign assessment were hidden from the surgeons performing the CS. The modified Nair's classification⁸ was used to grade adhesions intra-operatively, classifying them as filmy, cohesive, no adhesion, or moderate adhesion. The agreement between the pre- and intraoperative evaluations regarding the presence of adhesions was evaluated by comparing the surgical report, preliminary ultrasound diagnosis, and general examination after CS. SPSS (Statistical Package for the Social Sciences, version 20, IBM, and Armonk, New York) was used to collect and analyze the data. Student *t* tests were used to compare continuous data with nominal data using frequency (percentage) and the χ^2 test to compare nominal data with continuous data. Regression analysis was used to find predictors of dense adhesions and adhesions within the pelvis. Different predictors of intrapelvic adhesions' diagnostic performance were evaluated using a receiver operating characteristics curve. Since the level of confidence remained at 95%, a *P* value of 0.05 was considered significant.

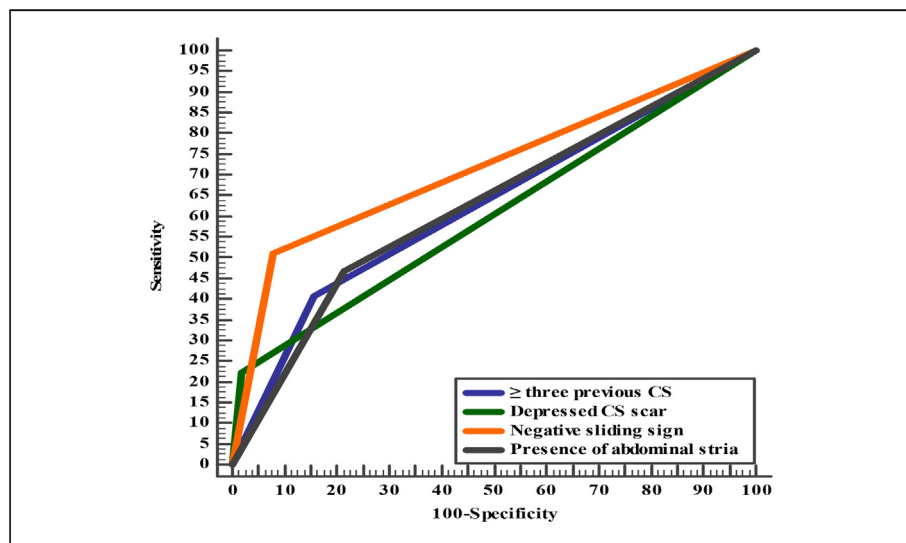


Fig. 1. Accuracy of different predictors for intra pelvic adhesions. CS: cesarean section.

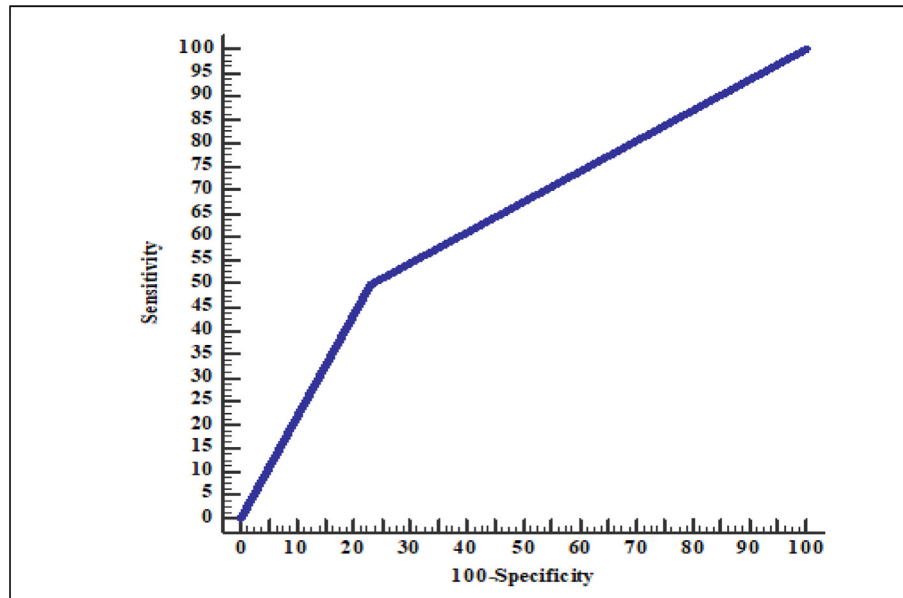


Fig. 2. Accuracy of greater than or equal to three previous cesarean section for prediction of dense adhesions.

3. Results

Mean age (\pm SD) of enrolled women was 27.36 ± 5.41 year. It was found that 195 (39%), 165 (33%), 100 (20%), 30 (6%), and 10 (2%) women had previous once, twice, third, fourth, and fifth CS, respectively. Out of the studied women; 295 (59%) women had flat scar and 170 (34%) women had abdominal stria. Sliding sign was detected by

abdominal ultrasound in 355 (71%) women. As regard type of adhesion; it was band of adhesion, fine adhesion and dense adhesion were found in 50 (10%), 105 (21%), and 90 (18%) women, respectively. It was found that 65 (26.5%) of those with adhesion had history of previous three CS. Also, previous four and five times of CS was present in 25 (10.2%) and 10 (4.1%) woman with adhesion, respectively.

There was significant difference between type of adhesion and number of previous CS. Each history of previous four and five CS was present in 10 women with dense adhesions.

Table 1. Baseline data of studied women.

	N = 500
Age (y)	27.36 ± 5.41
Range	19–40
Parity	1–7
Number of CS	
Once	195 (39%)
Twice	165 (33%)
Three times	100 (20%)
Four times	30 (6%)
Five time	10 (2%)
Time since last CS (years)	3.37 ± 2.18
Gestational age (week)	36.90 ± 1.23
Comorbidities	
None	310 (62%)
Hypertension	60 (12%)
Diabetes mellitus	45 (9%)
Cardiac diseases	35 (7%)
Bronchial asthma	20 (4%)
Systemic lupus erythematosus	5 (1%)
Previous operation	
None	395 (79%)
Appendectomy	50 (10%)
Cholecystectomy	40 (8%)
Ovarian cystectomy	10 (2%)
Myomectomy	5 (1%)

Table 2. Cesarean section scar, sliding sign and intra-abdominal adhesion in the study.

	N = 500
Shape of the scar	
Flat	295 (59%)
Elevated	145 (29%)
Depressed	60 (12%)
Stria	
No	330 (66%)
Alba	110 (22%)
Nigra	60 (12%)
Number of stria	2–11
Sliding sign	
Present	355 (71%)
Absent	145 (29%)
Intra pelvic adhesion	
Present	245 (49%)
Absent	255 (51%)
Type of adhesion	
Band of adhesion	50 (10%)
Fine adhesion	105 (21%)
Dense adhesion	90 (18%)

Table 3. Presence of adhesion and absent sliding sign based on number of cesarean section.

	Intrapelvic adhesion		Sliding sign	
	Present (n = 245)	Absent (n = 255)	Positive (n = 355)	Negative (n = 145)
Number of CS				
Once	75 (30.6 %)	120 (47.1 %)	150 (42.3 %)	45 (31 %)
Twice	70 (28.6 %)	95 (37.3 %)	120 (33.8 %)	45 (31 %)
Three times	65 (26.5 %)	35 (13.7 %)	65 (18.3 %)	35 (24.1 %)
Four times	25 (10.2 %)	5 (2 %)	20 (5.6 %)	10 (6.9 %)
Five times	10 (4.1 %)	0	0	10 (6.9 %)
P value	< 0.001		< 0.001	

Table 4. Type of adhesion based on number of cesarean section among studied women.

	Type of adhesions		
	Band (n = 50)	Fine (n = 105)	Dense (n = 90)
Number of CS			
Once	25 (50 %)	35 (33.3 %)	15 (16.7 %)
Twice	20 (40 %)	20 (19 %)	30 (33.3 %)
Three times	5 (10 %)	35 (33.3 %)	25 (27.8 %)
Four times	0	15 (14.3 %)	10 (11.1 %)
Five time	0	0	10 (11.1 %)
P value	< 0.001		

Table 5. Presence of adhesion and absent sliding sign based on previous operations.

	Intrapelvic adhesion		Sliding sign	
	Present (n = 245)	Absent (n = 255)	Positive (n = 355)	Negative (n = 145)
Previous operations				
Yes	60 (24.5 %)	45 (17.6 %)	65 (18.3 %)	40 (27.6 %)
No	185 (75.5 %)	210 (82.4 %)	290 (81.7 %)	105 (72.4 %)
P value	0.06	0.01		

It was found a significant difference between those women with positive sliding sign and those negative sliding sign as regard frequency of previous abdominal operations (27.6% vs. 18.3%; $P = 0.01$).

Patients with dense intrapelvic adhesions had higher frequency of previous abdominal operations in comparison to other types of adhesions.

Predictors for intra pelvic adhesions were depressed scar, greater than or equal to three previous CS, presence of abdominal stria and negative sliding sign. Based on receiver operating characteristic (ROC) analysis, we found that the best

predictor for intra pelvic adhesion was negative sliding sign where overall accuracy was 71.9% and area under curve (AUC) was 0.72.

It was found that the only predictor of dense intrapelvic adhesion was greater than or equal to three previous CS. Based on receiver operating characteristic analysis, we found that greater than or equal to three previous CS has 50% sensitivity and 77% specificity with overall accuracy was 72.1% and area under curve was 0.63 for prediction of dense intrapelvic adhesion (Figs. 1 and 2, Tables 1–10).

Table 6. Type of adhesion based on previous operations among studied women.

	Type of adhesions		
	Band (n = 50)	Fine (n = 105)	Dense (n = 90)
Previous operations			
Yes	5 (10 %)	25 (23.8 %)	30 (33.3 %)
No	45 (90 %)	80 (76.2 %)	60 (66.7 %)
P value	< 0.001		

Table 7. Multivariate regression analysis for predictors of intrapelvic adhesions.

	OR	95%CI	P value
≥Three previous CS	3.22	1.97–5.29	<0.001
CS at private clinic	0.87	0.54–1.40	0.54
Previous abdominal operations	1.08	0.63–1.88	0.76
Depressed CS scar	5.62	1.97–16.01	<0.001
Presence of abdominal stria	2.11	1.31–3.40	<0.001
Negative sliding sign	8.57	4.90–15.01	<0.001

Table 8. Accuracy of different predictors for intrapelvic adhesions.

	≥three previous CS	Depressed CS scar	Presence of abdominal stria	Negative sliding sign
Sensitivity	41 %	22.4 %	47 %	51 %
Specificity	84.3 %	98 %	78.4 %	92.2 %
PPV	71 %	92 %	68 %	86 %
NPV	60 %	57 %	61 %	66 %
Accuracy	62.9 %	60.1 %	62.8 %	71.9 %
AUC	0.63	0.60	0.63	0.72
P value	< 0.001	< 0.001	< 0.001	< 0.001

Table 9. Multivariate regression analysis for prediction of dense adhesions.

	OR	95%CI	P value
≥three previous CS	7.58	1.37–13.45	<0.001
CS at private clinic	1.55	1.33–4.35	0.34
Previous abdominal operations	0.51	0.12–2.19	0.70
Depressed CS scar	2.87	2.34–3.45	0.99
Presence of abdominal stria	1.72	0.34–8.50	0.50
Negative sliding sign	1.22	1.01–3.22	0.34

Table 10. Accuracy of greater than or equal to three previous cesarean section for prediction of dense adhesions.

Indices	Value
Sensitivity	50 %
Specificity	77 %
PPV	32 %
NPV	88 %
Accuracy	72.1 %
AUC	0.63
P value	<0.001

4. Discussion

However, there are few large-scale studies on obstetric factors that may increase adhesion formation after CS, and there are few studies on the incidence of adhesions after CS.⁹ By identifying risk factors, preventative measures could be taken at subsequent surgeries.¹⁰ The current study enrolled 500 pregnant women who had previously undergone pelvic surgery and were scheduled for caesarean section. The goal of the study was to use clinical and ultrasound examination to predict pelvic adhesion before CS in patients who had C.S. or other pelvic surgery in the past.

We discovered that 50 (10%), 105 (21%), and 90 (18%) women had fine adhesions, dense adhesions, and frequency of intrapelvic adhesions in 245 (49%) and 255 (51%) women, respectively.

To summarize, Tulandi et al.¹¹ and Rossouw et al.,¹² they discovered that a We reported that the incidence of adhesions following a CS varies depending on the method of data collection and the

population studied. Women with prior surgery and/or inflammatory diseases have not always been excluded.

Our study observed that depressed scar was considered a predictor for intrapelvic adhesion with an odd's ratio of 5.62 and an over accuracy of 60.1% in line with Rossouw *et al.*¹³.

We found that depressed scar was considered a predictor for intrapelvic adhesion with odd's ratio was 5.62 with over accuracy was 60.1%. According to the findings of recent meta-analysis nonflat scars, both elevated and depressed, are positively associated with the presence of pelvic adhesions whereas flat scars, seem to be predictive of the absence of adhesions in accordance with Menzies.¹⁴

Another study by Pergialiotis et al.¹⁵ suggested an association between abdominal scar characteristics and intra-abdominal adhesions among women who underwent laparoscopic operations due to gynecological pathology who had a history of previous pelvic or abdominal operation. The findings of the most recent meta-analysis indicate that flat scars, whether elevated or depressed, are predictive of the absence of adhesions in the abdomen, whereas nonflat scars, whether elevated or decreased.

As well as Kahyaoglu et al.,¹⁶ found no difference between women with different skin scar characteristics' dense and filmy adhesions.

However, Sham et al.¹⁷ 74% of women with non-flat scars had dense adhesions, whereas 29.6% of women with flat scars did.

Our findings were consistent with those of numerous other studies that have shown that repeated cesarean deliveries are associated with an increased risk of and severity of abdominal adhesions in line with Moro et al.¹⁸.

According to Morales et al.,¹⁹ in a retrospective study of 542 women who had undergone CS, the rate of adhesion development at the second CS delivery ranged from 24 to 46%, at the third, from 43 to 75%, and up to 83% at the fourth CS delivery. Women who underwent repeat CS had a higher incidence of any adhesions and severe adhesions than women who underwent primary CS, and the

percentage of women who had adhesions increased with each subsequent CS.

Despite this, Nisenblat et al.²⁰ showed that women who had their third or more CS were significantly more likely to develop dense adhesions than women who had their second CS.

With an odd's ratio of 2.11 and an overall accuracy of 62.8%, we found that the presence of abdominal stria is a risk factor for intrapelvic adhesion. This was in line with what Gungor et al.²¹ reported that pregnant women with more prominent striae gravidarum formed more adhesions.

Additionally, when the striae scores were higher, it was found that adhesion scores decreased significantly, but the sensitivity and specificity were only moderate (sensitivity 55%; 67% specificity; a 69% positive predictive value (PPV); Dogan et al.,²² with a negative predictive value (NPV) of 52%, recently published came to the conclusion that women with severe striae had a significant number of thick intraperitoneal adhesions. This was in accordance with the findings that the Abbas et al.²³ reported that thick adhesions were present in 90% of women with severe striae, with a mean Davey score of 4.25±3.36.

In conclusions, depressed scar, previous greater than 3 CS and absence of sliding sign are good predictors for intrapelvic adhesion in women with prior cesarean section. Also, transabdominal ultrasound in simple noninvasive tool could help in assessment of intrapelvic adhesion through sliding sign.

Its' recommended to perform such study in multiple centers with large sample size of patients. Intra-abdominal adhesion formation following cesarean delivery was common in such women with greater than 3 CS, so meticulous observation during delivery is highly recommended for those women.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Sources of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflicts of interest

The authors declared that there were no conflicts of interest.

References

- Bukar M, Mana AU, Ikunaiye N. Preoperative sonographic prediction of intra-abdominal adhesions using sliding sign at repeat caesarean section at the University of Maiduguri Teaching Hospital, Nigeria: a prospective observational study. *BMJ Open*. 2022;12:e046334.
- Pugliese-Garcia M, Radovich E, Campbell OM, Hassanein N, Khalil K, Benova L. Childbirth care in Egypt: a repeat cross-sectional analysis using Demographic and Health Surveys between 1995 and 2014 examining use of care, provider mix and immediate postpartum care content. *BMC Pregnancy Childbirth*. 2020;20:1–4.
- Farahnik B, Park K, Kroumpouzou G, Murase J. Striae gravidarum: risk factors, prevention, and management. *Int J Women Dermatol*. 2017;3:77–85.
- Jaafar ZAA, Obeid RZ, Salman DA. Skin markers and the prediction of intraabdominal adhesion during second Cesarean delivery. *Ginekol Pol*. 2019;90:325–330.
- Baron J, Tirosh D, Mastrolia SA, et al. Sliding sign in third-trimester sonographic evaluation of intra-abdominal adhesions in women undergoing repeat Cesarean section: a novel technique. *Ultrasound Obstet Gynecol*. 2018;52:662–665.
- Nuamah MA, Browne JL, Ory AV, Damale N, Klipstein-Grobusch K, Rijken MJ. Prevalence of adhesions and associated postoperative complications after cesarean section in Ghana: a prospective cohort study. *Reprod Health*. 2017;14:1–9.
- Davey C. Factors associated with the occurrence of striae gravidarum. *BJOG An Int J Obstet Gynaecol*. 1972;79:1113–1114.
- Murphy D, Stirrat G, Heron J. The relationship between Caesarean section and subfertility in a population-based sample of 14 541 pregnancies. *Hum Reprod*. 2002;17:1914–1917.
- Awonuga AO, Fletcher NM, Saed GM, Diamond MP. Post-operative adhesion development following cesarean and open intra-abdominal gynecological operations: a review. *Reprod Sci*. 2011;18:1166–1185.
- Hesselman S, Högberg U, Råssjö EB, Schytt E, Löfgren M, Jonsson M. Abdominal adhesions in gynaecologic surgery after caesarean section: a longitudinal population-based register study. *BJOG An Int J Obstet Gynaecol*. 2018;125:597–603.
- Tulandi T, Agdi M, Zarei A, Miner L, Sikirica V. Adhesion development and morbidity after repeat cesarean delivery. *Am J Obstet Gynecol*. 2009;201, 56–e1.
- Lyell DJ. Adhesions and perioperative complications of repeat cesarean delivery. *Am J Obstet Gynecol*. 2011;205:S11–S18.
- Rossouw JN, Hall D, Harvey J. Time between skin incision and delivery during cesarean. *Int J Gynecol Obstet*. 2013;121:82–85.
- Menzies D. Postoperative adhesions: their treatment and relevance in clinical practice. *Ann R Coll Surg Engl*. 1993;75:147.
- Pergialiotis V, Frountzas M, Siotos C, Karampetsou N, Perrea DN, Efthymios Vlachos D. Cesarean wound scar characteristics for the prediction of pelvic adhesions: a meta-analysis of observational studies. *J Matern Fetal Neonatal Med*. 2017;30:486–491.
- Kahyaoglu I, Kayikcioglu F, Kinay T, Mollamahmutoglu L. Abdominal scar characteristics: do they predict intra-abdominal adhesions with repeat cesarean deliveries? *J Obstet Gynaecol Res*. 2014;40:1643–1648.
- Sham AA, Bahar AH, Al-Shahrani ME, Eskander MA, Abbo MA, Baghi Amini A. Cesarean section scar characteristics as a preoperative predictor of intra-abdominal adhesions. *Med J Cairo Univ*. 2015;83:167–171.
- Moro F, Mavrelou D, Pateman K, Holland T, Hoo WL, Jurkovic D. Prevalence of pelvic adhesions on ultrasound examination in women with a history of Cesarean section. *Ultrasound Obstet Gynecol*. 2015;45:223–228.
- Morales KJ, Gordon MC, Bates Jr GW. Postcesarean delivery adhesions associated with delayed delivery of infant. *Am J Obstet Gynecol*. 2007;196:461.e1–461.e6.
- Nisenblat V, Barak S, Grinss OB, Degani S, Ohel G, Gonen R. Maternal complications associated with multiple cesarean deliveries. *Obstet Gynecol*. 2006;108:21–26.

21. Gungor C, Oğuz S, Uludağ A, et al. Stria gravidarum is genetic but not related with collagen gene polymorphism. *Gene Ther Mol Biol.* 2013;15:131–137.
22. Dogan NU, Haktankacmaz SA, Dogan S, et al. A reliable way to predict intraabdominal adhesions at repeat cesarean delivery: scar characteristics. *Acta Obstet Gynecol Scand.* 2011;90: 531–534.
23. Abbas AM, Khalaf M, Abdel-Reheem F, El-Nashar I. Prediction of pelvic adhesions at repeat cesarean delivery through assessment of striae gravidarum score: a cross-sectional study. *J Gynecol Obstet Hum Reprod.* 2020;49: 101619.