

Research Article | Araştırma Makalesi

SLIDING SIGN: COULD IT BE A NEW MARKER FOR PREDICTING PERINATAL OUTCOMES?

ULTRASONOGRAFİK SLIDING (KAYMA) BULGUSU : PERİNATAL SONUÇLARIN ÖNGÖRÜLMESİ İÇİN YENİ BİR BELİRTEÇ OLABİLİR Mİ?

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ABSTRACT

Objective: Adhesions following cesarean section has an important role in the course of subsequent cesarean deliveries and perinatal outcomes. Sliding sign can be proposed as a third trimester transabdominal sonographic marker for the predicting intra-abdominal adhesions in consecutive cesarean sections, skin-to-delivery time and APGAR scores.

Methods: A prospective study was conducted on women with a history of at least one cesarean section. All patients were evaluated at last trimester by real time ultrasonography in terms of sliding sign. The presence and absence of sliding sign, the degree of adhesions, skin-to-delivery time and APGAR scores were recorded.

Results: 200 patients were examined. Sensitivity and specificity of sliding sign in the prediction of intra-abdominal adhesions were 75.5% and 88.2%, respectively. More severe adhesions were observed in sliding sign negative group whereas the rate of no-adhesion was higher in the sliding sign positive group. Skin-to-delivery time and 1-5 minutes APGAR scores were significantly different between 2 groups. Visceral injury was observed in 6% and bleeding over 1000 ml was seen in 30% of the patients.

Conclusion: Ultrasonographic evaluation of sliding sign may be a reliable method as a predictor tool for presence of intraperitoneal adhesions in repeat cesarean sections.

Keywords: Pregnancy, cesarean section, perinatology, intraabdominal adhesions

ÖZ

Amaç: Sezaryen sonrası yapışıklıklar, sonraki sezaryen doğumların seyirinde ve perinatal sonuçlarda önemli bir role sahiptir. Sliding (Kayma) işareti, ardışık sezaryenlerde karın içi adezyonları, ciltten doğuma kadar geçen süreyi ve APGAR skorlarını öngörmek için üçüncü trimester transabdominal sonografik belirteç olarak önerilebilir.

Yöntem: En az bir sezaryen doğum öyküsü olan kadınlar üzerinde prospektif bir çalışma yapılmıştır. Tüm hastalar son trimesterde gerçek zamanlı ultrasonografi ile kayma işareti açısından değerlendirildi. Kayma işaretinin varlığı ve yokluğu, adezyonların derecesi, kesiden bebeğin doğumuna kadar geçen süre ve APGAR skorları kaydedildi.

Bulgular: 200 hasta çalışmaya dahil edildi. Karın içi adezyonları öngörmede kayma işaretinin duyarlılığı %75.5, özgüllüğü ise %88.2 idi. Kayma işareti negatif grupta daha şiddetli adezyonlar gözlenirken, hiç adezyon olmama oranı kayma işareti pozitif grupta daha yüksekti. İlk kesiden bebek doğumuna kadar geçen süre ve 1-5 dakika APGAR skorları 2 grup arasında anlamlı olarak farklıydı. Hastaların %6'sında visceral yaralanma ve %30'unda 1000 ml'nin üzerinde kanama görüldü.

Sonuç: Tekrarlayan sezaryenlerde intra-abdominal yapışıklıkların varlığını öngörmek için kayma işaretinin ultrasonografik olarak değerlendirilmesi güvenilir bir yöntem olabilir.

Anahtar Kelimeler: Gebelik, sezaryen doğum, perinatoloji, karın içi yapışıklıklar

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Introduction

Cesarean section is increasing all over the world and one of the most common reasons for this increase is previous cesarean sections.¹ Adhesions after cesarean section are important for the course of subsequent cesarean deliveries and perinatal outcomes.² In patients with extensive adhesions, the possibility of injury to surrounding organs and bleeding increases in the next cesarean section.³ As a result, skin-to-delivery time is prolonged and lower APGAR scores are observed.² It is vital to be informed on the adhesions prior to the surgery for the wellness of both the mother and the fetus.

'Sliding sign' was first used in obstetrics and gynecology to predict adhesions secondary to endometriosis.⁴ Then it was suggested as a transabdominal sonographic marker in obstetrics useful for foreseeing intra-abdominal adhesions in repeat cesarean sections with acceptable sensitivity and specificity.⁵

In this study we present data on the effectiveness of the 'sliding sign' for the prediction of intraabdominal adhesions in repeat cesarean sections and its relationship with skin-to-delivery time and APGAR scores.

Methods

Herein, we present a prospective study including women with a history of at least one cesarean section undertaking transabdominal ultrasonographic evaluation in the last trimester of pregnancy, between April and August 2023. The study was approved by the institutional ethical review board of XXX (approval number 2023/40). All participants were informed and informed consents were taken before participation.

Inclusion and Exclusion Criteria

Inclusion criteria were to have a third trimester pregnancy with previous cesarean section(s) and to have a plan of cesarean delivery in the current pregnancy. Patients with previous abdominal entry with any cause, history of pelvic inflammatory disease and soft tissue disease were excluded.

Study Design

At last trimester all patients were evaluated by real time ultrasonography by the same study collaborator (SS) 3 days prior to their planned cesarean section. Emergency procedures were evaluated before they were taken to operation room. Hitachi ARIETTA 65 (Aloka Medical, Ltd. Tokyo, Japan) was employed for all sonographic evaluations. The patient with empty bladder was asked to breathe deeply and hold for a few seconds during the abdominal ultrasonography. Recordings of positive and negative sliding sign was taken (Figure 1, Figure 2). Cesarean section procedures were performed by MD who was fully blinded on the ultrasonographic findings. The degree of adhesions was determined by MD and grouped in three as none- mild and severe adhesions. Filmy adhesions which were easy to dissect between the

uterus and the surrounding tissue were defined as mild adhesions whereas firm ones making the dissection rigid between the uterus and the bladder, and the bowels were defined as severe adhesions. The cases in which neither firm nor filmy adhesions observed were grouped as no adhesion group. Chronometric data was recorded in all procedures measuring the time from the start of laparotomy to the delivery of the fetus. Visceral injury, total estimated blood loss and type of anesthesia (regional/ general) were recorded for each procedure. APGAR scores at 1 and 5 minutes were recorded.

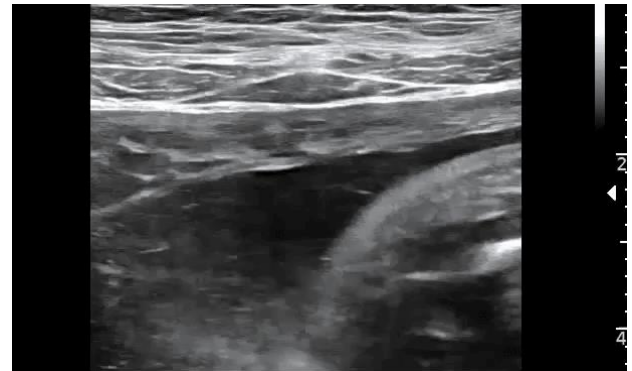


Figure 1. Positive sliding sign

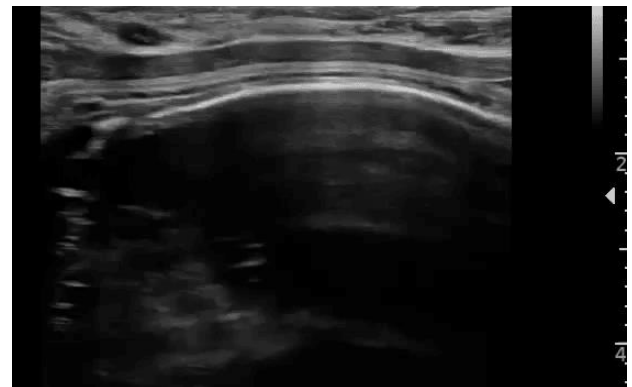


Figure 2. Negative sliding sign

Statistical Methods

Mean Standard Deviation, Median, minimum and maximum values were stated in descriptive statistics for continuous data, and number and percentage values were set in discrete data. Kolmogorov Smirnov test was applied to investigate the conformity of the data to the normal distribution. Mann-Whitney U test was used to compare skin-to-delivery times and APGAR scores. Chi-square test was used to compare degree of adhesions. IBM SPSS for Windows 20.0 (SPSS Inc. Chicago, IL) program was used. $P < 0.05$ was accepted as the statistical significance.

Results

We examined 200 patients with at least one previous cesarean section. Sliding sign was detected in 60% of them and no adhesion was observed in 44%. Sliding sign was absent in 40% of the patients and mild to severe

adhesions were observed in 56%. Mean skin-to-delivery time was 4.20±1.87 minutes, with a range of 1-8 minutes. Median 1st minute APGAR score was 9 and 5th minute APGAR score was 10. Visceral injury was observed in 6% and bleeding over 1000 ml was seen in 30% of the patients. 74% had regional anesthesia and 26% had general anesthesia. Patient characteristics are summarized in (Table 1).

Table 1. Patient characteristics

n=200	Mean ± SD	Median (Min-Max)
Skin-to-delivery time (min)	4.20±1.87 4	(1-8)
APGAR 1.min	7.97±1.44 9	(5-90)
APGAR 5.min	9.10±1.36 10	(6-10)
	n	%
Sliding sign		
Negative	80	40.0
Positive	120	60.0
Adhesions		
None	88	44.0
Mild	56	28.0
Severe	56	28.0
Visceral Injury		
No	188	94.0
Yes	12	6.0
Bleeding over 1000 ml		
No	140	70.0
Yes	60	30.0

There was a significant difference between sliding sign positive and negative groups in terms of skin-to-delivery time and 1-5 minutes APGAR scores. Skin-to-delivery time was significantly low in sliding sign positive group. Likewise, 1st and 5th minute APGAR scores were significantly high in those with a sliding sign ($p < 0.001$). There was no significant difference between the general and regional anesthesia groups in terms of skin-to-delivery time and APGAR scores. Median skin-to-delivery times and APGAR scores of sliding sign positive and negative groups are given in (Table 2).

Table 2. Skin-to-delivery times and APGAR scores of sliding sign positive and negative groups

	Sliding sign negative	Sliding sign positive	p
	Mean ± SD Median (Min-Max)	Mean ± SD Median (Min-Max)	
Skin-to-delivery time	6.00±1.42 6 (3-8)	3.00±0.93 3 (1-5)	<0.001*
APGAR 1.min	6.72±1.55 6 (5-9)	8.80±0.40 9 (8-9)	<0.001*
APGAR 5.min	7.95±1.50 8 (6-10)	9.87±0.34 10 (9-10)	<0.001*

* Mann Whitney U test

Sensitivity and specificity of sliding sign for predicting intra-abdominal adhesions were 75.5% and 88.2%, respectively. Significant difference was found in terms of adhesion rates in sliding sign negative and positive groups ($p < 0.001$). More severe adhesions were observed in sliding sign negative group whereas the rate of no-adhesion is higher in the sliding sign positive group. Comparison of adhesion degrees of sliding sign positive and negative groups is given in (Table 3).

Table 3. Adhesion degrees of sliding sign positive and negative groups

	Sliding sign negative		Sliding sign positive		p
	n	%	n	%	
Adhesion					
None	0	0	88	73.3	<0.001**
Mild	24	30.0	32	26.7	
Severe	56	70.0	0	0	

**Chi-Square Tests

Discussion

In this study we observed statistically significant correlation between sliding sign and intraabdominal adhesions in women with consecutive cesarean sections. The absence of sliding sign was associated with the presence of mild to severe intraabdominal adhesions, extended skin-to-delivery timeframe and worse APGAR scores.

Uterine sliding sign was first used in gynecology, especially in predicting uterorectal adhesions in deep infiltrating endometriosis.⁶ Sonographic demonstration of a negative uterine sliding sign reflected dense uterorectal adhesions and was accepted as a straightforward and convenient method for the estimation of deep infiltrating endometriosis and a valuable marker for triaging patients. Over time, it has been shown to be beneficial for obstetricians too, especially for predicting the adhesions preoperatively in consecutive cesarean sections and has begun to be used in this area.⁵ The sensitivity and specificity for predicting intra-abdominal adhesions in women with previous cesarean sections were 76.2% and 92.1%, respectively. Compatible with previous research, in our study we detected that sensitivity and specificity of the sliding sign in the prediction of intra-abdominal adhesions were 75.5% and 88.2%, respectively. Other ultrasonographic markers as an outstretched cervix, overdistended bladder and retroflexed uterus forming an angle with the distended urinary bladder were also evaluated in some studies.⁷

Extra parameters as skin scar features and the severity of striae gravidarum were also evaluated alone or in combination with sliding sign in recent studies, reporting the highest sensitivity with scar features and negative sliding sign (65%) and maximum specificity with negative sign and its several combinations (97% - 99%).⁸ They also reported highest positive predictive value with negative sign sliding and its combinations. The value of all three parameters and their combinations were reported to be the same in this study in terms of estimating the negativity.

Adhesion formation is common after cesarean sections and is reported to be around 7% after first and 68% after third cesarean section.⁹ In our cohort more severe adhesions were observed in patients with higher number of cesarean sections. Severe intraabdominal adhesions were associated with higher risk of damage to surrounding organ systems like urinary and

gastrointestinal tract, longer surgical duration, severe blood loss and poorer perinatal outcomes.^{5,10} Knowing the degree of adhesions prior to the surgery may help surgeons in getting well-prepared preoperatively.

Neonatal outcomes are also affected by the presence of intraabdominal adhesions. Since fetal delivery may be delayed in the presence of severe adhesions, and also if the adhesions are known preoperatively, the preparation of the neonatal specialists constitutes the main reasons for its effect on neonatal outcomes. Absence of sliding sign was significantly associated with extended skin-to-delivery time and worse 5-min APGAR scores.¹¹ Extensively long delivery time was observed with each repeat cesarean section due to intraabdominal adhesions, reporting a retardation of 5.6 minutes in the second and 18.1 minutes in the fourth cesarean section, which is a relatively long delay that could lead to neonatal compromise in some circumstances.² Umbilical artery blood pH ≤ 7.1 and lower 5-minutes APGAR scores were seen in patients with dense adhesions.¹²

The use of technique was safe in obese patients. Performers did not report technical difficulties in evaluating the sliding sign in patients with high body mass index.⁵ In our cohort, 26 (13%) patients had BMI over 30 however the sonographer (SS) did not report any difficulties compared to patients with normal BMI.

Limitations of this study, the major strength of our study is its prospective design. Besides, to our knowledge it is the research with the highest number participants in the literature about this subject. Our study limitation is that it was conducted in a single center.

In conclusion, ultrasonographic evaluation of sliding sign which is an easy and reliable method may be used as a tool for foreseeing presence of intraperitoneal adhesions in repeat cesarean sections with reliable results.

Compliance with Ethical Standards

The study protocol was approved by the Tekirdag Dr Ismail Cemil Cumalioglu City Hospital Clinical Research Ethics Committee (Date: 12.05.2023, No: 40).

Conflict of Interest

The authors declare there are no conflicts of interest—financial or otherwise—related to the material presented herein.

Author Contribution

MD, CY, SBA: The concept and design of the study and manuscript preparation, editing, and review; SS: Ultrasonographic evaluations; MD: Surgical procedures; MD, SS: Data acquisition. Data analysis and interpretation were performed by all the authors. Statistical analysis was performed by all authors.

Financial Disclosure

None

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