

Accuracy of ultrasonographic visceral slide test in predicting the presence of intra-abdominal adhesions

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Objective

The aim was to evaluate whether the visceral slide test was an effective screening test for the prediction of intra-abdominal adhesions.

Background

Intra-abdominal adhesions result in intraoperative and postoperative morbidities; adhesions to the abdominal wall bring bowel and blood vessels close to the sites of laparoscopic entry. Serious injury to the bowel or blood vessels occurs during the insertion of the trocar, and unrecognized injuries can have catastrophic morbidity and mortality. So, the prediction of the presence of adhesions can prevent these complications.

Patients and methods

In this cross-sectional study, a visceral slide test was performed on 151 women who underwent gynecologic surgery and the results of this screening test were correlated with the intraoperative presence of adhesions.

Results

Of the patients 67% had risk factors for pelvic infections. Approximately half of them had previous abdominal surgeries (50.3%). The visceral slide test showed a sensitivity of 78.8%, specificity of 95.9%, and a diagnostic accuracy of 90% in predicting the presence of intra-abdominal adhesions.

Conclusion

The visceral slide test is a good, simple, nonexpensive, and noninvasive test for predicting intra-abdominal adhesions.

Keywords:

Intra-abdominal adhesions, laparoscopy, open surgery, trocar injury, ultrasound, visceral slide

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Introduction

Intra-abdominal adhesions have important clinical and significant economic consequences to patients, surgeons, and the health system. The adhesions that developed in the peritoneal cavity following abdominal or pelvic surgery or after local inflammatory process are normal response to injury of the peritoneal surfaces during surgery, and although adhesions have some beneficial effects, they also cause significant morbidity, including adhesive small bowel obstruction, female infertility, chronic abdominal or pelvic pain, and increased difficulty with subsequent surgery [1].

Intra-abdominal adhesions arise when abnormal scar tissue is formed and connects structures that should be separated from one another. Postoperative adhesions typically occur within the first 5 days after surgery. They arise in ~90% of people who have undergone major abdominal surgery and in 55–100% of women after gynecologic surgery [2].

Adhesions between the abdominal wall and the viscera developed in ~25–50% of patients with previous

abdominal surgeries. These adhesions to the abdominal wall bring bowel and blood vessels close to sites of laparoscopic entry. During insertion of the Veress needle or trocar, serious injury to the bowel or blood vessels may occur and unrecognized injuries can have catastrophic morbidity and mortality [3].

Strategies to prevent injury during initial trocar insertion include alternative sites of entry such as Palmer's point, open laparoscopy, entry under direct visualization, and direct entry with mini-instruments. However, no one entry technique or instrumentation has reduced injuries according to a recent Cochrane review [4].

The visceral slide test is a simple and reliable test for detecting periumbilical adhesions. This test could be an important tool to assess surgical difficulty before entering the operating room [5].

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The aim of the study was to evaluate the accuracy of the visceral slide test in detecting the presence of intra-abdominal adhesions before the surgery to prevent complications related to adhesions.

Patients and methods

Patients

In this cross-sectional study, we evaluated 151 women who were attending the gynecologic surgery in the Obstetrics and Gynecology Department at Menoufia University Hospital in the period between January and October 2019. The study protocol was approved by the Medical Ethics Committee of the Faculty of Medicine, Menoufia University. Basic demographic data and medical history were taken first. Informed consent was taken from each participant before being enrolled in the study.

The inclusion criteria were: any patient admitted for gynecologic, laparoscopic, or abdominal surgery and with an uterine size of less than 20 weeks of gestation.

The exclusion criterion was: uterine size of more than 20 weeks of gestation.

Methods

The study was carried out in the Department of Obstetrics and Gynecology at Menoufia University Hospital, Menoufia Governorate, Egypt. A preoperative visceral slide test was done to all participants before surgical intervention. The test was conducted using a 3.5 MHz abdominal transducer placed in a sagittal plane at the abdomen. A stable echogenic focus between the anterior abdominal wall and aorta, which corresponds to the omentum or intestine was identified as point A (Fig. 1). Then the patient was asked to take

a deep inspiration and expiration. The movement of point A was observed and the new point is marked as point B; then the distance that this focus traveled was recorded (Fig. 2). The visceral slide is described as the longitudinal distance in which the viscera traveled in a vertical direction as visualized on ultrasonography from point A to point B. The normal visceral slide is the movement of the viscera of more than 3 cm, and an abnormal visceral slide is the movement of the viscera of less than 3 cm during exaggerated respiration.

Reduction or absence of visceral slide is considered a positive sign of the underlying adhesions, while normal visceral slide is considered as a negative sign for adhesions.

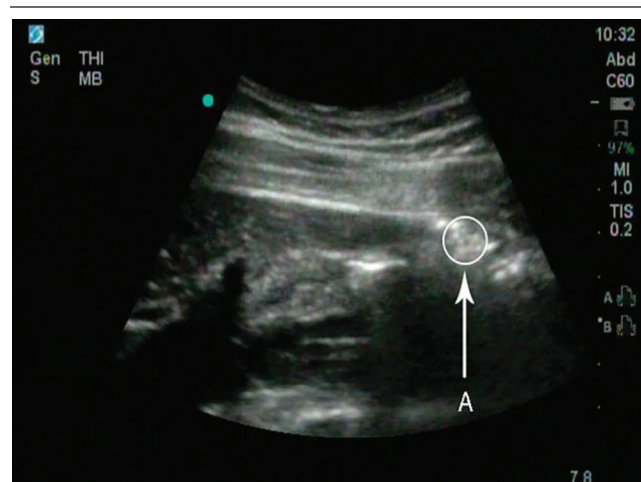
After a successful entry into the peritoneal cavity either by laparoscopy or by laparotomy, operative findings (presence of any intra-abdominal adhesions) were recorded.

Then the sonographic findings (sliding sign) were correlated to the corresponding operative findings (peritoneal adhesions) for each patient to evaluate the diagnostic value and accuracy of the ultrasonographic sliding sign to predict intra-abdominal adhesions in patients scheduled for gynecologic surgery.

Sample size

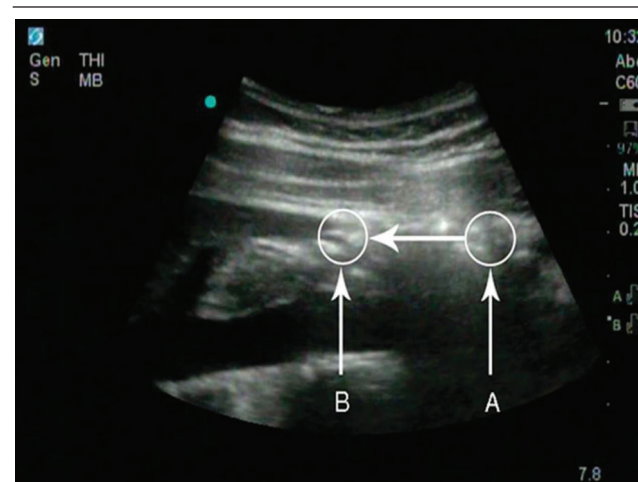
On the basis of a study done by Tabibian *et al.* [6], nearly 90% of abdominal adhesions form as a result of prior abdominal surgery, primarily laparotomy (i.e., open surgery) and to a much lesser extent laparoscopic surgery. With a margin of error 5%, confidence level 95% in a total population of 20 000, the minimum recommended size of our sample would be 138 patients.

Figure 1



Visceral slide test performance.

Figure 2



Visceral slide test after deep respiration.

Statistical analysis

All data were collected, tabulated, and statistically analyzed by an IBM SPSS 20 (SPSS Inc. Released 2015. IBM SPSS statistics for windows, version 20.0; IBM Corp., Armonk, New York, USA).

Descriptive statistics were used in the study, for example, percentage, range, mean, and SD.

Results

The age of the participants ranged from 16 to 70 years; the mean age was 41.9 years (± 10.6). The weight ranged from 54 to 120 kg, the mean weight was 78.4 kg (± 12). Nulliparous women were 25 women constituting 16.56% (Table 1).

A total of 105 (69.5%) women were free of medical diseases and 46 (30.5%) had medical disorders; 102 (67.5%) participants had risk factors of pelvic infections and 49 (32.5%) had no risk factors; 76 (50.3%) participants had a previous history of abdominal or pelvic operations and 75 (49.7%) were without (Table 2).

A total of 151 women who were admitted to the gynecologic surgery were recruited for the study. Of these, 67% of patients had risk factors for pelvic infections. Approximately, half of them had previous abdominal surgery (50.3%). The percentage of adhesions detected by the visceral slide test was 27.2% and the adhesions which were detected intraoperatively were 34.4%. By comparison (*P* value) between the percentage of cases with adhesions detected by the test and intraoperatively, there is no significant statistical difference between the results as the *P* value is 0.211 which is nonsignificant (Table 3).

The visceral slid test parameters showed a sensitivity of 78.8% and specificity of 95.9% and a diagnostic accuracy of 90% (Table 4).

Discussion

Visceral slide test has been suggested as a simple, objective, and reliable method for detecting intra-abdominal adhesions. Previous studies have demonstrated the effectiveness of this technique in determining areas of adhesions. Our findings were similar to previous studies which concluded that the visceral slide test is associated with high prediction rates for intraperitoneal adhesions. Ultrasonography is a simple and noninvasive method that is available for many specialties. Ultrasonographic visceral slide test was first described in 1991 by Sigel *et al.* [7]. A study

Table 1 Demographic data of studied patients (n=151)

Data	
Age (years)	
Mean $\pm$ SD	41.94 $\pm$ 10.59
Range	16-70
Weight (kg)	
Mean $\pm$ SD	78.42 $\pm$ 12.01
Range	54-120
Parity [n (%)]	
Nulliparous	25 (16.6)
Multiparous	126 (83.4)

Table 2 Medical and surgical history and risk factors of adhesion among studied patients (n=151)

Data	n (%)
Medical history	
No medical diseases	105 (69.5)
DM	14 (9.3)
HTN	13 (8.6)
DM and HTN	11 (7.3)
Hypothyroidism	2 (1.3)
Renal disease	2 (1.3)
History of stroke	2 (1.3)
Esophageal varices	1 (0.7)
Bronchial asthma	1 (0.7%)
Risk of adhesion	
Free	49 (32.5)
PID, IUCD, and chronic pain	102 (67.5)
Previous surgical history	
Yes	76 (50.3)
No	75 (49.7)

DM, diabetes mellitus; HTN, hypertension; IUCD, intrauterine contraceptive device; PID, pelvic inflammatory disease.

Table 3 Comparison between sliding test and intraoperative adhesion

Variables	Sliding test adhesion [n (%)]	Intraoperative adhesions [n (%)]	Z-test	P
Cases with adhesions	41 (27.1)	52 (34.4)	1.25	0.211 (NS)

Table 4 Screening parameters of the sliding test to predicted adhesions

Slid test results	Conformity diagnosis of adhesion during operation		
	Adhesion	No adhesion	Total
Positive	41 TP	4 FP	45
Negative	11 FN	95 TN	106
Total	52	99	151

Sensitivity=78.84%. Specificity=95.95%. PPV=91.11%. NPV=89.62%. Accuracy=90%. FN, false negative; FP, false positive; NPV, negative predictive value; PPV, positive predictive value; TN, true negative; TP, true positive.

with non-blinded data by Kolečki *et al.* [8] found a sensitivity of 90% and specificity of 92% of the visceral slide test for predicting adhesions. The first blinded study was conducted by Kothari *et al.* [9]. They found a sensitivity of 43%, a specificity of 90%, and an overall accuracy of 78%. In comparison with other studies, a study included 155 patients showed an overall accuracy

of 86.5%, sensitivity of 78.6%, specificity of 88.2%, positive predictive value (PPV) of 59.5%, and a negative predictive value (NPV) of 94.9% [10]. Another study included 144 women. A total of 48 (33.3%) patients had adhesions. Visceral slide test had a sensitivity of 97.2%, specificity of 68.6%, a PPV of 90.6%, a NPV of 88.9%, and a diagnostic accuracy of 90.3% [11].

Minaker *et al.* [12] also investigated 145 patients for the presence of adhesions before surgery. The test showed a sensitivity of 69.6%, specificity of 98.7% and a PPV of 99.5% for detection of areas free of critical adhesions.

Also, there is a study that included 70 women with a history of abdominal and pelvic operations, six of them had periumbilical adhesions and 18 of them had adhesions located in other parts of the abdomen or the pelvis. The visceral slide test had a sensitivity of 83.3%, specificity of 100%, PPV of 100%, NPV of 98.5%, and diagnostic accuracy of 98.6% [3].

There was a study on the office visceral slide test in the prediction of periumbilical adhesions. Forty-five consecutive patients with prior surgical history and scheduled to undergo laparoscopic surgery were included. The office visceral slide test had a sensitivity of 80%, specificity of 100%, PPV of 100%, and NPV of 97.6%. The preoperative examination with visceral slide had a sensitivity of 80%, specificity of 95%, PPV of 66.7%, and NPV of 97.4%. The periumbilical ultrasound-guided saline infusion (PUGSI) had a sensitivity of 60%, specificity of 97.5%, PPV of 75%, and an NPV of 95.1%. This study concluded that the office visceral slide test is a simple and reliable diagnostic test for detecting obliterating periumbilical adhesions in an outpatient setting. The accuracy of the test is comparable to the preoperative examination with the visceral slide and PUGSI. This test could be an important tool to assess surgical difficulty before entering the operating room [5].

There is a comparative study that used visceral slide test in comparison to the PUGSI and concluded that visceral slide test had an accuracy of 96.4%, sensitivity of 50%, specificity of 98.1%, NPV of 98.1%, and a PPV of 50%. The PUGSI test was able to detect all cases of obliterating subumbilical adhesions, demonstrating a sensitivity and a specificity of 100% [13].

A comparative study of TAU and cine MRI as noninvasive methods in detecting adhesions to the abdominal wall concluded that both methods are specific in detecting adhesion-free areas [14].

Conclusion

Ultrasound is a fundamental tool in all areas of obstetrics and gynecology. Visceral slide test is a simple and useful method in detecting intra-abdominal adhesions before a surgical procedure which helps in preventing intraoperative injuries and complications related to adhesions.

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Conflicts of interest

There are no conflicts of interest.

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