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Predicting Parameters of Cesarean Scar Indicators for Presence and Severity of Intra-abdominal Adhesions

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ABSTRACT

Background: The most serious post-CS complication is intraabdominal adhesions. There is no accurate method for pre-operative identification of intra-abdominal adhesion. The aim of the present study is to detect the presence of certain CS scars characteristics which might have value in predicting occurrences and degree of intraabdominal adhesions . Methods: this is a retrospective cohort study in which patients' data were collected from patients' files. We included 150 patients with past history of Pfannenstiel incision CSs, with gestational age that was about around 36 weeks. Score values of this system is ranged from 5 - 25. **Results:** We showed that females with higher indices of the scar had higher rates of adhesion than others. We showed that adhesion occur more in women with a past history of 2 CSs or more (P = 0.002). We showed that the sensitivity of evaluation of the CS scar index in detecting intra-abdominal adhesions was 60%, specificity was 31%, positive and negative predictive values were 29%, and 78% respectively. Conclusions: We concluded that patients with a higher scar index were more liable to occurrence of more severe adhesions than patients with low score index .

Keywords: Cesarean Scar Indicators, Adhesions, Prediction.

INTRODUCTION

D ecently the rate of performing cesarean **N** section (CS) rate was markedly elevated and even doubled [1]. The most frequent CS indication is repeated cesarean sections [2]. CS has many drawbacks such as liability for occurrence of postoperative infections, pelvic adhesions, postpartum hemorrhage and even hysterectomy [3]. The most serious post-CS complication is intraabdominal adhesions which might lead to obstruction. chronic intestinal pelvic persistent pain, and secondary infertility in addition to repeated complicated surgeries Moreover, females with inherited [**4**]. disorder of fibrinolysis are liable to permanent fibrosis and adhesion [5]. Peritoneum adhesions are usually formed between the omentum, intestine, abdominal wall and internal organs [6]. Adhesion risk in patients underwent a single CS is about 7%, which is elevated up to 68% in the subsequent CSs [7].

There is no accurate method for preoperative identification of intra-abdominal adhesion so characteristics of the abdominal scar might be considered a parameter for prediction of the presence and severity of adhesions [8]. Evaluation of CS scar parameters for detecting intra-abdominal adhesions are not sufficiently studied [4] So we aimed in the present study to evaluate the presence of certain abdominal CS scar characteristics which might have value in predicting occurrence and severity of intraabdominal adhesions. Thus, ensuring predictive values of these parameters will make subsequent CSs easier which lead to a healthy delivery for mother and fetus.

METHODS

This is a retrospective cohort study was conducted at department of Gynecology and Obstetrics, Faculty of Medicine, Zagazig University on pregnant females with repeated performance of cesarean sections more than 36 weeks in the period from May 2022 to July 24 years. The institutional review board of Faculty of Medicine, Zagazig University approved this study. IRB#:101007-23-9-2023. We obtained written consent from all patients. Inclusion criteria: All patients with past history of Pfannenstiel incision CSs with a double layer suturing of Kerr incision and performing peritoneal repair, with around 36 weeks gestational age were included in the present study. Exclusion criteria: Emergency CS, endometritis resulting from previous CS, CS wound infection, patients with connective tissue diseases, patients with systemic steroids use, DM, smoking, patients with past history of endometriosis or patients with past history of any abdominal surgery other than CS were excluded from the study. After applications of inclusion criteria 150 pregnant females were selected

Assessments of CS scar criteria: We calculated the Manchester scars indices parameters for included patients to assess the risk of adhesion. The score values of this system ranged from 5 - 25. Evaluated scar appearance criteria according to Likert scale include color of scar, if CS scar was shiny or dull, lines on the surface of the scar,

irregular scar appearance, and quality of tissue. After evaluating and registering all scar parameters we observe and assessed the presence and degree of intra-abdominal adhesions during surgery. We reported all our findings immediately after surgery, as the presence or absence of adhesions then we divided their severity into 4 categories. We used modified Nair's system for grading intra-abdominal adhesions to divide them into 5 groups (0 - 4). Grade 0 describes complete adhesions absence and grade 4 describes the degree of adhesions when the viscera are directly adherent to the abdominal wall or obliteration of rectovaginal pouch regardless extent or number of bands of the adhesions. Grades 1 and 2 describe filmy adhesions, while grades 3 describe dense adhesions. We collect all data as patients' age, comorbid conditions, CSs number and past history of any surgical interference.

Statistical Analysis: Mean, frequency, and standard deviation were used for the descriptive data analysis, presenting them in the form of frequency distribution figures and tables. We used trend analysis tests and cross-checking tests for performing analysis of study findings according to the power of the variable statistical tests. We performed all data analysis by using SPSS v25, and the statistical tests were done to achieve the goals.

RESULTS

In the current report we included 150 women underwent CS. Mean age was 30 ± 7 years and median previous CS number was 2 (1 - 3), respectively. Ninety-two patients had low scar index (61.3%). According to the grade of adhesions, 38.7% had dense adhesions (grade 3 and 4) (table 1).

| | Mean \pm SD/Median | Range (%) |
|--|----------------------|-----------|
| Age (year) | 32.93 ± 6.89 | 22 - 45 |
| Number of CS | 2(1-3) | 1 - 5 |
| One | 64 | 42.7% |
| Two | 37 | 31.3% |
| Three and more | 39 | 26% |
| Scar index | | |
| Low | 99 | 66% |
| High | 51 | 34% |
| Grades of adhesion(modified Nair classification) | | |
| Filmy adhesions (grade 1 and 2) | 92 | 61.3% |
| Dense adhesions (grade 3 and 4) | 58 | 38.7% |

Table (1) Baseline data of patients studied:

We found statistically significant differences between included groups that have high and low scar indices as regards presence of adhesion. Patients presented with high indices of the scar found to have a higher rate of adhesion (table 2). Thus, high scars indices might be able to predict the presence of dense adhesions with 74.1% sensitivity, 91.3% specificity and overall accuracy 84.7%. Patients presented with low scar indices, 5.2% of women with a single CS presented with dense adhesions. 10.3% of female patients with a past history of 2 CSs and 75% of female patients with 3 or more CSs had dense adhesions . Included patients with high scar indices, it was found that 25% of patients with a history of one CS, 88.9% of women with a history of 2 CSs were presented with adhesions, and 93% with a history of 3 or more CSs had adhesions (p=0.003). We found statistically significance differences regarding presence or absence of adhesions between both included groups that are presented with low and

high scar indices. We showed that females with higher indices of the scar had higher rates of adhesion than others. We showed that in patients with a low scar index 18 % of women have a single CS had intra-abdominal adhesions, 60% of patients with a history of two CSs and all patients with more than CSs had adhesions. The results showed that presence of severe adhesion was more in females with a past history of many times of CSs (P =0.002). In females with higher indices of the scar we found 75% of them have a past history of one CS, 85.7% of them have a past history of two CSs, and 66.7% of them have a past history of 3 or more CSs had adhesions. We found no statistically significant differences between included three groups with variable CSs history in women that are presented with high scar indices . We showed that the sensitivity of the CS scar index evaluation in intra-abdominal adhesions diagnosis was 60%, specificity was 31%, positive predictive value was 29%, and negative predictive value was 78%.

| Table (| (2) Relation | between | Manchester | score index | and g | rades of | adhesions | among | studied | patients |
|---------|--------------|---------|------------|-------------|-------|----------|-----------|-------|---------|----------|
| | < / / | | | | 0 | , | | 0 | | |

| | Filmy adl | nesions | Dense adhesions | | γ2 | p |
|------------|-------------|-------------|-----------------|-------|----------|-----------|
| | N=92 | (%) | N=58 (%) | | ~ | r |
| Low | 84 (91.3%) | | 15 (25.9% | 6) | | |
| High | 8 (8.9%) | | 43 (74.1%) | | 67.892 | < 0.001** |
| | Sensitivity | Specificity | PPV | NPV | Accuracy | k |
| High score | 74.1% | 91.3% | 84.3% | 84.9% | 84.7% | 0.669 |

** $p \le 0.001$ is statistically highly significant *p < 0.05 is statistically significant χ^2 Chi square for trend test

| | Filmy adhesions | Dense adhesions | ~? | n |
|----------------|-----------------|-----------------|---------|----------|
| | N=92 (%) | N=58 (%) | λ2 | Р |
| Low risk(n=99) | | | | |
| One | 55 (94.8%) | 3 (5.2%) | | |
| Two | 26 (89.7%) | 3 (10.3%) | 26 627 | <0.001** |
| ≥three | 3 (25%) | 9 (75%) | 20.057 | <0.001 |
| High risk | | | | |
| One | 4 (75%) | 2 (25%) | | |
| Two | 2 (11.1%) | 16 (88.9%) | 0 5 2 1 | 0.002* |
| ≥three | 2 (7.4%) | 25 (92.6%) | 0.331 | 0.005* |

| Table (3) | Relation between | Manchester sco | re index and | grades of | adhesions a | mong studied patients |
|-----------|--------------------|------------------|--------------|-----------|-------------|-----------------------|
| |) Kelalion Delweel | I Manchester sco | ie mues anu | grades or | aunesions a | mong studied patients |

** $p \le 0.001$ is statistically highly significant * $p \le 0.05$ is statistically significant χ^2 Chi square for trend test



Figure (1) Multiple bar chart showing relation between number of CS among patients with Manchester score index and grades of adhesions among studied patients

DISCUSSION

In the present study we tried to detect a model for prediction of the presence of intra-abdominal adhesions from the CS scar indices by observation of such indices and correlating them with intra-abdominal adhesions in cases with a past history of a single or multiple CSs.

We demonstrated that the rates of development of intra-abdominal adhesion of

higher grades were higher and positively associated with higher scar indices. Additionally, we found higher values of sensitivity and specificity of scar indices so patients with higher scar indices must be put consideration into pre-operative in evaluation of those patients. Moreover, we showed that in patients with low scar indices the liability for developing adhesions is increased with the increased CSs

frequencies. Our findings are similar to the findings of Shafiei et al., [4], Taylan et al., [8] and Salim et al., [9] studies. Results of Taylan's study [8] demonstrated that there is an association between the presences and severities of intra-abdominal adhesions in association with past history and number of CSs. That was consistent with the results of our study. Salim et al. [9] assessed abdominal cavity parameters as predictors of the presence of intra-abdominal adhesions in patients with repeated CSs. They demonstrated that 16% of them have skin adhesions while 27% were presented with dense marked adhesions that were in line with our study results.

Results of Salim et al., [9] study was slightly different from our study in the point that they found no associations between scar criteria and the presence or absence of intraabdominal adhesions after CSs that was different from our findings. The explanation of differences in these results is the differences in the evaluation of; presence, severity and sites adhesions and criteria of included patients. We demonstrated the status of adhesions according to the scar index and showed its association with the distance from past CSs. We showed no significant differences in occurrence or severity of adhesions between included groups with different time intervals from past CSs in groups with low and high scar indices our results were similar to results of Shafiei et al., [4]. Elprince et al. [10] demonstrated like our results that there are strong associations between detected indices abdominal scar and presence of of abdominal striae in expecting the occurrence of intra-abdominal adhesion.

Drukker et al., [11], results pointed to the values of predicting the presence of intraabdominal adhesions by detecting the presence of the sliding sign by using ultrasound before performing repeated CSs and the y showed that absent sliding sign

was related to a longer duration from performing skin incision till delivery. The limitations of the current study are retrospective nature, small number and nonrandom sampling of patients make difficulty in generalizing the results; additionally, the accurate pre-operative prediction of occurrence and severity of intra-abdominal remains uncertain. adhesions We recommend performing large multicenter prospective study for evaluating all factors that facilitate prediction of adhesions in patients with CSs to allow easy surgery later.

CONCLUSION

We showed that prediction of intraabdominal adhesion could be performed preoperatively in patients with previous single or multiple CSs by evaluation of scar parameters and scar index. We concluded that patients with a higher scar index were more liable to occurrence of more severe adhesions than patients with low score index. Moreover, we showed that patients with high BMI, history of many pregnancies, previous CSs, appearance of the striae, and the time interval from previous surgeries have roles in predicting occurrence and severity of adhesions.

Disclosure of Conflict of interests: there is no conflict of interests

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