

ORIGINAL ARTICLE

Prediction of intra-peritoneal adhesions using trans abdominal ultrasound and scar features in cases of repeated cesarean sections

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ABSTRACT

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| <p>Keywords: intra-peritoneal adhesions, scar, repeated cesarean section, ultrasound.</p> <p>*Corresponding Author: Yasser H. Abdelnaeem 01008026486 E-mail: hassanyasser159@gmail.com</p> | <p>Background: Intra-peritoneal adhesions are one of the most common complications seen in repeated cesarean sections and are difficult to diagnose, rates of adhesion development recorded at a second cesarean delivery (CD) are lower and ranged from 24% to 46%,objectives: to investigate whether cesarean scar characteristics and Trans-abdominal ultrasound could predict the presence and severity of intra-peritoneal adhesions for patients with previous one cesarean delivery ,Patients and Methods: This is a prospective cohort study was conducted at department of obstetrics and gynecology in Aswan university hospital between July 2017 and June 2018 our study included all pregnant women with previous one c.s , all the participant were examined abdominally followed by ultrasound examination to detect signs of intra-peritoneal adhesions and then followed up to delivery in which the intra-operative characters and outcomes of adhesions are reported, Results: Our results showed that women with depressed/elevated scars and abnormal movement on US are at increased risk of development of post-CS adhesion with a total number (%) of the patients diagnosed with adhesions was 70 (58.3%) .Conclusion both abdominal scars' characteristics and trans-abdominal US are useful tools for the prediction of the development intra-abdominal adhesions among women with repeated CS.</p> |
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INTRODUCTION: The primary cesarean delivery rate rise in the last decade, and the percentage of women undergoing vaginal birth after cesarean delivery declined remarkably.(1) Cesarean delivery is considered a risk factor for abdominal adhesion formation (2) .

Also, over the years trans-abdominal ultrasound (TUS) has been evaluated in an attempt to identify intra-abdominal adhesions (3).

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The current study aims to investigate whether cesarean scar characteristics and Trans-abdominal ultrasound could predict the presence and severity of intra-peritoneal adhesions for patients with previous one cesarean delivery.

MATERIALS AND METHODS: This is a prospective cohort study was conducted at department of obstetrics and gynecology in Aswan university hospital between July 2017 and June 2018. All pregnant women with history of previous one CS were clinically examined and investigated for routine antenatal care. Those who were eligible for participation and accept to share in the study were signed a written informed consent. Inclusion criteria were 1- Pregnant women at 1st trimester with a history of previous one CS. 2- The previous incision was Pfannestiel incision. 3- The skin was repaired by subcuticular sutures. 4- informed written consent . Exclusion criteria were 1- Pregnant women with history of more than one CS. 2- Pregnant women with history of wound infection after the previous CS. 3- Women with vaginal birth after C.S (VBAC). 4- Women with Abdominal Oedema. 5- Women with morbid obesity. 6- Other types of C.S incisions (e.g mid line incisions) 7- Other surgical incisions due to any surgery neither than c.s . One hundred and twenty were eligible participants and recruited for the following management:-

History and careful examination were done including: personal ,menstrual,obstetric and past history Through examination,
we recorded

- **Abdominal examination:** inspection of scar characteristics either flat or elevated or depressed, and its pigmentation

Then **Trans-abdominal ultrasound** was done for all patients using **GE VolosunE8 system-Chicago, Illinois USA**

The movement of intra-abdominal content in relation to Abdominal wall (viscera slide), the degree of V.S with respiratory variation evaluated to determine whether there was free movement chaotic Movement or no Movement.

Then intraoperative the following were recorded:

- **Site of Adhesions:** uterovesical, Douglas pouch, lateral pelvic wall, intraperitoneal.
- **Severity of Adhesions:** filmy, dense.

1- Primary outcome was to investigate whether cesarean scar characteristics and Trans-abdominal ultrasound could predict the presence and severity of intra-peritoneal adhesions.

2- Secondary outcomes:

Evaluation of adhesions if present, according to the (site, type, intra-operative difficulty and complication as bladder or bowel injury).

Results:

Table 1 shows the mean age (SD) of the patients was 25.1±3.9 years old. The number (%) of the primipara and the multipara patients were 49 (40.8%), and 72 (59.2%) respectively. The mean (SD) duration since last CS was 2.6±1.2 years

Table (1) : Demographic characteristics of the participants

| Variables | Patients (N =120) |
|--|-------------------|
| Age in years Mean ±SD | 25.1 ±3.9 |
| Parity | <i>NO</i> (%) |
| Primipara | 49(40.8%) |
| Multipara | 71(59.2%) |
| Residency | |
| Rural | 48 (40%) |
| Urban | 72 (60%) |
| Occupation | |
| Housewife | 96 (80%) |
| Employee | 24 (20%) |
| Education level | |
| Illiterate and primary school | 72 (60%) |
| Secondary school and higher education | 48 (40%) |
| Time Since last CS in years Mean ±SD | 2.6 ±1.2 |

Table 2 shows that the number (%) of the women who had hyper-pigmented scars was 64 (53.3%), while the number (%) of those who had hypo-pigmented scars was 56(46.7%). On the other hand, 39.2% of women had flat scar, 33.3% had depressed scars, and 27.5% had elevated scars.

The number (%) of the patients diagnosed with utero-vesical pouch adhesions, Douglas pouch adhesions, intra peritoneal adhesions, and lateral pelvic wall adhesions were 25(35.7%), 6(8.6%), 35(50%), and 4(5.7%), respectively. The total number (%) of the patients diagnosed with adhesions was 70 (58.3%). These patients were further categorized according to the adhesion density into filmy adhesions (n=21, 17.5%), dense adhesions (n=34, 28.3%), and combined adhesions (n=15, 12.5%).

Table (2): Characteristics of C.S scar

| Scar characteristics | Patients (n =120) No (%) |
|----------------------|-----------------------------|
| Pigmentation | |
| • Hyper-pigmented | 64(53.3%) |
| • Hypo-pigmented | 56(46.7%) |
| Scar Height | |
| • Flat | 47(39.2%) |
| • Elevated | 33(27.5%) |
| • Depressed | 40(33.3%) |

Table 3 shows that the mean (SD) gestational age was 38.1±0.8 weeks. The number (%) of the patients who underwent elective vs emergent CS was 104(86.7%) vs 16(13.3%). Regarding the postoperative complications, 116(96.6%) patients did not experience any complications, while two (1.7%) patients had bladder injury, and two (1.7%) patients had postpartum hemorrhage.

Table (3): Cesarean section characteristics

| Variables | Patients (N=120) |
|---|------------------|
| Gestational age in weeks Mean ±SD | 38.1 ±0.8 |
| Indications <i>No (%)</i> | |
| • Elective | 104(86.7%) |
| • Emergency | 16(13.3%) |
| Complications <i>No (%)</i> | |
| • no complications | 116(96.6%) |
| • bladder injury | 2(1.7%) |
| • post-partum hemorrhage | 2(1.7%) |

Table 4 shows that there was a statistically significant difference in the presence of adhesions and scar height ($p=0.031$) as adhesions were more in Elevated and depressed scar. Nevertheless, scar pigmentation did not show statistically significant difference in the presence of adhesions between women with hyperpigmentation and women with hypopigmentation, p - value was 0.621

* *The level of significance was considered at p - value < 0.05*

Table (4): Relation between the presence of adhesion and scar characteristics

| | No adhesion (n = 50) | Adhesion (n = 70) | P- Values |
|---------------------------------|-------------------------|----------------------|--------------|
| Scar height | | | |
| Flat scar 47 (39.2%) | 26(55.3%) | 21(44.7%) | 0.95 |
| Elevated scar 33 (27.5%) | 13(39.4%) | 20(60.6%) | 0.031 |
| Depressed scar 40 (33.3%) | 11(27.5%) | 29(72.5%) | |
| Pigmentation | | | |
| Hyperpigmentation 64 (53.3%) | 28(43.8%) | 36(56.3%) | 0.621 |
| Hypopigmentation 56 (46.7%) | 22(39.3%) | 34(60.7%) | 0.76 |

Table 5 showed that there was statistical significant difference between type of adhesion and scar height (flat– depressed) ($p < 0.001$). However, scar pigmentation had statistical insignificant difference with type of adhesion, Hypopigmentation ($p=0.84$), Hyperpigmentation ($p= 0.99$).

*statistical significant as $p < 0.05$

Table (5): Relation between the type of adhesion and scar characteristics

| | Filmy (n = 40) | Dense (n = 30) | P-values |
|----------------------|-------------------|-------------------|----------|
| Scar height | | | |
| Flat scar 21 | 17 (42.5%) | 4 (13.33%) | 0.02 |
| Elevated scar 20 | 14(35%) | 6(20%) | N.S 0.27 |
| Depressed scar 29 | 9 (22.5%) | 20 (66.67%) | <0.001* |
| Pigmentation | | | |
| Hyperpigmentation 36 | 21 (52.5%) | 15 (50%) | N.S 0.99 |

| | | | |
|---------------------|-----------|-----------|----------|
| Hypopigmentation 34 | 19(47.5%) | 15 (50%) | 0.84 N.S |
|---------------------|-----------|-----------|----------|

Table 6 shows that there was a statistically significant difference between the presence of adhesion and (No movement) ($p = 0.007$), N.S difference between presence of adhesion and free movement p - was 0.07

* The level of significance was considered at p - value < 0.5

Table (6): Relation between the presence of adhesion and US findings

| | No adhesion (N = 50) | Adhesion (N = 70) | P- values |
|----------------------------|-------------------------|----------------------|--------------|
| Free 68 (56.7%) | 36(52%) | 32(47.1%) | 0.07* |
| Chaotic movement 25(20.8%) | 9(36%) | 16(64%) | N.S 0.64 |
| No movement 27 (22.5%) | 5(18.5%) | 22(81.5%) | 0.007 |

Table 7 showed that there was statistical significant difference between type of adhesion and free movement ($p < 0.001$) as dense adhesions were more in no movement and filmy adhesions were more in free movement but chaotic movement showed N.S difference with type of adhesions ($P=0.7$).

*statistical significant as $p < 0.05$

Table (7) : Relation between the type of adhesion and US findings

| | Filmy (n = 40) | Dense adhesion (n = 30) | P- values |
|---------------------|-------------------|----------------------------|--------------|
| Free 32 | 27 (67.5%) | 5(16.67%) | < 0.001 * |
| Chaotic movement 16 | 8 (20%) | 8(26.67%) | N.S 0.7 |
| No movement 22 | 5 (12.5%) | 17(5.66%) | < 0.001 * |

DISCUSSION

Intra-abdominal Adhesions are one of the most common complications of CS. The potential sequelae of intra-abdominal adhesions are infertility with increased risk of ectopic pregnancy, abdominal and pelvic pain, bowel obstruction, and difficult repeat surgical procedures. The rates of adhesion development recorded at a second CS were reported to range from 24% to 46%, although they increase from 43% to 75% at the third, and up to 83% at the fourth CS. (4)

Due to these high rates, there are needs for a reliable method for the preoperative prediction of intra-abdominal adhesions in repeat CS. Over the last decades, a growing body of evidence has

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suggested that skin scar characteristics can be associated with the degree of adhesions. More recently, different imaging modalities have been implicated in the prediction of the development of adhesion. Abdominal ultrasonography (US) and computed tomography (CT) findings were suggested as useful predictors the presence and severity of intra-abdominal adhesions found at repeated CS. Nevertheless, there is still scarcity in the published literature regarding their role (5). Therefore, we conducted the present Cohort prospective study to investigate whether abdominal scar characteristics and trans-abdominal US could predict the presence and severity of intra-abdominal adhesions found at repeated cesarean delivery.

The present study included 120 pregnant women with a previous one CS from first trimester. Notably the prevalence of abdominal adhesion in the present study was 58.3%.

Similar to our findings, performed a review study to characterize the epidemiologic features of CS and the perioperative risks that are associated with repeat CS. The results showed that the abdominal adhesions are commonly seen after primary CS with reported prevalence of 46%–65% (6).

scar pigmentation did not show statistically significant difference in the presence of adhesions between women with hyperpigmentation and women with hypopigmentation, p- value was 0.621.

In concordance with our findings, other team (7) conducted a retrospective cohort analysis on 542 women who had undergone primary (265 women) or repeat CS (277 women). After the first CS, 100 of 217 women (46%) had pelvic adhesive disease; 48 of 64 women (75%) who underwent a third cesarean delivery and 5 of 6 women (83%) who underwent a fourth cesarean delivery had formed pelvic adhesive diseases, another group (8) performed a prospective cohort study to investigate whether abdominal scar characteristics could predict the incidence and severity of intra-abdominal adhesions found at repeat CS. The study included 107 pregnant women with at least one previous CS and who delivered abdominally. Of 107 women enrolled into this trial, 61 (57%) had no adhesions, 17 (16%) had filmy adhesions, and 29 (27%) had dense adhesions. Of all the abdominal scar characteristics studied, only a depressed scar was associated with an increased incidence of both dense and filmy intra-abdominal adhesions.

Similarly, (9) aimed to investigate the presence and severity of intra-abdominal adhesions before CS can be predict using patient history, symptoms, and abdominal skin scar characteristics. In this prospective study, 143 pregnant women with history of previous abdominal surgery were included and they delivered by cesarean. In the adhesion group, abdominal scar scoring parameters were significantly increased

(10) evaluated the relation between abdominal scar characteristics and the severity of intra-abdominal adhesions with repeat CS. A total of 208 women with at least one previous CS at or beyond 37 weeks of gestation who were admitted for repeat CS were enrolled in this study. Women with depressed scars had more intra-abdominal adhesions than women with flat or elevated abdominal scars ($P = 0.013$). There was no significant difference in the incidence of hyperpigmented and non-pigmented scars between women with or without adhesions. The authors concluded that there is a relation between depressed abdominal scars and intra-abdominal adhesions.

The exact causes of this significant association between scar characteristics and the development of adhesions after repeated CS are unclear. However, it can be attributed to the fact that wound healing is a process that is influenced by immunologic, genetic and hormonal factors as well as tractional forces leading to regeneration of the tissues either in the inner or outer body surfaces. Exudation, resorption and regeneration phases of cutaneous wound healing are comparable with the phases of serosal wound healing. Moreover, some mediators of the cytokine-regulated healing process are similar. These similarities in the process of wound healing in the dermis and the peritoneum led to the idea that abdominal scar features may have a role in the prediction of intra-abdominal adhesions. **(11)**

Regarding the predictive value of US, the present study showed that there were statistically significant associations between U/S findings with the presence of adhesion and adhesion density. Patients with no movement which had adhesion were 22 (81.5%) patients with no movement in U/S were more likely to have dense adhesion.

To date, a few authors investigated the association between trans-abdominal US and intra-abdominal adhesions. In agreement with our findings **(12)** explored the associations between post-CS adhesion and transabdominal US findings. The authors concluded that transabdominal US can be considered a useful, quick and non-deleterious alternative diagnostic tool, therefore preventing further adhesion formation.

Similarly **(13)** conducted a prospective observational study of scheduled repeat CS to predict the development of adhesions using transabdominal US. A total of 370 women were recruited. A negative sliding sign was associated with severe adhesions (sensitivity 56%, 95% CI 35–76; specificity 95%, 95% CI 93–97). A similar accuracy (sensitivity 64%, 95% CI 43–82; specificity 94%, 95% CI 92–97) was achieved by combining the sliding sign with a history of adhesions in the previous surgery. In multivariable models, a negative sliding sign was significantly correlated with a longer interval from skin incision to delivery and increased risk for bleeding.

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