Transvaginal Ultrasonographic Assessment of Post-Cesarean Section Scar Defects

MARWA EID, M.D. and OMNEYA HELAL, M.D.
The Department of Obstetrics & Gynecology, Faculty of Medicine, Cairo University

Abstract

Objective: To evaluate post cesarean section scars by transvaginal ultrasonography (TVS) and analyze its relationship to menstrual disturbances.

Study Design: Cross sectional study.

Settings: Kasr El-Aini Obstetrics and Gynecology Department, Ultrasound Unit.

Patients: 60 non-pregnant women with regular cycles and a history of one or more cesarean sections at least 6 months from last cesarean section.

Methods: Cesarean section scars were examined by TVS for the presence of defects and measuring thickness of residual myometrium. Menstrual irregularities were investigated with history and vaginal examination to detect cause of bleeding, if present.

Results: Scar defects were found in 29 patients (48.3%). The mean thickness of residual myometrium was 0.69 ±0.13 cm. The mean size of CS defect in the 29 women was 0.36±0.16 cm. Eight patients (13.3%) had postmenstrual vaginal spotting, which was significantly associated with the presence of CS scar defects (p=0.002).

Conclusion: TVS is highly accurate in detecting CS scar defects. Defects are seen in nearly half of the patients and were significantly associated with thin residual myometrium and higher frequency of postmenstrual spotting.

Key Words: CS scar defect – Transvaginal US.

Introduction

CAESAREAN section (CS) was introduced into obstetrics late in the 19th century. Cesarean section rates vary widely across the world; it accounts for about a quarter of deliveries in UK and more than half in China. In 1985, World Health Organization (WHO) issued a consensus statement that there were no justification for any region to have CS rates higher than 10-15% [1]. However, WHO found that approximately 50% of 137 countries have CS rates >15%. CS rate in Egypt in this report was 27.6% [2]. Hospital-based deliveries in Egypt increased from 15.3% in 1992 to 20.9% in 2000; representing a 72% increase [3].

Cesarean section is associated with a three-to six-fold risk of severe complications compared to vaginal delivery; including intermenstrual bleeding, chronic pelvic pain and secondary infertility [4]. In addition, multiple CSs are associated with a greater risk of complications during next surgery and higher probability of abnormal placentation (previa, accreta) [8]. Most of the long term complications of cesarean section are attributable to the presence of scar tissue in the low uterine segment [6]. A meta-analysis of data from 11 studies showed that the uterine rupture rate for women undergoing a trial of labor after CS was 0.39% compared to 0.16% for patients undergoing elective repeat CS [7].

Myometrial discontinuity at the site of a previous CS scar is termed cesarean scar defect; it may be in the form of deficient uterine scars or scar dehiscence. These defects have been reported to be associated with chronic pelvic pain and postmenstrual spotting [8-12]. Uterine scar dehiscence may present in the antenatal or intrapartum periods, leading to substantial fetal and maternal morbidity [13]. The frequency of dehiscence was estimated to be between 0.6 and 3.8% [14,15].

Three possible mechanisms of pathogenesis of scar defects have been proposed in a histopathological study of hysterectomy specimens of uteri with previous CS. Congestion of endometrial fold and small polyps in the scar recess may produce abnormal uterine bleeding. Distortion of the lower uterine segment and lymphocytic infiltration can cause chronic pelvic pain and dyspareunia. In addition, adenomyosis in the scar may contribute for dysmenorrhea [16].
Diagnosis of cesarean section scar defects can be performed by ultrasonography, hysterosalpingography and hysteroscopy. Transvaginal unenhanced ultrasound examination can be used for detection of CS defects. However, it is not useful to determine the number and size of defects and residual myometrial thickness\(^{17,18}\). High resolution transvaginal ultrasound (TVS) is a valuable tool for detection of myometrial thinning or scar dehiscence. Saline contrast sonohysterography is considered by some investigators for evaluating CS scar defects\(^{19}\).

The aim of this study was evaluation of post cesarean section scar defects by transvaginal ultrasonography and analysis of the relationship between these defects and menstrual disturbances.

**Patients and Methods**

An observational prospective study was done between May 2012 and December 2012 at the Ultrasound Unit of the Department of Obstetrics and Gynecology in Kasr-El-Aini Hospital. The study included 60 non-pregnant women with history of at least one previous cesarean section since at least 6 months. Inclusion criteria included age 20 to 40 years, regular menstrual cycles, with all the CS performed in Kasr El-Aini Hospital. Patients using any type of contraception or those with history of endocrinal disturbances were excluded from the study. Patients with other uterine pathology observed during the ultrasound examination, that may have been responsible for abnormal uterine bleeding, including endometrial polyps, submucous fibroid polyps were excluded from the study. The study was approved by the local Ethical Committee of the hospital. All participants were informed about procedure, values and possible discomfort associated with the study and accordingly they provided a verbal consent for participation.

Careful history taking were reviewed with special emphasis of postmenstrual spotting, chronic pelvic pain, dysmenorrhea and dyspareunia. All patients were examined for assessment of general condition and abdominal wall scar. Vaginal examination was done to exclude other possible cause of vaginal spotting, if present.

All women were subjected to transvaginal sonographic (TVS) examination during the proliferative phase of the menstrual cycle. During this period, endometrium is normally thin and homogeneous to allow more definitive evaluation of CS scar and myometrium. The sonography machine used was Madison XA with 5-9MHz transvaginal probe. All examinations were performed by experienced sonographer for assessment of the cervix, uterus, adnexae, and thickness of residual myometrium, presence or absence of uterine scar defect and their number and size, if present.

With an empty bladder, the patient was examined in the dorsal position with flexion of thighs and knees. The transvaginal probe tip was lubricated with coupling gel to avoid air trapping, and introduced to the vagina. Cesarean section scar defect was diagnosed in the presence of a hypoechogenic area (a filling defect) within the myometrium of the lower uterine segment, at the site of a previous cesarean incision. Once identified, the myometrial defects were evaluated regarding the following parameters: Scar width (the length of the widest gap along the cervicoisthmic canal), scar depth (the vertical distance between the base and the apex of the defect) and thickness of residual myometrium (from the apex of the defect to the uterovesical peritoneum). Importantly, a scar defect will display a fluid collection along this line and in continuity with the end cervical canal or below it (Fig. 1). Cesarean scar defects were measured in longitudinal and transverse planes. The mean diameter of the defect was calculated from these two values. In patients with multiple scar defects, only the largest defect was measured.
**Statistical analysis:**

Data was analyzed using IBM SPSS Advanced Statistics version 20.0 (SPSS Inc., Chicago, IL). Numerical data were expressed as mean and standard deviation or median and range as appropriate. Qualitative data were expressed as frequency and percentage. Chi-square test (Fisher’s exact test) was used to examine the relation between qualitative variables. For quantitative data, comparison between two groups was done using independent sample \( t \)-test or Mann-Whitney test. A \( p \)-value <0.05 was considered significant.

**Results**

The mean age of the studied group was 28.2 ± 4.6 years. The median parity was 2 (range: 1-4). The median of number of CS was 1 (range: 1-4). Half of the participants had a history of one previous cesarean section, fourteen women (23.3%) had 2, nine women (15.0%) had three and seven (11.7%) had 4 previous cesarean sections.

Table (1): Age, parity, history of previous CS and residual myometrium thickness in patients with CS defects and those without defects.

<table>
<thead>
<tr>
<th></th>
<th>CS scar defect (n=29)</th>
<th>No defect (n=31)</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>26.3±4.6</td>
<td>29.9±3.9</td>
<td>0.002</td>
</tr>
<tr>
<td>Parity*</td>
<td>1 (1-4)</td>
<td>2 (1-4)</td>
<td>0.018</td>
</tr>
<tr>
<td>Number of CS*</td>
<td>1 (1-4)</td>
<td>2 (1-4)</td>
<td>0.058</td>
</tr>
<tr>
<td>Time since last CS (years)*</td>
<td>3.0 (1.0-9.0)</td>
<td>2.0 (0.6-13.0)</td>
<td>0.070</td>
</tr>
<tr>
<td>Residual myometrium (cm)</td>
<td>0.62±0.10</td>
<td>0.75±0.14</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

* Data as median (range).

Table (1) shows that patients with cesarean scar defect are significantly younger \( (p=0.002) \) with lower parity \( (p=0.018) \) compared to those with no defect. Apparently, number of previous CS was lower \( (p=0.058) \) and the time elapsed since the last CS was longer \( (p=0.070) \) in patients with defects, however, the difference between the two groups was not statistically significant. The thickness of residual myometrium was significantly lower in patients with scar defects \( (p<0.001) \).

Table (2) shows that only the time since last CS was significantly shorter \( (p<0.001) \) in women with postmenstrual vaginal spotting. Otherwise, there were no significant differences between women with and without vaginal spotting regarding age, parity, number of previous CS, thickness of residual myometrium and CS scar defect size.

Table (2): Age, parity, history of previous CS and residual myometrium thickness in patients with and without postmenstrual vaginal spotting.

<table>
<thead>
<tr>
<th></th>
<th>Abnormal spotting (n=8)</th>
<th>No abnormal spotting (n=52)</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>27.0±4.4</td>
<td>28.4±4.6</td>
<td>0.570</td>
</tr>
<tr>
<td>Parity*</td>
<td>2 (1-4)</td>
<td>2 (1-4)</td>
<td>0.869</td>
</tr>
<tr>
<td>Number of CS*</td>
<td>2 (1-2)</td>
<td>1 (1-4)</td>
<td>0.842</td>
</tr>
<tr>
<td>Time since last CS (years)*</td>
<td>2.3 (1.5-3.0)</td>
<td>4.0 (0.6-13.0)</td>
<td>0.012</td>
</tr>
<tr>
<td>Residual myometrium (cm)</td>
<td>0.62±0.11</td>
<td>0.70±0.14</td>
<td>0.117</td>
</tr>
</tbody>
</table>

* Data as median (range).  
# n=21

CS scar defects were detected in 29 women (48.3%). Thickness of residual myometrium was 0.69±0.14cm. The mean size of CS defect in the 29 women was 0.36±0.16cm (Table 3).

Table (3): Sonographic findings of the studied group.

<table>
<thead>
<tr>
<th></th>
<th>Mean±SD</th>
<th>Median (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual myometrium thickness (cm)</td>
<td>0.69±0.14</td>
<td>0.69 (0.47-1.15)</td>
</tr>
<tr>
<td>Size of defect (cm)*</td>
<td>0.36±0.16</td>
<td>0.31 (0.23-0.84)</td>
</tr>
</tbody>
</table>

* Measured in 29 cases.

As shown in Table (4), all patients complaining of vaginal spotting or pain in the CS scar had scar defects diagnosed on TVS. The presence of CS scar defect was significantly associated with postmenstrual vaginal spotting \( (p=0.002) \).

Table (4): The frequency of abnormal vaginal spotting and painful scar in patients with CS defects and those without defects.

<table>
<thead>
<tr>
<th></th>
<th>CS scar defect (n=29)</th>
<th>No defect (n=31)</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abnormal spotting:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>8 (100.0%)</td>
<td>0 (0.0%)</td>
<td>0.002</td>
</tr>
<tr>
<td>No</td>
<td>21 (40.4%)</td>
<td>31 (59.6%)</td>
<td></td>
</tr>
<tr>
<td>Scar site pain:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4 (100.0%)</td>
<td>0 (0.0%)</td>
<td>0.049</td>
</tr>
<tr>
<td>No</td>
<td>25 (44.6%)</td>
<td>31 (55.4%)</td>
<td></td>
</tr>
</tbody>
</table>

Discussion

Cesarean section delivery has been increasingly performed for a variety of clinical indications. Most uterine incisions are made transversely in the lower segment, where fibrous tissue is abundant. This allow the scar to heal more securely. Repair
of the uterine incision may be in a single layer or multiple layers because of differences in myometrial contraction on either side of the incision, the superior edge of the incision typically is thicker than the inferior edge. This discrepancy often contributes to the development of the lower segment defects noted on sonographic examination. The abnormal bleeding pattern observed in patients with Cesarean section scar defects is due to collection of the menstrual blood in the scar and then leak out after the majority of the menstrual flow has ceased, resulting in 2 to 12 days of postmenstrual spotting of old blood.

In the current study, Cesarean section scar defects were detected in 48.3% of the study sample. CS scar defects were associated with significantly thinner residual myometrium than cases without defects (0.62±0.10cm vs. 0.75±0.14cm, p<0.001) and higher frequency of postmenstrual vaginal spotting (p=0.002) and abdominal scar pain (p=0.049). Time since last CS was significantly shorter in women with postmenstrual vaginal spotting (p=0.012), however, CS scar defect size was not significantly different between patients with and those without post menstrual vaginal spotting (p=0.184).

The current study endorses that TVS examination can accurately detect cesarean section scar defects. These results agree with those of previous studies [15,20,21].

CS defects have been a frequent finding since administration of TVS as a routine investigation for gynecological patient with different complaints. Generally, evaluation of uterine scars after cesarean section can be done with ultrasonography, whether transabdominal or transvaginal, magnetic resonance imaging (MRI) and sometimes CT. Ultrasound studies demonstrated the intact CS scar as an echogenic line through the lower anterior myometrium. In the current study, TVS was the method of scar evaluation which has been found to be 100% sensitive and specific for the detection of post-cesarean scars according to Armstrong et al., [15].

Many investigators found that scar defects can be seen more often and appear larger with more clear margins using saline contrast sonohysteroscopy (SCSH) [22] or gel instillation sonography (GIS) [23]. This might be due to increased uterine pressure during these procedures which may exaggerate the size of any scar present.

Monteagudo et al., [19] added more to the value of saline infusion enhancement; they concluded that it is the only accepted way for examination of CS scars. On the contrary, Ofili-Yebovi et al., [17] emphasized the unnecessary risks in association with saline infusion in addition to its limited value. In a more recent study, Osser et al., [24] investigated the agreement between TVS and SCSH. They suggested that identification of cesarean section scars in non-pregnant state is better at SCSH than TVS, but with a good agreement between the two techniques. The percentage agreement varied between 88% and 100% with substantial kappa values from 0.679 to 1.000.

In the literature, there is a marked discrepancy in the prevalence of cesarean scar defects. In a large study involving 4250 women over a period of 3 years period, 293 (6.9%) were diagnosed by transvaginal sonography with cesarean scar defects [25]. Ofili-Yebovi et al., [17] reported 19.4% of 324 women with deficient CS scars. Another study reported 24.0% incidence of defects with TVS [23]. A systematic review of 12 eligible studies including 1834 women reported uterine scar defects in 6.6% of cases [26]. On the other hand, higher records were reported by other authors; 40% [21], 42% [27], 59.5% [15] and 64.5% [28].

Another study found significant increase of scar defects with increasing number of previous CS. Authors reported frequencies of 61%, 81% and 100% of women who had one, two and three or more CS, respectively [20]. Conversely, in the current study, the number of previous CS was lower in patients with defects compared to those without however, the difference statistically significant (p=0.058). A recent systematic review involved 21 papers investigating prevalence and symptoms of CS defects in non-pregnant women. A wide range of the prevalence was found between 56% and 84% using sonohysteroscopy [23].

In the current study, all of the eight patients with menstrual disturbances had CS defects. Also, all of the 4 patients with scar pain had CS defects. This finding confirms previous studies that linked higher frequencies of abnormal vaginal bleeding with cesarean scar defects [21]. Wang et al., [25] concluded that postmenstrual spotting and chronic pelvic pain were significantly higher in women with large defects. Postmenstrual spotting was associated with CS defects especially in the presence of thin residual myometrium [28]. Postcesarean hysteroscopic examination found pseudocavities in cesarean section scars in patients with abnormal uterine spotting [29].

Li et al., [30] recommended examination of women with irregular perimenstrual bleeding after
cesarean delivery using combined hysteroscopy and ultrasound examination for detection of scar defects. Surgical repair with hysteroscopy or laparoscopy is recommended for large defects and thin residual myometrium to relieve symptoms and for more safe future pregnancies.

In conclusion, cesarean section scar defects are seen in nearly half of the patients using TVS. CS scar defects were significantly associated with thin residual myometrium, and higher frequency of abnormal spotting and abdominal scar pain.

References
4. TIHTONEN K. and NYBERG R.: Long-term effects of residual myometrium, and higher frequency of more safe future pregnancies.


