Caesarean Scar Defect Assessment by Saline Infusion Sonography After Primary Caesarean Section

Original Article

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ABSTRACT

Background: CS Scar defect is associated with increased risk of uterine rupture, abnormal placental implantation, uterine scar dehiscence in subsequent pregnancies and scar ectopic pregnancy, also CS defects are reported to be associated with abnormal uterine bleeding and post menstrual spotting. Uterine wound healing is of great importance to achieve healthy future pregnancy and allow for vaginal birth after caesarean section, hence minimizing the rate of repeated caesarean sections.
Objective: To assess the healing of caesarean section scar defect by sonohystrography after primary CS.
Patients and Methods: The current study investigated the uterine wound healing after primary CS assessed by saline infusion sonography. The calculated surface area of the defect was done after considering the shape of CSD approximates to an isosceles triangle and used the formula (width x depth)/ 2, to calculate the surface area. Additionally, scoring CSD according to surface area with 3 defined grades: Grade 1 when the surface area was less or equal to 15mm2, grade 2 when the surface area was between 16 and 25mm2, and grade 3 when the surface area was larger than 25mm2.most of the defects.
Results: There is no significant correlation between the surface area of cesarean scar defect and age, BMI, GA, Parity, or Hb level. In the present study, the incidence of primary caesarean section in multigravida was 64.2.on the other and , primigravida cases accounted for 19(35.8%). In the present study the most common indication for CS was pathological CTG 15.1% followed by the occurrence of breech presentation 13.2 %4- The triangular shape accounted for more than half of the detected shapes. In our study, severe niche was detected in two patient with an incidence of 3.8 on the other hand non sever defect was 96.2%. There is moderate agreement between the two scoring system in this study were grade 1 (96.2%), and with using the other score severe defects occurred in 3.8% of participants.
Conclusion: It has demonstrated that both scoring systems are efficient in investigating the myometrial wound healing and CS scar defect in the patients undergoing their first elective cesarean section.

Key Words: CS defect grades, niche severity, scoring system of the niche, ultrasonography.

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INTRODUCTION

Caesarean section scar defect is associated with increased risk of uterine rupture, abnormal placental implantation, uterine scar dehiscence in subsequent pregnancies and scar ectopic pregnancy, also CS defects are reported to be associated with abnormal uterine bleeding and post menstrual spotting[1].

Uterine wound healing is of great importance to achieve healthy future pregnancy and to allow for vaginal birth after caesarean section, hence minimizing the rate of repeated caesarean sections[2].

While ultrasonography (US) is of great value in scar assessment in pregnant uterus[3], its role in scar assessment in non-pregnant uterus is limited. Sonohysterography (SHG) is the method of choice for assessing the scar in non-pregnant uterus; in which the US of the uterus is enhanced by instillation of fluid into the uterine cavity to provide an anechoic contrast medium. Thus, SHG combines the advantages of both US and hysterosalpingography[4].

The evolution of SHG has contributed significantly in the assessment of the uterine cavity[5]; it can be performed 6-12 weeks after caesarean section using gel or saline instillation[6], to evaluate the thickness of the residual myometrium, thickness of myometrium bordering the scar, depth of the filling defect in the scar (niche) and scar related intrauterine adhesions[7].

Sonohysterography has an overall accuracy of 96% in the diagnosis of scar defect; and 91% in the diagnosis of intrauterine adhesions. In addition, the procedure of SHG is well-tolerated, cost effective, not time-consuming, and can be performed as an office based gynaecological practice[8].

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The current study will investigate the healing of caesarean section scar evaluated by sonohystrography.

AIM OF THE WORK

The aim of this study is to assess the healing of caesarean section scar evaluated by sonohystrography after primary CS.

PATIENTS AND METHODS

Study Design

Cross sectional study

Study Setting

The study was conducted at Ain Shams University Maternity Hospital during the period between February and September 2020.

Study Population

53 pregnant female underwent primary CS with caesarean scar defect assessed by saline contrast sonohysterography three months after their section

Primary outcomes

Evaluating and assessment of the different shapes of caesarean scar defect by saline contrast sonohysterography

Secondary outcomes

Assessment by two scoring system for caesarean scar defect for classification and grading of CSD severity scoring CSD according to surface area with 3 defined grades: Grade 1 when the surface area was less or equal to 15mm2, grade 2 when the surface area was between 16 and 25mm2, and grade 3 when the surface area was larger than 25mm2[9].

The severity of the niche which was descriebed by Ofili-Yebovi and his colleagues according to the deficient area of the scar in which sever defect was defiend as deficient scar by more than 50%[10].

Data collection

Age, maternal height, weight, body mass index, parity, gestational age, medical history, surgical history, ultrasound assessment, laboratory investigation of HB and haematocrit, indication of CS, surface area by mm2 of the niche, shape of CSD by SHG.

Study Procedure

After approval of the ethical committee, the entire participant was subjected to the following: Discussion about the study with explanation of benefits, side effects and possible complications. Informed written consent had been obtained.

Careful history taking including personal, menstrual, obstetric, medical and surgical history. Complete physical examination.

After 3 month of caesarean section the participant had been reassessed regarding history and examination. Saline contrast sonohysterography ha d been done using mindray DC-N2 6.5 MHz vaginal prope.it was performed as described by Goldstein[11].

Premedication with acetominophen or ibuprofen approximately1 hour before the scheduled procedure was done. As women usually experienced mild discomfort when the catheter is inserted beyond the internal os, and again when the balloon is inflated. Uterine cavity distension can also cause menstrual-type cramping in some women

The participant was in the lithotomy position with an empty bladder, a sterile vaginal speculum was inserted and the cervix was cleaned with an antiseptic solution.

A pediatric thin foley's catheter (size CH 8) had been placed into the cervical os and the balloon had been inflated with 2-5 ml of sterile saline for stabilization and occlusion of the internal cervical os.

The catheter was inserted into the cervix 3 cm to 4 cm beyond the distal aspect of the insufflation balloon, to ensure that the balloon is just beyond the internal cervical os. The balloon is inflated with approximately 1 mL of normal saline to stabilize the catheter and prevent leakage of fluid back through the cervix. The speculum is then removed, with the catheter left in place. Catheters designed for SHSG can usually be inserted without using a tenaculum, so that the procedure is typically more comfortable for the woman.The speculum had been carefully removed and 20ml plastic syringe containing sterile saline had been attached to the catheter.

The ultrasound probe had been gently introduced into the posterior fornix of the vagina; the incision site had been viewed longitudinally.

The transvaginal ultrasound probe is then inserted into the vagina, and balloon placement confirmed just above the internal cervical os in a sagittal plane. Normal saline that has been processed for intravenous use is slowly instilled into the cavity while the cavity is being examined in both sagittal and transverse planes.

The shape of niche was recorded and two scoring system was done for evaluation of it's healing (Figures 1,2).

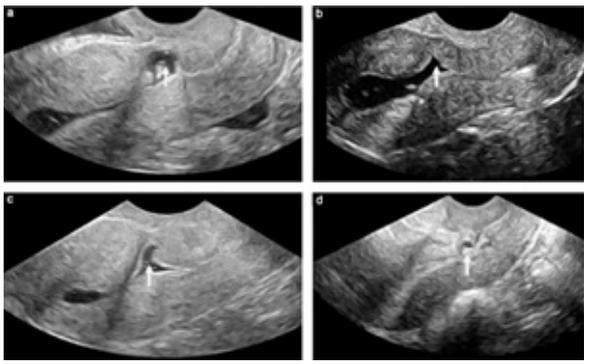

Fig. 1: SCSH showing the most common niche shapes: (a) The semicircular niche, (b) triangular niche, (c) droplet-shaped niche, and (d) inclusion cysts[12].

A b

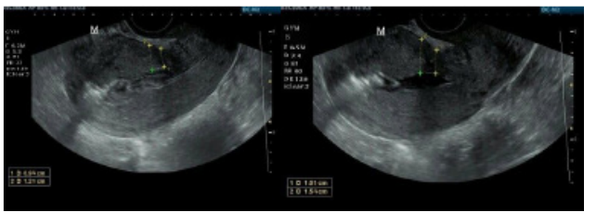

Fig. 2: SCSH showing the most common niche shapes (a) irregular and (b) triangular niche.

Ethical consideration

The clinical research study was conducted in accordance with the current IRB-approved clinical protocol; ICH GCP guidelines; and relevant policies, requirements, and regulations of the Ain Shams university. The investigator made certain that an appropriate informed consent process is in place to ensure that potential research subjects or their authorized representatives are fully informed about the nature and objectives of the clinical study, the potential risks and benefits of study participation, and their rights as research subjects. The Investigator obtained the written, signed informed consent of each subject, or the subjects authorized representative, prior to performing any study-specific procedures on the subject. The investigator will retain the original signed informed consent form. All evaluation forms, reports, and other records that left the site were not included unique personal data to maintain subject. Any woman had the right to withdraw from the study at any stage without being harmed by this withdrawal concerning medical and ethical management.

Statistical analysis

Data were collected, tabulated and analyzed using SPSS© Statistics version 22 (IBM© Corp.,Armonk, NY, USA).Categorical variables were presented as number and percentage. Continuous numerical variables were presented as mean and SD. Agreement between the two scoring systems for scar defect size was performed using Cohen kappa test. The following interpretation of Cohen's kappa used was as follows: kappa < 0.41 reflects poor strength of agreement; 0.41–0.60 reflects moderate strength; 0.61–0.80 reflects good strength; 0.81–1.0 reflects excellent strength. The Correlation of the surface area of scar defect, and other variables was assessed by Spearman's correlation. *P-values* <0.05 were considered statistically significant.

RESULTS

The aim of this table is to analyze the basic demographic and clinical characteristics of 53 women presented with cesarean scar defect 3 months after 1ry cesarean delivery.

It shows that 35.8 % of participants were primigravidas, the mean gestational age at delivery was 38.98±0.99 weeks, and pathological CTG, breech, and macrosomia were the main indications for CS (Table 1, Figures 3,4).

Table 1: Demographic characteristics of the study participants

Variable	
Age (Y) Mean± SD	27.81± 3.22
BMI(kg/m2) Mean ±SD	22.60±1.38
Gestational age (wks) Mean ±SD	38.98±0.99
Hb (g/dl) Mean ±SD	11.82±0.73
HCT % Mean ±SD	32.98± 2.67
Parity N (%)	
P0	19(35.8%)
P1	9 (17.0%)
P2	13(24.5%)
P3	9(17.0%)
P4	3(5.7%)
Indications for cesarean section N (%)	
Pathological CTG	8 (15.1%)
Breech	7 (13.2 %)
Macrosomia	6 (11.3%)
CPD	5 (9.4%)
Maternal request	5 (9.4%)
1ry infertility & ICSI	4 (7.5%)
IUGR	4 (7.5%)
2ry infertility& ICSI	4 (7.5%)
Oligohydramnious	3 (5.7%)
Cord presentation	1 (1.9%)
Other indication	6 (11.3 %)

(Table 2, Figure 5): shows the different observed shapes of cesarean scar defects during sonohysterographic assessment; the triangular shape accounted for more than half of the detected shapes. The calculated surface area of

the defect was done after considering the shape of CSD approximates to an isosceles triangle and used the formula (width x depth)/ 2, to calculate the surface area.

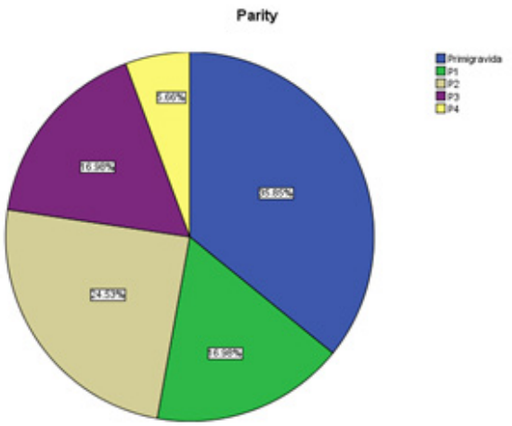

Fig. 3: Pie chart of different parities in the studied group

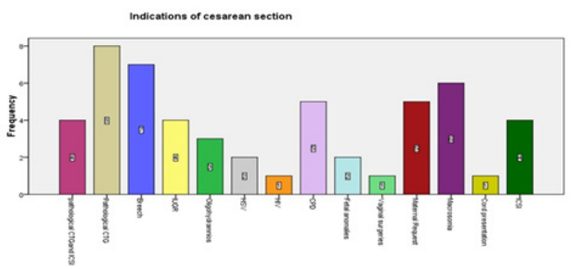

Fig. 4: Bar graph of the different indications for 1ry CS in the study group

Table 2: Shape of cesarean scar niche in the studied women

Variable	Number	%
Shape of niche		
Triangular	27	50.9
Irregular	19	35.8
Linear	7	13.2
Surface area mm^2	9.29	5.22

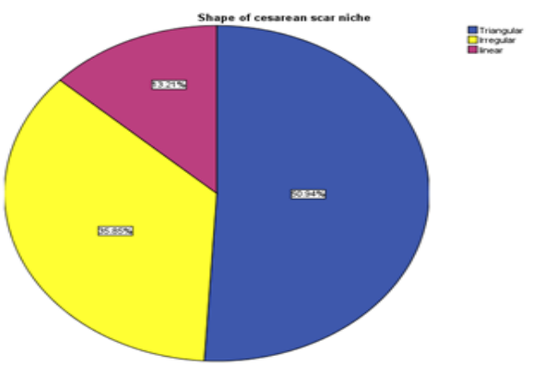

Fig. 5: Shape of cesarean scar niche in the studied women

Stratification of scar defect size by the two classification scores: Scoring CSD according to surface area with 3 defined grades: Grade 1 when the surface area was less or equal to 15 mm^2, grade 2 when the surface area was between 16 and 25 mm^2, and grade 3 when the surface area was larger than 25 mm^2. most of the defects in this study were grade 1 (96.2%), and with using the other score severe defects occurred in 3.8% of participants.

Table 3 shows that, There is moderate agreement between the two scoring system, Kappa=0.48 (Table 3, Figure 6).

Table 3: The agreement between the two scoring systems for scar defect size

	Grades		
Severity	Grade 1	Grade 2	Grade 3
Non severe	50 (98%)	1(50%)	0
Severe	1(2%)	1(50%)	0
Observed agreement		1.89%	
Global agreement		96.2%	
Kappa		0.4804	
95% CI		-0.1355 to 1.0963	
P value		0.0005*	

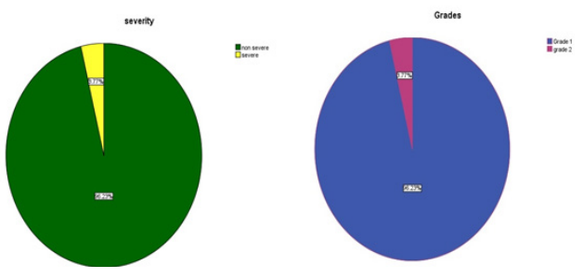

Fig. 6: Stratification of scar defect size by the two classification scores

Table 4 shows that, there is no significant correlation between the surface area of cesarean scar defect and age, BMI, GA, Parity, or Hb level

Table 4: Correlation between scar defect Surface area and other variables

Variables	Rho	*P value*
Age	-0.04	0.74
BMI	-0.079	0.57
GA	-0.048	0.73
Parity	0.175	0.21
Hb	-0.113	0.41

DISCUSSION

In Egypt, CS accounted for 51.8 percent of all live births. By 2014, the CS rate had increased to 67 percent of hospital-based deliveries occurring in that year[13].

Repeated cesarean sections are associated with an increased risk for uterine rupture, abnormal placental implantation, uterine scar dehiscence in subsequent pregnancies and scar ectopic pregnancy, so it should be limited to cases with a significant risk of maternal or fetal adverse outcomes if the operation is not performed at a given time[14].

A cross sectional study was conducted at Ain Shams University Maternity Hospital including 53 pregnant females undergoing primary pre labor CS. The main objective of this study was to to assess the healing of caesarean section scar and the shape of the niche evaluated by sonohystrography after three months following a primary CS.

In the present study the average age of cases in the study was 27.81± 3.22. Women with age above 35 or lower than 35 were excluded from the study to exclude the effect of age on the uterine scar healing.

Sammour and his colleagues reported the average age of cases in the study and the placebo groups was 25.3+5.1, 25.1+5.4 respectively[15].

Saha and Chowdhury[16] in their study on primary cesarean section reported that the age of women underwent primary CS in their study was 20 to 25 years.

In developed countries CS rates were higher in older maternal age. Mylonas and Friese revealed that CS rates were higher among mothers of advanced age, increasing from 26.2% for younger mothers aged 20 to 34 to 35.9% in women aged above 35[17].

As maternal age rises, so does the risk of fetal congenital malformations, hypertension, or even diabetes mellitus. Age is not in itself an indication for cesarean section; rather, it is the occurrence of specific risks in this age group that may lead to an indication for cesarean delivery[17].

In the present study, the incidence of primary caesarean section in multigravida was 64.2%. However, the rates of CS decreased with increased parity. Primigravida cases accounted for 19(35.8%),

This correlate with Sammour colleagues' study which elicited that the incidence of primary caesarean section in multigravida was 58.8% in study group and 68.5% in placebo group[15].

This agrees with Hiasat, who reported that the rates of CS in the various parity groups were 8.5%, 7.1%, 7.4%, 6.3% and 12.9%, in PO, P1, P2, P3 and >P3, respectively.

In the present study the most common indication for CS was pathological CTG 15.1% followed by the occurrence of breech presentation 13.2 %

In Sammour *et al*.[15] the most common indication for CS was breech presentation (16.7%) followed by the occurrence of pathological CTG (15.7%)

These findings were in accordance with data from Kulkarni and Shrotri[18]. The wide spread application of cardiotocography has resulted in an increase in the number of obstetric interventions, particularly the incidence of CS. In the present study, fetal distress and abnormal CTG were the second common indication of primary caesarean section (15.7%) as shown in table (1) this correlates with a study by Kulkarni and Shroti showed a progressive rise in operative deliveries for fetal distress from 5.17% in the reactive group to 28.5% in the ominous group[18].

Other studies also established the association between a high CS rate and an abnormal cardiotocography[19].

A Study by Himabindu and colleagues reported that the rate of primary caesarean section among multipara women who had fetal distress to be 24.7%[20].

Obviously, these rates can be lowered by reducing the inter observer difference in interpretation of CTG by implementing frequent teaching workshops for the obstetric staffs, and spread the role of ST Segment and T Wave Analysis (STAN) system to determine fetal status in labor[21].

Barber and his colleagues reported that mal-presentations, and the non -reassuring CTG were the most common indications for primary CS after labor arrest[22].

In the current study, labor arrest was excluded to neutralize the effect of cervical dilatation on uterine scar healing.

The rise in CS as the mode of delivery for breech was noticed in various previous data. A study reported that in cases with breech presentation; planned cesarean delivery was associated with fewer adverse outcomes than vaginal delivery or cesarean delivery during labor[23]. Another study by Lee and colleagues showed that the majority of term breech presentations in developed nations were delivered by CS[24].

Moreover, the eligibility criteria for vaginal breech delivery can be set at the national level to guide best

practice, such as those published in Canada by the Society of Obstetricians and Gynecologists. Otherwise, elective CS for all term singleton breech presentation may add to the increasing rate of CS across the world[25].

Regarding the shape of scar niche; The triangular niche was the most common shape. It was present in 50.9% of cases followed by irruglar shape which was 35.8.

In sammour and his colleagues study ,there was a significant difference between both groups. The triangular niche was the most common shape in both groups. It was present in 45.1% and 35.3% in placebo and study groups, respectively. The linear shape was (25.5% in study group, 3.9% in placebo group), and the irregular shape was (0.0% in study group, 31.4% in placebo group)[15].

Anthor study reported that 83% of niches were triangular, 2% were round, 4% were oval and 10% showed no remaining myometrium over the defect[26]. The same group demonstrated that the shape did not change when evaluated by SHG. Another study conducted by Fabres *et al*.[8] demonstrated that the niche was visualized as a triangular anechoic area in all women.

In addition, it was reported that a wedge defect was present in 21% of women with a history of CS, inward protrusion (internal surface of the scar bulging toward the uterine cavity) in 6%, outward protrusion (external surface bulging toward the bladder or abdominal cavity) in 15%, hematoma (echogenic mass adjacent to the wound site of the anterior wall of the lower uterine segment) in 4% and inward retraction (external surface of the scar dimpled toward the myometrial layer) in 4%[27].

By using SHG, There were 50% of niches were semicircular, 32% were triangular and 10% were droplet-shape; inclusion cysts accounted for 7%[12].

A niche is mainly a sonographic finding and has been defined as a triangular anechoic area at the presumed site of incision. However, a generally accepted definition of a niche is still under debate. Alternative terms for a niche are Cesarean scar defect deficient Cesarean scar, diverticulum, pouch and isthmocele[28].

In our study, severe niche was detected in two patient with an incidence of 3.8 on the other hand non sever defect was 96.2%

Ofili-Yebovi and his colleagues demonstrated that, when using TVS in a group of women with gynecological symptoms, half of them had a large niche, i.e. one involving more than 50% of Monteagudo and his colleagues stated the myometrial thickness[10].

Sonohysterography has an overall accuracy of 96% in the diagnosis of scar defect; and 91% in the diagnosis of intrauterine adhesions. In addition, the procedure of SHG is well-tolerated, cost effective, not time-consuming, and can be performed as an office based gynecological practice[8].

TVUS was less accurate than SCSH in detecting scar niche in many researches. Furthermore, it was reported that scar niche in 24% of CSs by TVUS and 56% with gel instillation. The lower incidence of scar niche in their study may be because they assessed scar 6- 12 months after CS[12].

Moreover, the evaluation of CS scar defects was not possible without SCSH[29]. The difficulties with assessing scar defects without SCSH may be partly explained by the presence of mucus and other matter in the scar defects. This may be washed away during saline infusion. The rinsing out of mucus and other particulate matter from the defect may also explain why the defects appeared larger at SCSH than at unenhanced TVUS[26].

In the current study a double layer closure of the uterine wound was done for all participants. Additionally, the study in our hand showed that 96.2 % of case was grade 1, 3.8 was grade2and there was no reported grade 3 cases . Thus, there was a moderate agreement between the two scoring system (kappa 0.48) in assessing the healing of uterine wound healing after 1ry Cs

At TVU, 23 of 41 Caesarean scar defect (56.1%) were grade 1, 13 (31.7%) were grade 2, and 5 (12.2%) were grade 3[9].

Ofiile and his colleagues showed that Women with deficient scars (n (%)) 32/211 after the primary CS (15.2) ,20/84 (23.8) after the secondary CS ,after 11/29 (37.9) after three or more CS[10].

So we can conclude that both scoring systems are efficient in assessing and evaluating degree of uterine wound healing using saline sonohystrography.

CONCLUSION

It has demonstrated that both scoring systems are effeciant in investigating the myometrial wound healing and CS scar defect in the patients undergoing their first elective cesarean section.

CONFLICT OF INTERESTS

There are no conflicts of interest.

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