



The Relationship between Caesarean Scar Defect Ultrasound Measurements and Post-menstrual Spotting (RMT/AMT as a Powerful Predictor of Niche); A prospective Cohort Study

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Submit Date 30-08-2024

Revise Date 07-09-2024

Accept Date 13-09-2024

ABSTRACT

Background: There is an increase in the prevalence of intermittent post menstrual spotting in women with previous one or more cesarean section with no sufficient study about the association between cesarean scar defect, cesarean scar defect ultrasound measurement and post menstrual bleeding, so this study is conducted to assess this association. So, we aimed to evaluate the relationship between the cesarean scar defect ultrasound measurement and post menstrual spotting in women with previous Cesarean section.

Methods: The current prospective cohort study was conducted in obstetrics and gynecology outpatient & fetal medicine unit at Zagazig University Hospital on 48 Patients, who had a previous cesarean section and complained of unexplained abnormal uterine bleeding. All patients were evaluated clinically as well as by transvaginal ultrasound. Cesarean scar niche assessed by transvaginal sonography (TVS) with measurement of niche dimensions (length, depth, width and residual myometrium thickness)

Results: We found a significant positive correlation between menstrual duration, width, depth, and spotting, a significant negative correlation between residual myometrium thickness (RMT) and spotting, and a weak negative correlation between adjacent myometrial thickness (AMT) and spotting. There was a significant positive correlation between dysmenorrhea, dyspareunia, PID, subfertility, and spotting. A significant week-positive correlation between dysuria and spotting and a significant negative correlation between menstrual regularity and spotting.

Conclusions:Caesarean scar defect ultrasound measurements could be used for prediction of post-menstrual spotting

Keywords: Caesarean Scar Defect; Ultrasound; Post-menstrual Spotting. **Keywords:** Interleukin-6; Seizure; Refractory epilepsy; Neuroinflammation.

INTRODUCTION

The usage of caesarean sections (CSs), which can save the lives of both the mother and the child, has grown significantly in the past ten years [1]. In line with worldwide patterns, the percentage of caesarean sections (CS) in Egypt has been rising rapidly. As per the 2014 Egypt Demographic and Health Survey (EDHS), CS accounts for 52% of all deliveries, marking a more than 100% surge in CS rates since 2005 [2]. Several variables influence how well the caesarean scar heals, including wound infections, poor nutritional status, retroflexed uteri, and multiple previous caesarean sections [3].

A niche may also be referred to as a pouch, sacculation, uterine diverticulum, caesarean scar dehiscence, isthmocele, or pouch. At the location of a previous caesarean surgery, there is a pouch-like defect of the anterior uterine isthmus [4], which Morris originally detailed in 1995 [5].

It has been connected to problems with gynecological procedures, unfavorable pregnancy outcomes, and clinical signs such as spotting after menstruation [6]. One typical symptom associated with the development of a niche is prolonged menstruation or postmenstrual spotting, which is more common in women with abnormal uterine bleeding (AUB) [7].

Since there is currently little direct evidence, further research is needed to determine whether postmenstrual spotting and a niche in the uterine scar are related [8]. Not all niches generate symptoms. Given the high occurrence of Caesarean sections, it's critical to understand the therapeutic implications of a niche better [9].

A few modest studies have shown that extended menstrual bleeding and

postmenstrual spotting in women who have had a caesarean section in the past may be caused by a niche. But women with gynecological problems were included in most of the research [10].

METHODS

The current prospective cohort study involved 48 patients who had a previous caesarean section and complained of unexplained abnormal uterine bleeding. The study was carried out in the obstetrics and gynecology outpatient & foetal medicine unit at Zagazig University Hospital between February 2023 and February 2024. TVs assessed each patient both clinically and holistically. The Institutional Review Board at Zagazig University granted approval (IRB number 10199). Every patient gave their informed permission.

Inclusion criteria included non-pregnant women within the reproductive age range of 20 to 40 years, who had undergone one or more caesarean deliveries more than six months prior, and who experienced irregular uterine bleeding.

Exclusion criteria included patients who have had uterine surgery other than a caesarean section; general coagulation disorders; organic (uterine, ovarian, cervical, or other) causes of abnormal uterine bleeding; and hormonal (hormonal contraceptive method) causes of abnormal uterine bleeding.

A comprehensive medical history was taken on all patients, with a focus on menstruation, pregnancy, and use of contraceptives. A local examination comprised a speculum examination for abnormalities in the cervical region and a bimanual examination to assess the size, position, and any adnexal masses of the uterus. A clinical examination also

included a general examination, an abdominal examination with special attention to the presence of scar site and associated tenderness, and an examination of the abdomen. The postmenstrual phase was when the examination was conducted. We employed a Mindray Nuewa 19 ultrasound machine, which has a frequency range of 2.3 MHz - 11.6 MHz, and a 2D endovaginal probe (V11-3Hs). Sections both longitudinally and transversely across the uterus were investigated. Documentation was made of the position of the uterus, its width, the endometrium's thickness, and the presence of intracavitary collection (Figure 1). The uterus was examined for a caesarean scar defect, which manifested as an anechoic area at least 1 mm deep within the area of the prior CS scar. If a CSD was found, the breadth, the greatest space along the cervicoisthmic canal, the depth of the defect, the vertical distance between the base and apex, and the RMT were measured by the same experienced sonographer to avoid interobserver variability. There were no negative consequences from this move.

The scar was identified by transvaginal sonography as being in the uterus's mid-sagittal plane, and the following characteristics were assessed. RMT is defined as the thickness of the anterior uterine wall that remains in front of the scar (the distance between the surface of the anterior uterine wall and the tip of the hypoechoic space), and length is defined as a straight line overlaid on the edges of the scar that are in opposition to each other across the niche. width: defined as the distance between the lateral angles of the defect (the calibre of the new shadow obtained indicates the width of the scar; the

hypoechoic shadow of the defect seen on the sagittal plane would be followed slowly while switching into the transverse plane of the uterus); the defect should appear between the hyperechoic uterovesical fold and the myometrial mantle; depth: the distance measured from the tip of the hypoechoic space to the surface of the endometrial-endocervical layer of the uterus' anterior wall; and position of the uterus was also recorded: The term "anteflexion" refers to the uterus's anterior deviation of the uterine endometrial cavity's long axis towards the cervix, whereas "retroflexion" denotes a posterior deviation of the same axis.

Statistical Methods

After the data was collected, coded to make manipulation easier, and twice entered Microsoft Access, it was analyzed using the Statistical Package of Social Science (SPSS) software version 22 in Windows 7 (SPSS Inc., Chicago, IL, USA, 2020). When comparing the likelihood that a disease will manifest in a person with a specific trait or who has been exposed to a risk factor to the likelihood that the disease will manifest in a person without that trait or who has not been exposed, the odds ratio (OR) was utilized. The means of two independent groups were compared using the student "t" test. The difference between quantitative variables in non-normally distributed data between two groups was computed using the Mann Whitney test. We employed the Chi-square test (X^2) to determine if row and column variables were related. To compare the proportion of outcome between the two groups, the Z-test for percentage was employed.

RESULTS

In the present study participants' age ranges from 24 to 40 years with a mean age of 31 years and the mean BMI was 27.3. Three participants were diabetics and two had

hypertension (Table 1). More than 52% of participants had previous two parity and two previous CS too (Table 2). The most frequent Gynecological symptoms was Menstrual irregularity 62.5% followed by PID 54.2% and Dysmenorrhea (Table 3).

In this study US parameters were as follows: Width was range from 3 to 19 cm with mean of 10.3 Cm, Length was range from 1.4 to 15 cm with mean of 9.3 cm. Depth was range from 1.6 to 14 cm with mean of 7.3cm. The RMT/AMT ratio was range from 0.1 to 0.9 with a mean of 0.37 (Table 4).

We found a significant good positive correlation between menstrual duration, width, depth, and spotting. And a significant

good negative correlation between RMT and spotting, And a significant week negative correlation between AMT and spotting. While the correlation between Length and spotting were insignificant. Also, we find a good negative correlation between RMT/AMT ratio and spotting (Table 5).

We found a significant good positive correlation between Dysmenorrhea, dyspareunia, PID, Subfertility and spotting. And a significant week positive correlation between dysuria and spotting. And a significant week negative correlation between menstrual regularity and spotting, While the correlation between uterine axis and spotting was insignificant (Table 6).

Table 1: Demographic Data of studied group

	Mean	SD
Age	31	4.2
BMI	27.3	5.5
	N	%
Working	39	81.3
DM	3	6.3
HTN	2	4.2

Table 2: Obstetric Data of Studied group

		N	%
Parity	1	17	35.4
	2	25	52.1
	3	8	12.5
Previous CS	1	20	41.7
	2	25	52.1
	3	3	6.3

Table 3: Gynecological Data of studied group

	N	%
Dysmenorrhea	26	54.2
Dyspareunia	18	37.5
Dysuria	12	25
PID	26	54.2
Subfertility	15	31.3
Menstrual regularity	30	62.5
	Mean	SD
PMS (days)	8.04	2.4
Menstruation duration	7.6	2.4

Table 4: US parameter of studied group

	Mean	SD
Width (Cm)	10.3	4.8
Length (Cm)	9.3	3.7
Depth (Cm)	7.4	3.2
RMT (Cm)	3.8	2.7
AMT (Cm)	10.2	2.9
RMT/AMT ratio	0.37	0.18
	N	%
Uterine axis	40	83.3

Table 5: Correlation between US parameter and Spotting

	r	P value
Menstruation duration	0.6	0.001*
Width	0.5	0.001*
Length	0.1	0.5
Depth	0.4	0.02*
RMT	-0.7	0.001*
AMT	-0.3	0.03*
RMT/AMT ratio	-0.7	0.001*

r Pearson correlation; * Significant

Table 6: Correlation between Gynecological Data and Spotting

	r	P value
Dysmenorrhea	0.7	0.001*
Dyspareunia	0.5	0.001*
Dysuria	0.3	0.04*
PID	0.7	0.001*
Subfertility	0.8	0.001*
Menstrual regularity	-0.1	0.4
Uterine axis	0.03	0.8

r Spearman correlation; * Significant

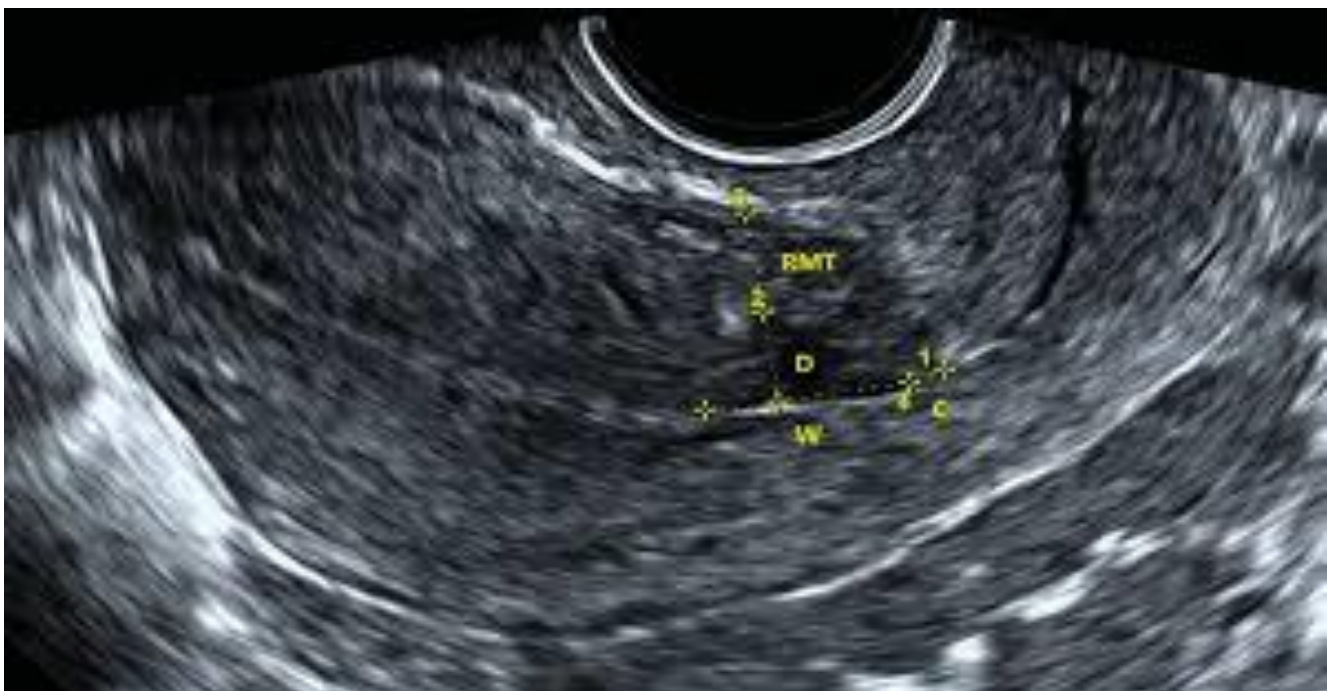


Figure (1): Measurement of the standardized cesarean section scar parameters and assessment of the scar. location; RMT — residual myometrial thickness; D — depth of the scar niche; W — width of the scar niche; C — distance from the internal cervical os to the scar.

DISCUSSION

A deficiency or discontinuance within a caesarean section niche is defined as the myometrium of the lower uterine segment where a previous C-section was performed. A niche may also be linked to other gynecological issues such as dysmenorrhea, dyspareunia, and persistent pelvic pain in addition to irregular uterine bleeding [11].

In gynecology, abnormal uterine bleeding is one of the most prevalent clinical issues. This issue affects up to 33% of women who

are sent to gynecological outpatient clinics. This illness has significant effects on social life, morbidity, and clinical workload [12].

Postmenstrual spotting brought on by a niche has an impact on a woman's ability to pray, fast, work, and have a sexual life. There have been cases reported of women with anomalous uterine bleeding who had previously undergone caesarean sections; in particular, postmenstrual spotting may be related to scar flaws from the surgery that formed a diverticulum, a condition some have dubbed

an "isthmocele." Morris[5] named "cesarean scar syndrome" who was the first to describe this condition.

Tulandi and Cohen [13] conducted a systematic review utilizing the keywords "caesarean scar defect, uterine scar defect, uterine diverticulum niche, isthmocele, pouch, or sacculation" and their combination, following the statement of the recommended reporting items for systematic reviews and meta-analyses. It was discovered that thirty-two experiments were eligible for inclusion. Using an additional eight experiments from 2016 and 2017, the study data is updated using the same keywords in this work. This might reflect the topic's growing interest and clinical significance. The alterations in caesarean section scars can be diagnosed by hysteroscopy, hysterosalpingography, and ultrasonography. These days, hysteroscopy is the gold standard for identifying scar abnormalities from caesarean sections and for facilitating surgical correction [14].

In this prospective cohort study, 48 patients who had previously undergone a cesarean section and reported unexplained irregular uterine bleeding were included. TVs assessed each patient both clinically and holistically. Between February 2023 and February 2024, the study was carried out at Zagazig University Hospital's obstetrics and gynecology outpatient clinic and foetal medicine unit.

Our study's findings showed that a study group with a niche identified by TVS based on age ($P=0.002$), parity ($P<0.001$), the number of prior CSS ($P<0.001$), and the length of irregular uterine bleeding ($P<0.001$) had statistical significance ($P<0.05$).

The participants in this study ranged in age from 24 to 40 years old, with a mean age of 31. In terms of the comorbidities of the

patients, two had hypertension and three had diabetes.

In a study conducted by Talamonte et al. [15] Out of 20 women who had previously had CS and were undergoing TVS evaluation for postmenstrual spotting, 50% of patients with scar defects had previously experienced CS (P -value: 0.03). This is consistent with the findings of our investigation, as the majority of patients with a niche had two prior CS diagnoses (52.1%) (P -value <0.001), indicating statistical significance. This highlights the correlation between the quantity of prior CS and the emergence of a niche.

In the study conducted by Wanget al. [16], the following gynecological complaints were reported dyspareunia (18.3%), chronic pelvic discomfort (36.7%), and dysmenorrhea (53.1%). (The P values for secondary infertility were 0.686, 0.001, <0.001 , and 0.001, respectively.

In our study, RMT less than 2.5 mm has good positive correlation with secondary infertility. This is consistent with the study's findings, which indicated that the three most common gynecological complaints (P values <0.001) were dysmenorrhea (54.2%), chronic pelvic pain (54.2%), and dyspareunia (37.5%). This highlights the correlation that exists between the CS niche and persistent pelvic discomfort and dysmenorrhea.

Three parameters scar length, depth, and width were found to have a strong link with the emergence of postmenstrual spotting in our investigation. It was observed that an increase in the defect's length, depth, and width was associated with the niche group's high prevalence of postmenstrual spotting. Previous research had shown a correlation between niche volume and postmenstrual spotting.

According to the current study, patients who reported having postmenstrual spotting were

more likely to have lower RMT and lower RMT/AMT which is the powerful predictor in our study. [17].

Our research showed that large niches were defined as those where the residual myometrium was less than half as thick as the surrounding myometrium. Postmenstrual spotting would emerge due to reduced myometrial thickness and poorer contractility caused by fibrosis within the defect [18, 19].

This study had certain inevitable limitations. First, due to time constraints, only a limited portion of the population that visited the OB/GYN outpatient clinic at Zagazig University Hospitals was included in this study; as a result, bigger sample sizes should be considered in future, comprehensive research to extrapolate the findings to broader populations. Second, the individuals' post-treatment alternatives and their impact on the amelioration of symptoms associated to their niche and infertility were not discussed in the follow-up.

CONCLUSIONS

The rising occurrence of CS has been accompanied by a rise in CS-related complications. A uterine wall defect known as an isthmocele or niche at the location of the CS scar is one of the known consequences. It has been linked to negative pregnancy outcomes, an increased chance of difficulties during gynaecological operations, and clinical signs such spotting during menstruation. Women with abnormal uterine bleeding (AUB) have a high prevalence of problems, including extended periods and postmenstrual spotting is a common symptom linked to the existence of a niche. We found a significant good positive correlation between menstrual duration, width, depth, and spotting. And a significant good negative correlation between RMT and spotting, And a significant week negative correlation between

AMT and spotting. So, caesarean scar defect ultrasound measurements could be used for prediction of post-menstrual spotting.

Conflict of interest: The authors declare that they have no competing interest.

Financial Disclosure:

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors

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Citation:

Elkadosi, M., El Anwar, A., Elsayed, O., Hamed, B. The Relationship between Caesarean Scar Defect Ultrasound Measurements and Post-menstrual Spotting (RMT/AMT as a Powerful Predictor of Niche); A prospective Cohort Study. *Zagazig University Medical Journal*, 2024; (4457-4465): -. doi: 10.21608/zumj.2024.316441.3545