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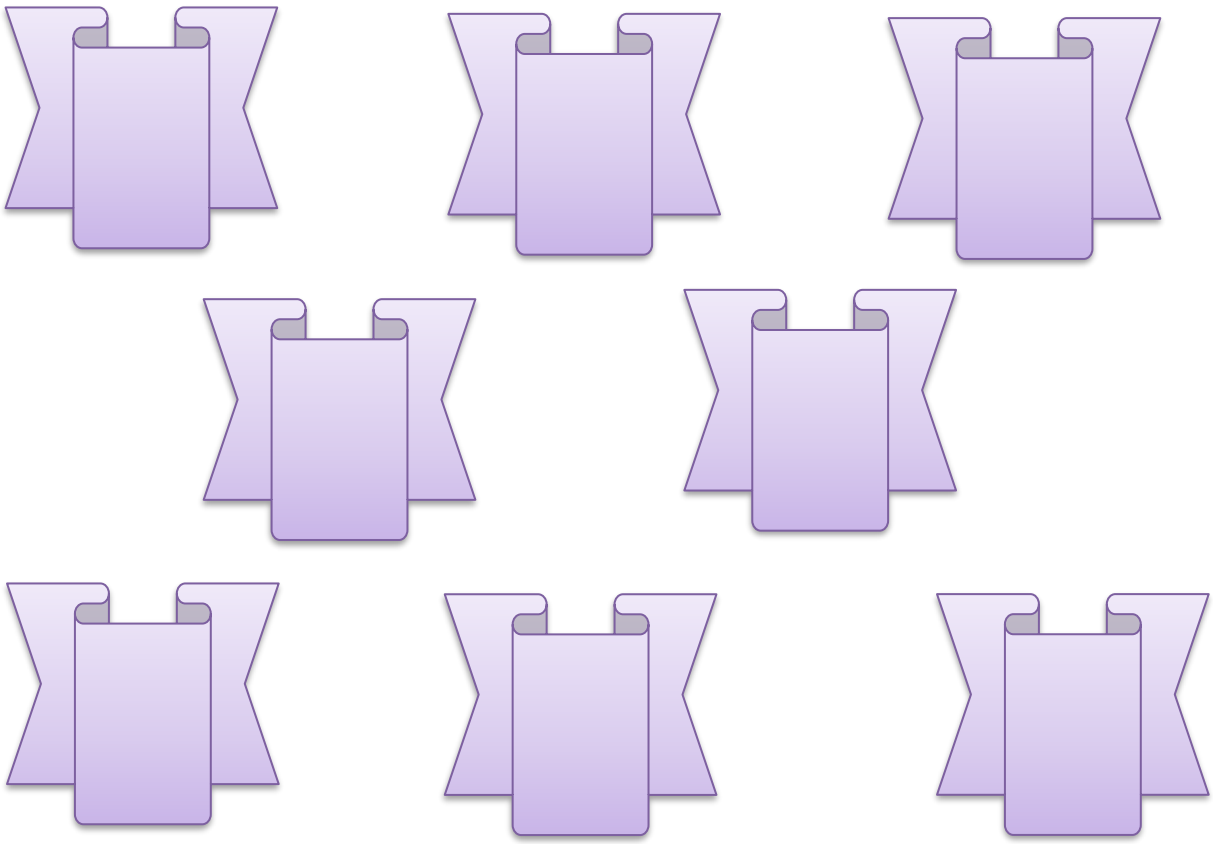

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Original Article

Three-dimensional Ultrasound versus Hysteroscopy in Diagnosis of Cesarean Scar Defect

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ABSTRACT

Background: As there is increase in cesarean section mode of delivery, growing concerns related to its negative consequences are raised and reliable diagnostic tools are of crucial importance in order to diagnose caesarean scar defect.

Aim of the work: The aim of this study was to compare the efficacy of 3D ultrasound versus Hysteroscopy in diagnosis of caesarean scar defect.

Patients and Methods: Three hundred cases of female patients 6-12 months after undergoing cesarean section were recruited and assessed for eligibility at the outpatient Gynecology Clinic in Al-Azhar University Hospital [Damietta]. The study cases were examined using 3D trans-vaginal ultrasound for detecting the presence of caesarean scar defect [niche] and assessing its site, depth, shape and volume and measuring the residual myometrium. Diagnostic hysteroscopy was carried out to all patients under anesthesia and compared blindly to the ultrasound findings.

Results: The mean scar thickness of the study group by trans-vaginal ultrasound was 1.94±0.89 with range 0.65-3.2 cm. There was significant difference between using the trans-vaginal ultrasound and hysteroscopy regarding detecting scar ballooning, it was detected in 74 cases [24.7%] using trans-vaginal ultrasound in compare with 38 cases [12.7%] diagnosed by hysteroscopy [P<0.001]. There was no significant difference between using the trans-vaginal ultrasound and hysteroscopy regarding detecting the site of the scar [P=0.52], the continuity of scar [P= 0.24] and the vascularity of scar [P=0.33].

Conclusion: Ultrasound is of greater value in evaluating scar thickness and detecting scar defect originated after cesarean section than hysteroscopy.

Keywords: Ultrasound; Hysteroscopy; Cesarean section; Niche; Scar ballooning.

INTRODUCTION

Cesarean section [CS] is recently used commonly as a mode of delivery worldwide. The prevalence of cesarean section deliveries has significantly risen in developed nations over the past few decades because of higher maternal socioeconomic status [1]. The rate of CS was found to be ranging between 6 and 27% [2].

While cesarean incisions typically heal without major issues, there is still a chance of experiencing complications. The rising rates of cesarean sections have led to a growing interest in researching the immediate and long-term complications associated with cesarean scar defects [3].

Cesarean scar defect has many synonymic terms such as isthmocele, niche, diverticulum or pouch. It is characterized as an area with reduced or absent ultrasound echoes within the lower part of the uterine muscle [myometrium], indicating a break or interruption in the myometrium at the location of a previous cesarean scar with a depth of at least 1 mm [4, 5]. The prevalence of niche varies between 24% and 70% when assessed through transvaginal ultrasound, while sono-hysterography shows a higher range of prevalence, between 56% and 84% [6].

More than half of women show the presence of niche when evaluated through sono-hysterography within 6 to 12 months after a cesarean section. While some cases of CS defects do not exhibit any symptoms, in many instances they can result in various gynecol-ogical issues, including abnormal uterine bleeding, painful menstruation, chronic pelvic pain, discomfort during sexual intercourse, and difficulties conceiving. Furthermore, these defects could potentially contribute to future complications during pregnancy, such as ectopic pregnancy, uterine rupture, and abnormal placental development [7]. Many studies suggested different methods in diagnosing niche, including hysterography, ultrasono-graphy, sono-hysterography, hysteroscopy and magnetic resonance imaging [8].

Ultrasound has been broadly investigated for its role in identifying defects in the cesarean section [CS] scar. The use of transvaginal ultrasound has proven to be a precise method for evaluating scar thickness. Furthermore, colored Doppler ultrasound has demonstrated its effectiveness in detecting the blood flow within the scar tissue [9].

Diagnostic hysteroscopy has long been regarded as the most reliable method for identifying intrauterine abnormalities and has been considered the "gold standard". It has been proven to be highly effective in directly visualizing the uterine scar and intrauterine adhesions in women who have undergone previous cesarean sections [10].

The aim of our study was to compare the efficacy of 3D trans-vaginal ultrasound versus Hysteroscopy in diagnosis of caesarean scar defect.

PATIENTS AND METHODS

This was a prospective study, which included 300 cases of female patients 6-12 months after undergoing cesarean section. Patients were examined and evaluated at the outpatient Gynecology Clinic in Al-Azhar University Hospital [Damietta] from May 2018 to April 2019. The patients were eligible in this study after interviews and laboratory tests. Written informed patient consent was obtained from each subject before the study.

Inclusion criteria included Delivery by cesarean section [up to 4 cesarean sections], No pregnancy and Age between 20 – 35 years old.

Exclusion criteria included women with risk of pelvic inflammatory disease, cervical cancer, pregnancy and the infection with Herpes simplex virus.

All women underwent both 3D TVS and Diagnostic Office Hysteroscopy to study the presumed site of the caesarean section scar. During the history-taking and examination process, various assessments are conducted. These include a general examination, abdominal examination to rule out pregnancy and evaluate the scar [size, location, tenderness], and gynecological examination to exclude pelvic infection, pregnancy, and cervical pathology. Specifically, the uterus is examined for a caesarean scar defect, which is described as a fluid-filled area at the location of the cesarean scar, displaying a minimum depth of 1 mm. If a niche could be detected, its depth and residual myometrium were measured. The niche shape was assessed and the volume of the niche measured. Diagnostic hysteroscopy was carried

out to all patients under anesthesia and compared blindly to the ultrasound findings. During the hysteroscopy assessment, several factors are taken into consideration: [1] the condition of the scar site, including its thickness, continuity, presence of blood vessels, and whether it appears healthy [pinkish] or unhealthy [fibrosed]; [2] the presence of a scar defect; and [3] the presence of intrauterine adhesions associated with the scar, including their type [thin or thick], location, and extent.

Ethical consideration: The research protocol was submitted to the Institution Research Board [IRB] of the Faculty of Medicine, Al-Azhar University, Damietta for approval. Each participant in the study provided informed verbal consent. The study maintained strict confidentiality and respected the personal privacy of all participants.

Statistical Analysis of Data: Data analysis was conducted using SPSS version 21, starting with the assessment of data normality using the Kolmogorov-Smirnov test. Categorical data were described using frequency and percentage. The association between categorical variables was examined using the Chi-square test. For continuous variables, parametric data were presented as mean ± standard deviation [SD], while non-parametric data were reported as the median. To compare the two groups, the Student t-test was used for parametric data and the Mann-Whitney test for non-parametric data. P value < 0.05 is considered significant.

RESULTS

The mean age was 29.4±3.29 ranged from 25-38 years old, the mean parity was 1.84±0.75 ranged from 1-3 and mean number of years from last section was 9.12±1.8 ranged from 6-12 month. The mean scar thickness by trans-vaginal ultrasound was 1.94±0.89 with range 0.65-3.2 cm [table 1].

The indications of previous Cs were shown in table [2]. The most frequent indications were contracted pelvis and failure to progress [17.7%].

Using transvaginal ultrasound, the site of scar in 86 case [28.7%] above internal os and 214 [71.3%] below internal os. Scar ballooning was indicated in 74 [24.7%] cases. 240 [80.0%] with scar continuity and 156 [52.0%] with scar vascularity [table 3].

By hysteroscopy, the site of scar in 79 case [26.3%] above internal os and 221 [73.7%] below internal os, Scar ballooning was indicated in 38 [12.7%] cases, 228 [76%] with scar continuity and 144 [48.0%] with scar vascularity [table 4].

Correlation between transvaginal ultrasound and hysteroscopy revealed that there was no significant difference between both maneuvers regarding cesarean scar site, scar continuity and vascularity. On the other hand, scar ballooning was more frequently detected by hysteroscopy with statistically significant difference [table 5].

Table [1]: Demographic, clinical data and scar thickness obtained by ultrasound

	Mean	SD	Minimum	Maximum
Age [years]	29.4	3.29	25	38
Parity [No.]	1.84	0.75	1	3
Duration from last section [month]	9.12	1.8	6	12
Scar thickness [cm]	1.94	0.89	0.65	3.2

Table [2]: Indication of the previous cesarean in the study group

	Number	[%]
Contracted pelvis	53	17.7
Cephalopelvic disproportion	20	6.7
Fetal distress	26	8.7
Failure to progress	53	17.7
Fetal macrosomia	13	4.3
Obstructed labour	15	5
Breech presentation	28	9.3
Preeclampsia	40	13.3
Maternal DM	13	4.3
Post-term pregnancy	22	7.3
Precious baby	5	1.7
Prelabor rupture of membrane	12	4

Table [3]: Transvaginal ultrasound findings of the studied cases

		Number	[%]
Scar site	Above internal os	86	28.7
	Below internal os	214	71.3
Scar ballooning	Yes	74	24.7
	No	226	75.3
Scar continuity	Yes	240	80
	No	60	20
Scar vascularity	Yes	156	52
	No	144	48

Table [4]: Hysteroscopy findings of the studied cases

		Number	[%]
Scar site	**Above internal os**	79	26.3
	Below internal os	221	73.7
Scar ballooning	**Yes**	38	12.7
	No	262	87.3
Scar continuity	**Yes**	228	76
	No	72	24
Scar Vascularity	**Yes**	144	48
	No	156	52

Table [5]: Correlation between transvaginal ultrasound and hysteroscopy findings

		Number	Percentage	X^2	P-value
scar site above internal os	Ultrasonography	86	28.7	0.64	0.52
	Hysteroscopy	79	26.3		
Scar Ballooning	Ultrasonography	38	12.7	3.78	**<0.001***
	Hysteroscopy	74	24.7		
Scar Continuity	Ultrasonography	240	80	1.18	0.24
	Hysteroscopy	228	76		
Scar Vascularity	Ultrasonography	156	52	0.9	0.33
	Hysteroscopy	144	48		

DISCUSSION

After a cesarean section, a surgical procedure is done by making an incision in the lower part of the uterus. Ultrasound scans have detected different modifications in the front wall of the uterus after the surgery [11]. In women who have experienced infertility and previously had a cesarean section, the occurrence of uterine scar defects can reach as high as 50% [12]. Transvaginal sonography can be seen as the optimal screening choice due to its simplicity, affordability, and noninvasive nature, making it a top contender for initial consideration. **Tower and Frishman** [13] revealed that scar defects resulted from cesarean appeared by transvaginal sono-hysterography as a triangular area of reduced echoes located in the muscular wall of the uterus towards the front and lower segment. A previous study revealed that having large scars from previous pregnancies increases the chances of experiencing complications in subsequent pregnancies in compare with small scar defects [14].

The present study aimed to compare the efficacy of 3D transvaginal ultrasound versus hysteroscopy in diagnosis of caesarean scar defect.

In the present study, the mean age was 29.4±3.29, the mean parity was 1.84±0.75 and the mean number of years from last section was 9.12±1.8 ranged from 6-12 month. Previous studies found that women who underwent cesarean sections at an older age had a greater likelihood of developing scar diverticulum, and this probability increased in relation to the number of previous cesarean sections they had [15]. **Li *et al.*** [16] reported women with cesarean scar defect develop in patient at age 30.7 years and such finding was in agreement with our results.

The role of ultrasound in detecting the scar defects resulted from previous cesarean in non-pregnant females have been studied. Two-dimensional transvaginal ultrasound was determined to be a reliable technique for measuring scar thickness. Additionally, the

application of colored Doppler was found to be beneficial in identifying the blood flow within the scar [9].

In the present study, the mean thickness of scar in the study group by ultrasound was 1.94±0.89. The findings were consistent with the study conducted by **Ofili-Yebovi *et al.*** [17], where they identified the degree of the abnormality by assessing the ratio of the scar's myometrial thickness to the thickness of the neighboring myometrium, which determined to be greater than 50%. **Osser *et al.*** [18] indicated that scar myometrial thickness of <2.5 mm on the sono-hysterogram to be a sever defect.

Diagnostic hysteroscopy has been widely regarded as the most reliable method for identifying intrauterine abnormalities. It has been demonstrated to be a highly effective technique for directly observing uterine scars and intrauterine adhesions, making it a sensitive diagnostic tool [10].

Our results revealed that there was significant difference between using the trans-vaginal ultrasound and hysteroscopy regarding detecting scar ballooning, it was detected in 74 cases [24.7%] using trans-vaginal ultrasound in compare with 38 cases [12.7%] diagnosed by hysteroscopy. No significant difference was found between using the trans-vaginal ultrasound and hysteroscopy regarding detecting the site of the scar [P=0.52], the continuity of scar [P= 0.24] and the vascularity of scar [P=0.33].

A previous study performed by **Babacan *et al.*** [19] found that hysteroscopy is better diagnostic value for uterine pathology especially uterine polyps. Moreover, **El-Tagy *et al.*** [20] recommended using hysteroscopy for accurate detection and diagnosis of uterine cavity lesion.

Conclusion: Hysteroscopy remains the preferred method for diagnosing cesarean scar defects due to its higher precision and ability to directly visualize the scar tissue. Transvaginal ultrasound can still be considered as a potential alternative in cases where hysteroscopy is contraindicated or unavailable, taking into account its limitations and the need for further studies to establish its reliability. Further research should focus on exploring correlations between the diagnostic findings obtained from hysteroscopy and clinical outcomes.

Conflict of Interest and Financial Disclosure: None.

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