Assessment of Cesarean Niche by Transvaginal Ultrasonography and Pelvic Magnetic Resonance Imaging

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Abstract

Background: Transvaginal ultrasonography (TVUS) is the predominant technique used to assess the uterine wall.

Objectives: of this study was to compare TVUS with pelvic MRI in identifying the cesarean niche.

Patients and Methods: This prospective cohort study was carried out on 30 non-pregnant women aged from 20 to 40 years old, who complaining from postmenstrual spotting, dysmenorrhea, chronic pelvic pain and dyspareunia undergoing at least one cesarean section (CS). All patients were categorized into two equal groups: Group A: (Detected CS Niche) and Group B: (No Detected CS Niche).

Results: The cutoff value of 3.9 mm, the residual myometrial thickness (RMT) by anteverted uterus (TVS) variable had a sensitivity of 87.8%, a specificity of 71.3% and AUC 0.771 for predicting niche and indicated that at the cutoff value of 4.15 mm, the RMT by MRI variable had a sensitivity of 88.3%, a specificity of 70.6% and AUC 0.781 for predicting niche. Cesarean niche detected measurement were significantly increase with MRI when compared with TVS ($P<0.05$). AVF was significantly reported in cases with no detected CS Niche. Regarding age, number of previous CS, parity, breech, transverse presentation, single layer, use of locking sutures, chronic use of steroids during pregnancy, pre-eclampsia, and peri- or postpartum fever or infection, there was significantly increased in both groups ($P<0.0001$).

Conclusion: MRI shows promise in evaluating the thickness of uterine scars by reducing the reliance on the operator, which is a limitation of TVUS, and providing more precise measurements compared to TVUS.

Keywords: Cesarean Niche; Transvaginal Ultrasonography; Pelvic Magnetic Resonance Imaging; Cesarean Section.

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Introduction

The prevalence of increasing cesarean section (CS) has been progressively rising in recent decades. Approximately one-third of women globally have given birth by CS, according to estimates **(Betrán et al., 2016)**.

Globally, the World Health Organization (WHO) states that there are no significant additional health benefits associated with a cesarean rate above 10-15%. However, high-income countries, such as the United Kingdom (UK), the United States (USA), South America, and certain provinces in China, are observing a common trend of increasing cesarean delivery rates, with figures reaching 25%, 32%, 41%, and over 50% respectively **(Hellerstein et al., 2015)**. In conjunction with the increasing CS incidence, there has been a corresponding rise in the problems associated with CS. An established consequence is the presence of a uterine wall defect at the location of the CS scar, termed as isthmocele, diverticulum, scar pouch, or niche **(Monteagudo et al., 2001)**.

Although some women with a cesarean niche may not have any symptoms, others may present with gynecological manifestations as postmenstrual spotting, irregular and extended menstruation, persistent brown vaginal discharge, chronic pelvic discomfort, and secondary infertility **(Brook et al., 2020)**.

Multiple theories may explain the development of a specialized ecological role, but recent research indicates that a technique including the closure of the uterus using two layers that do not interlock, together with the inclusion of the innermost layer of the uterine lining, and meticulous surgical skill to prevent a shallow incision, is linked to a lower probability of niche creation. Furthermore, the development of this condition has been linked to an advanced stage of labor and uterine retroflexion.

The presence of smoking or uncontrolled diabetes may hinder the healing process of a wound. Therefore, it is important to identify any possible risk factors that may indicate the probability of its occurrence **(Bij de Vaate et al., 2014)**.

The precise prevalence of the cesarean niche is uncertain; however, it may reach up to 61%, 81%, and 100% for individuals who had one, two, and three or more CS, respectively **(Bij de Vaate et al., 2014)**. The authors suggest using sonohysterography (SHG) as the most reliable method, considering it the gold standard. However, they caution against excessive efforts to diagnose minor problems without fully comprehending their clinical importance **(Jordans et al., 2019)**.

Diagnostic evaluation has been hindered by a recent absence of reliable evidence. Several imaging techniques have been documented for diagnosing the cesarean niche, including transvaginal ultrasound (TVS), saline SHG, hysteroscopy, and hysterosalpingography (HSG) **(Sipahi et al., 2017)**.

Nevertheless, there is a scarcity of research on the use of magnetic resonance imaging (MRI) in diagnosing the cesarean niche. Moreover, there is currently no agreement on a universally accepted method for identifying and quantifying the cesarean niche **(Tang et al., 2019)** . The management of the cesarean niche remains uncertain. Presently, the available treatment choices including hormone therapy, laparoscopic excision, hysteroscopic desiccation or resection, vaginal revision, and endometrial ablation **(Brook et al., 2020)**.

The objective of this study was to assess the comparative effectiveness of transvaginal ultrasonography (TVUS) and pelvic magnetic resonance imaging (MRI) in identifying the caesarean niche.

Patients and methods

This research was conducted on a group of 30 non-pregnant women between the ages of 20 and 40. These women were experiencing symptoms such as postmenstrual spotting, dysmenorrhea,

persistent pelvic discomfort, and dyspareunia. They had all had at least one CS and the time elapsed since the previous CS was at least six months. The research was conducted between November 2021 and April 2023, after clearance from the Ethical Committee of Tanta University Hospitals in Tanta, Egypt. The patients were provided with a well-informed signed consent.

Exclusion criteria were women with a history of uterine surgery other than low transverse incision including (Classic CS, myomectomy, or perforation) other uterine pathologies (such as polyps, hyperplasia, myoma, malignancy, or congenital uterine malformations), a recent pelvic infection or use hormonal contraceptives and pregnant women.

All patients are categorized into two equal groups: Group A: detected CS niche (n=10) and Group B: no detected CS niche (n=20) according to initial assessment by ultrasound.

All patients were subjected to: history taking, clinical examination, laboratory investigations [complete blood count (CBC), coagulation profile, thyroid function tests and female hormonal profile] and radiological imaging [evaluation by TVUS, followed by pelvic MRI at least six months post-CS].

Transvaginal ultrasonography

Following bladder evacuation, the patient will be placed in a supine position on the examination table, with her knees flexed and her feet supported in stirrups. The transducer, a probe with a mid-high frequency (e.g., >7 MHz), will be coated with gel and wrapped with a plastic or latex sheath. Subsequently, it is introduced into the vaginal cavity. Prior to beginning the assessment of a certain market segment, it is crucial to adjust the settings of the ultrasound machine. To enhance the clarity of the image, it is advisable to modify the sector angle so as to get an appropriate perspective of the whole uterus. Modify the depth until the whole uterus is visible and establish the focus depth at the level of the niche. To mitigate excessive shadowing caused by scar tissue in the front of the uterus, attempt to place the transvaginal probe in the rear fornix and see whether the picture quality improves. To get an ideal perspective and rule out any abnormalities in the uterus, it is recommended to begin by doing a thorough examination of the whole uterus in two orientations: the sagittal plane from right to left and the transverse plane from the cervix to the fundus. This should be done before focusing on the niche and performing any measurements.

Measuring length, depth and width of niche as follows

Select the picture where the primary recess has the greatest depth and length. The midsagittal plane may not always be the case since it might potentially be more lateral. Enlarge the area of interest and fine-tune the focus. Determine the length of the niche by measuring it in a direct line that runs parallel to the uterine cavity or cervical canal. Determine the depth of the niche by measuring the vertical distance from the bottom of the defect to the myometrium at the highest point of the niche. Excluding the endometrium is necessary for measuring the niche. Afterwards, determine the width of the niche in the horizontal plane, at its widest point; this may occur at the bottom or the top of the flaw.

Magnetic resonance imaging (MRI)

Obtained images were acquired using a closed pelvic MRI scanner (General Electric 1.5 Tesla) without the use of contrast agent. An assessment was conducted on a T2-weighted sagittal scan of the uterus to detect a scar niche. Prior to the examination, inquire with the patient about the following: presence of a brain aneurysm clip, artificial heart valves, cardiac defibrillator or pacemaker, inner ear (cochlear) implants, renal illness, or dialysis (as contrast administration may not be feasible), newly implanted artificial joints, vascular stents, and pain pumps. Entry of metallic items into the MRI

scanner room is prohibited. The patient assumes a supine position on a sliding table, with their feet positioned first and secured with a coil (body array). To mitigate the high noise levels caused by the vibration of the gradient coils during imaging, it is usual practice to use earplugs or specially developed in-ear audio systems.

The niche was measured by

The depth (the vertical distance between the base and apex of the defect), the width (the distance of the base of the defect), the remaining myometrium (the distance from the serosal surface of the uterus to the apex of the niche and the total myometrial thickness adjacent to the niche was also measured next to the base of the defect.

Statistical analysis

The statistical analysis was conducted using SPSS v26 software (IBM Inc., Chicago, IL, USA). The quantitative variables were expressed as the mean and standard deviation (SD) and compared between the two groups using an unpaired Student's t-test. The qualitative variables were shown as frequency and percentage (%) and assessed using either the Chi-square test or Fisher's exact test, depending on the circumstances. Receiver Operating Characteristic curve (ROC) analysis was used to determine the overall predictive ability of a parameter and identify the optimal threshold value. This analysis also allowed for the assessment of sensitivity and specificity at this threshold value. A two-tailed P value less than 0.05 was deemed to be statistically significant.

Results

Regarding parity, parity of 1, 2, 3 and ≥4 was reported in 5 (16.67%), 11 (36.67%), 7 (23.33%) and 7 (23.33%) cases respectively. Regarding number of previous CS, 15 (50%), 5 (16.67%) and 10 (33.33%) cases reported 1, 2 and ≥3 CSs respectively. Regarding indication for last CS, breech presentation was reported in 3 (10%) cases , transverse presentation was reported in 3 (10%) cases, cephalopelvic disproportion was reported in 6 (20%) cases, delayed second stage of labor was reported in 4 (13.33%) cases, failure of cervical dilatation, fetal distress was reported in 2 (6.67%) cases, maternal condition was reported in 3 (10%) and multiple CS was reported in 9 (30%) cases. Regarding type of CS, elective Cs was performed in 23 (76.67%) cases and emergency was reported in 7 (23.33%). Regarding Suturing technique used, double-layer, single-layer and use of locking sutures were reported in 10 (33.33%), 9 (30%) and 11 (36.67%) cases respectively. DM were reported in 8 (26.67%), chronic use of steroids during pregnancy were reported in 4 (13.33%), pre-eclampsia was reported in 7 (23.33%) and peri- or postpartum fever or infection were reported in 11 (36.67%). (**Table.1**).

Table 1. Demographic data, suturing technique used and medical conditions of studied patients

Variables		N = 30
Age (Years)		34.77 ± 6.33
1		5(16.67%)
2		11(36.67%)
3		7(23.33%)
≥4		7(23.33%)
Number of previous CS	**1**	15 (50%)
	2	5(16.67%)
	≥3	10(33.33%)
Indication for last CS	**Transverse presentation**	3 (10%)
	Breech presentation	3 (10%)
	Cephalopelvic disproportion	6 (20%)

	Delayed second stage of labor	4 (13.33%)
	failure of cervical dilatation, fetal distress	2 (6.67%)
	Maternal condition (including placental problems)	3 (10%)
	Multiple CS	9 (30%)
Type of CS	**Elective**	23 (76.67%)
	Emergency	7 (23.33%)
Suturing technique	**Double layer**	10 (33.33%)
	Single layer	9 (30%)
	Use of locking sutures	11 (36.67%)
Medical Conditions	**DM**	8 (26.67%)
	Chronic use of steroids during pregnancy	4 (13.33%)
	Pre-eclampsia	7 (23.33%)
	Peri- or postpartum fever or infection	11 (36.67%)

Data are presented as mean ± SD or frequency (%). CS: cesarean section, DM: Diabetes mellitus.

Regarding clinical symptoms, 12 (40%) were asymptomatic cases. Blood loss of more than 80 ml was in 14 (46.67%) cases. Prolonged menstruation of more than 6 days was reported in 7 (23.33%) cases. Dysmenorrhea, chronic pelvic pain, dyspareunia, and secondary infertility were reported in 20 (66.67%), 11 (36.67%), 8 (26.67%) and 6 (20%) cases. AVF uterus was reported in 19 (63.33%) cases and RVF uterus was reported in 11 (36.67%) cases. Cesarean niche was detected in 10 (33.33%) cases with both TVS and MRI. Regarding shape of CS scar niche, oval, rectangular and triangular scar niche was detected in 3 (30%), 3 (30%) and 4 (40%) , (**Table. 2**).

Table 2. Clinical symptoms, position of uterus, cesarean niche detection and shape of CS scar niche of studied patients

Variables		**N = 30**
Asymptomatic		12 (40%)
Blood loss(ml)	**>80 ml**	14 (46.67%)
	30–80 ml	16 (53.33%)
Prolonged menstruation (days)	**≤ 6 days**	23 (76.67%)
	>6 days	7 (23.33%)
Dysmenorrhea		20 (66.67%)
Chronic pelvic pain		11 (36.67%)
Dyspareunia		8 (26.67%)
Secondary infertility		6 (20%)
Position of uterus	**AVF**	19 (63.33%)
	RVF	11 (36.67%)
Detected cesarean niche by TVS and MRI		10 (33.33%)
Shape of CS scar niche	**Oval**	3 (30%)
	Rectangular	3 (30%)
	Triangular	4 (40%)

Data are presented as frequency (%). AVF: Anteverted and Anteflexed Uterus, RVF: Retroverted and Retroflexed Uterus, TVS: transvaginal sonography, MRI: Magnetic resonance imaging.

Cesarean niche detected measurement were significantly increase with MRI when compared with TVS ($P<0.05$). (**Table.3**).

Table 3. TVS and MRI evaluation of caesarean niche

Variables	N = 10		P
	TVS	MRI	
Depth of cesarean niche (mm)	6.49 ± 0.37	7.31 ± 0.58	0.00442
Width of cesarean niche (mm)	16.59 ± 0.57	17.38 ± 0.39	0.0056
Length of cesarean niche (mm)	7.36 ± 0.71	8.35 ± 0.74	0.01373
Volume of cesarean niche (cm^3)	0.57 ± 0.12	0.71 ± 0.06	0.00923
AMT of cesarean niche (mm)	12.3 ± 0.94	13.37 ± 0.63	0.0152
RMT of cesarean niche (mm)	2.92 ± 1.1	3.69 ± 1.21	0.00082
RMT/AMT ratio (%)	51.2 ± 6.58	55.6 ± 5.56	0.14073

Data are presented as mean ± SD or frequency (%), *significant p value <0.05, TVS: transvaginal sonography, MRI: Magnetic resonance imaging, AMT: adjacent myometrial thickness, RMT: residual myometrial thickness.

Regarding age, number of previous Cs, parity, breech, transverse presentation, single layer, use of locking sutures, chronic use of steroids during pregnancy, pre-eclampsia, and peri- or postpartum fever or infection, there was significantly increased in both groups (P<0.0001). Regarding maternal BMI, indication for last CS, double-layer suture, there was no significant difference between the two groups (**Table .4**).

Table 4. Demographic data of subjects, suturing technique used and medical conditions with and without detected CS Niche

Variables		Detected CS Niche (N = 10)	No Detected CS Niche (N = 20)	P
Age		41.2 ± 1.75	31.55 ± 5.2	**<0.0001***
1		0(0.0%)	5 (25%)	0.08867
2		0(0.0%)	11 (55%)	0.00216*
3		3 (30%)	4 (20%)	0.55763
≥4		7 (70%)	0(0.0%)	**<0.0001***
Number of previous CS	**1**	0(0.0%)	15 (75%)	**0.00001***
	2	0(0.0%)	5 (25%)	0.08867
	≥3	0(0.0%)	0(0.0%)	**<0.0001***
Indication for last CS	**Breech presentation**	3 (30%)	0(0.0%)	**0.00855***
	Transverse presentation	3 (30%)	0(0.0%)	**0.00855***
	Cephalopelvic disproportion	0(0.0%)	6 (30%)	0.05529
	Delayed second stage of labor	0(0.0%)	4 (20%)	0.13785
	failure of cervical dilatation, fetal distress	0(0.0%)	2 (10%)	0.31723
	Maternal condition (Including placental problems)	0(0.0%)	3 (15%)	0.20988
	Multiple CS	4 (40%)	5 (25%)	0.398
Type of CS	**Elective**	3 (30%)	20 (100%)	**<0.0001***
	Emergency	7 (70%)	0(0.0%)	
Suturing technique	**Double layer**	4 (40%)	6 (30%)	0.59905
	Single layer	6 (60%)	3 (15%)	**0.01***

used	**Use of locking sutures**	0(0.0%)	11 (55%)	**0.00216***
Medical conditions	**DM**	4 (40%)	4 (20%)	0.25797
	Chronic use of steroids during pregnancy	4 (40%)	0(0.0%)	**0.00147***
	Pre-eclampsia	7 (70%)	0(0.0%)	**<0.0001***
	Peri- or postpartum fever or infection	7 (70%)	4 (20%)	**0.00609***

Data are presented as mean ± SD or frequency (%). *Significant p value <0.05, CS: cesarean section, DM: Diabetes mellitus, BMI: body mass index.

Regarding clinical symptoms and RVF, there were all significantly increased in cases with detected CS Neach. AVF was significantly reported in cases with no detected CS Neach. (**Table.5**).

Table 5. Clinical symptoms and uterus position of included subjects with and without detected CS Niche

Variables		**Detected CS Neach (N = 10)**	**No Detected CS Neach (N = 20)**	**P**
Menstrual duration\days		6.8 ± 1.23	4.3 ± 0.8	**<0.0001***
Menstrual cycle\days		29.3 ± 2.06	33.55 ± 2.54	**0.00009***
Asymptomatic		6 (60%)	6 (30%)	0.12184
Blood loss (ml)	**>80 ml**	10 (100%)	4 (20%)	**<0.0001***
	30–80 ml	0(0.0%)	16 (80%)	**<0.0001***
Prolonged menstruation (days)	**≤ 6 days**	3 (30%)	20 (100%)	**<0.0001***
	>6 days	7 (70%)	0(0.0%)	**<0.0001***
Postmenstrual spotting	**Dysmenorrhea**	10 (100%)	10 (50%)	**0.0049***
	Chronic pelvic pain	7 (70%)	4 (20%)	**0.00609***
	Dyspareunia	4 (40%)	4 (20%)	0.25797
	Secondary infertility	3 (30%)	3 (15%)	0.35005
Uterus position	**AVF**	3 (30%)	16 (80%)	**0.00609***
	RVF	7 (70%)	4 (20%)	

Data are presented as mean ± SD or frequency (%). CS: cesarean section, AVF: Anteverted and Anteflexed Uterus, RVF: Retroverted and Retroflexed Uterus.

The cutoff value of 3.9 mm, the RMT by TVS variable had a sensitivity of 87.8%, a specificity of 71.3% and AUC 0.771 for predicting niche and indicated that at the cutoff value of 4.15 mm, the RMT by MRI variable had a sensitivity of 88.3%, a specificity of 70.6% and AUC 0.781 for predicting niche. (**Fig.1**)

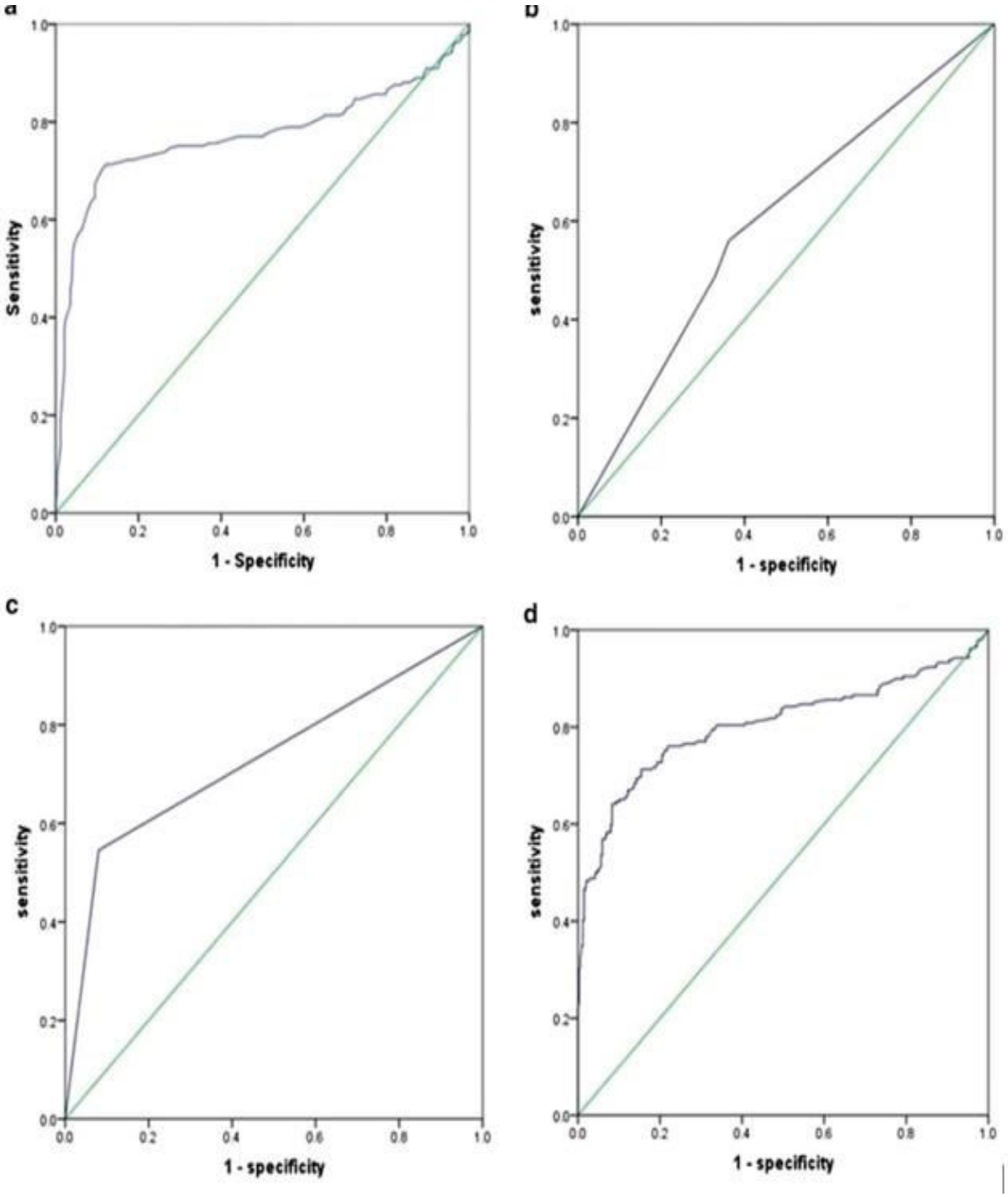
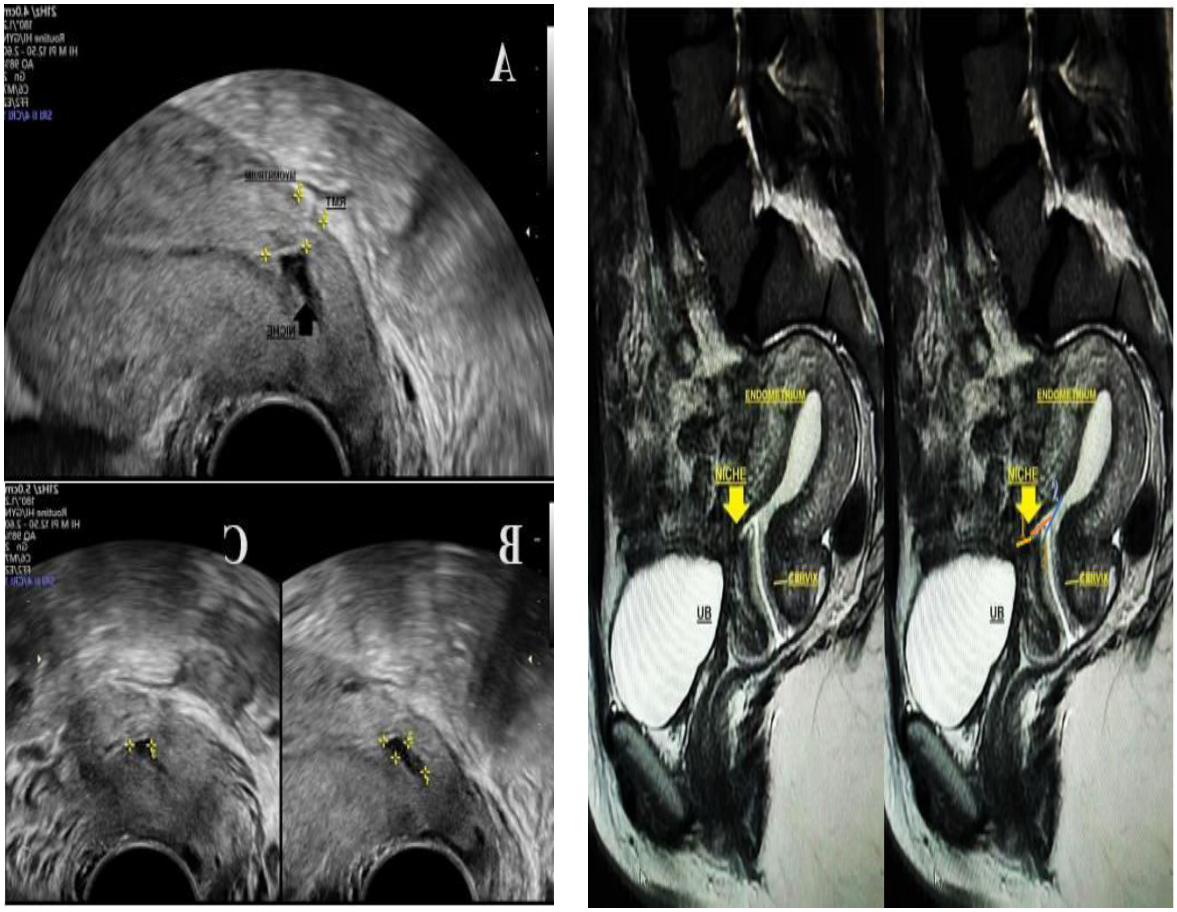


Fig. 1. ROC curve of residual myometrial thickness thickness by TVS; b ROC curve of uterine position; c ROC curve of symptoms; d ROC curve of RMT thickness by MRI

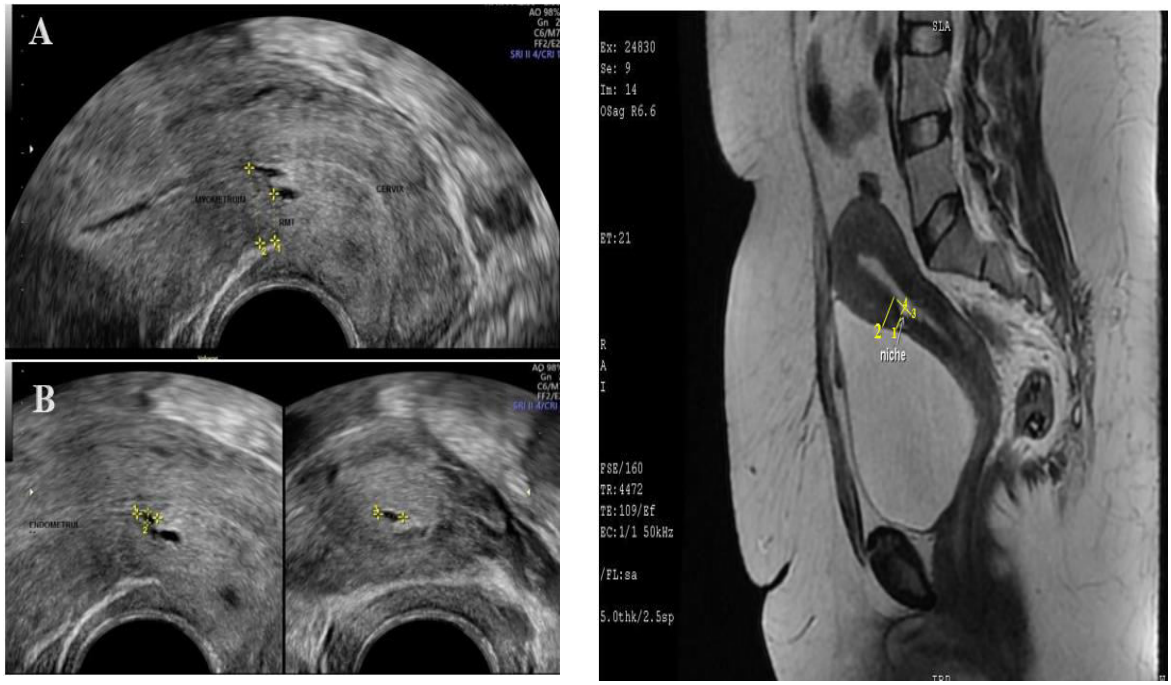
Case 1: A 35-year-old women with CS from six month ago, presented with inter mensterual bleeding and left sided pelvic pain. Abnormal bleeding started three months after CS. (**Fig. 2**).



(A) **(B)**

Fig. 2. (A) TVUS show TVUS of RVF uterus with myometrium defect at the site of previous cesarean delivery with residual myometrium thickness a)1. residual myometrial thickness 3.2mm, 2. AMT 10.9mm, b)1. Width 16.3mm, 2. Depth 6.9mm, c)3. Length 6.5mm, (B) MRI revealed midsagittal T2 WI of pelvic MRI revealed RVF uterus with rectangular shaped myometrium defect directed anteriorly 1.RMT 3.7mm, 2.width 17.3mm, 3.depth 8mm

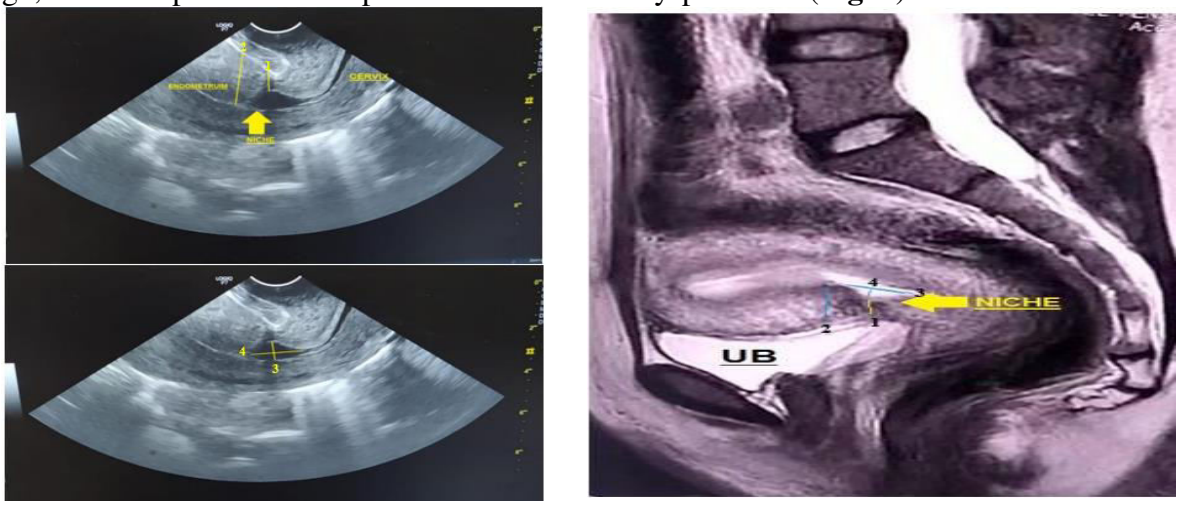
Case 2: A 38-year-old woman who had been actively trying to conceive for 18 months and had been diagnosed with asymptomatic CS scar defect by TVUS and pelvic MRI. (**Fig. 3**).



(A) **(B)**

Fig.3. (A) TVUS show TVUS with anechoic cystic area at the anterior uterine wall at the isthmus. Niche is detected A) 1. residual myometrial thickness: 6.8mm, 2.AMT:11mm B) 1. Length: 3.5mm, 2. Depth: 1.8mm, 3. Width: 4.2mm, (B) MRI revealed midsagittal T2 WI with myometrium defect at the site of previous scar Niche is detected 1. RMT: 7.5mm , 2.AMT:12mm, 3.Length: 4.2mm 4.Depth: 2.3mm

Case 3: A 39-year-old patient with a history of 2 previous CS, last one 4 years ago, she complained from postmenstrual spotting, the duration of the period increased from 4 to 11 days and dyspareunia. (**Fig. 4**).



(A) **(B)**

Fig. 4.(A) TVUS show TVUS revealed anechoic area at the isthmus at the site of previous scar, 1. residual myometrial thickness: 3.1mm, 2.AMT:13.mm, 3.Depth: 5.8mm, 4.Length: 6.5mm ,(B) MRI pelvis of sagittal T2 WI with triangular area of myometrium defect directed anteriorly to urinary bladder ,Niche is detected, 1.RMT:4.2m, 2.AMT:14mm, 3.Length:7.5mm, 4.Depth: 6.5mm

Discussion

Over the last several decades, there has been a significant surge in the CS rate. Approximately one-third of women worldwide have had a CS, according to estimates **(Hamilton et al., 2016)**. The total computer science (CS) rate in China had a growth from 28.8% in 2008 to 34.9% in 2014 **(Li et al., 2017)**.

A caesarean scar defect (CSD), also known as a 'niche', 'isthmocele', 'diverticulum', or 'caesarean scar dehiscence', refers to a defect in the anterior uterine isthmus that occurs at the site of a previous caesarean section (CS). This defect is becoming more common owing to the rising number of caesarean sections**(Gubbini et al., 2008)** .

Regarding indication for last CS, Breech or transverse presentation was reported in 3 (10%) cases, cephalopelvic disproportion was reported in 6 (20%) cases, delayed second stage of labor was reported in 4 (13.33%) cases, failure of cervical dilatation, fetal distress was reported in 2 (6.67%) cases, maternal condition (including placental problems) was reported in 3 (10%) and Multiple CS was reported in 9 (30%) cases. Moreover, elective Cs was performed in 23 (76.67%) cases and emergency was reported in 7 (23.33%). Our results were in agreement with Gao et al. **(Gao et al., 2019)** found that one hundred and eighty-nine women with CSD and 378 women without CSD with a history of caesarean section age at last CS < 30 years its mean(years) 32.84 ±3.74, number of CSs (n1, %) 139 CSs (n,2 %) 47 (24.9) (n3, %) 3(1.6).

Regarding anesthesia in our study subjects, general anesthesia was in 8 (26.67%) cases and spinal anesthesia was in 22 (73.33%) cases. Our results agreement with Gao et al. **(Gao et al., 2019)** who used two types of anathesia in189 participant, 138 (73.0%) were regional and 51 (27.0%) were general in cesearan group.

Regarding Suturing technique used with included subjects, double-layer, single-layer and use of locking sutures were reported in our results 10 (33.33%), 9 (30%) and 11 (36.67%) cases respectively. Our results agreement with Gao et al. **(Gao et al., 2019)** The cesarean group used two types of sutures: single layer, which accounted for 96 cases (50.8%), and double-layer, which accounted for 93 cases (49.2%). The formation of cesarean scar defect (CSD) may be influenced by several factors, such as the method of closing the uterine wall (single or multiple layers), the kind of suture technique (locked or unlocked), the presence or absence of decidua, and the choice of suture material. **(Tulandi and Cohen, 2016a)** discovered that using a single-layer closure technique decreased the likelihood of cesarean scar defect (CSD).

Regarding medical conditions in our study subjects, we found that DM, chronic use of steroids during pregnancy, pre-eclampsia, and peri- or postpartum fever or infection were reported in 8 (26.67%), 4 (13.33%), 7 (23.33%) and 11 (36.67%) respectively.

Our results showed that Cesarean niche was detected in 10 (33.33%) cases with both TVS and MRI. However, our results disagreed with Singh et al. **(Singh et al., 2013)** found that Scar dehiscence was seen in 90% of patients who had a sonographically determined scar thickness of 3 mm, whereas it was observed in only 13% of patients with a scar thickness less than 3 mm.

Regarding indication for last CS, there was no significant difference between the two groups except for breech or transverse presentation was significantly increased in cases with detected CS niche and multiple CS was significantly increased in cases with no detected CS niche. number of previous Cs and parity were significantly increased in cases with detected CS Niche. Our results were consistent with Vikhareva et al. **(Vikhareva Osser et al., 2009)** found The study found a significant difference in the number of CS among women who had

undergone one, two, and at least three CS, respectively (P<0.001). Scar deficiencies were seen in 61% (66/108), 81% (35/43), and 100% (11/11) of the women who had undergone one, two, and three or more CS, respectively. Our results showed that regarding shape of CS scar niche, oval, rectangular and triangular scar niche was detected in 3 (30%), 3 (30%) and 4 (40%). Our results agreed with Vikhareva et al. **(Vikhareva Osser et al., 2009)** The study revealed that the majority of the scars (103 out of 124, or 83%) were seen as triangular in form. However, a few were observed to be round (n = 3), oval (n = 5), or had complete flaws (n = 13; one lady had a complete defect in two scars). Regarding niche evaluation in this study, mean time from the last CS to TVS was 99.5 days with SD of 22.53. Mean time from the last CS to MRI was 110.77 with SD of 23.98. AVF uterus was reported in 19 (63.33%) cases and RVF uterus was reported in 11 (36.67%) cases. Cesarean niche detected measurement were significantly increase with MRI when compared with TVS (P<0.05). Our study was disagreement with Singh et al. **(Singh et al., 2013)** Based on the findings, it can be inferred that TVS is a more favorable modality compared to MRI due to its stronger correlation coefficient with the real scar thickness. Additionally, it is worth noting that MRI is a more expensive imaging technique. Furthermore, our findings align with those of **(Kushtagi and Garepalli, 2011)**, who observed a correlation between sonographic measures and physical measurements of the lower flap of the lower uterine segment (LUS) using Vernier callipers in women who had an elective CS. In current study, our results showed that mean menstrual duration of included subjects was 5.13± 1.53 days. Mean menstrual cycle was 32.13±3.12 days. Asymptomatic cases were 12(40%). Blood loss of more than 80 ml was in 14 (46.67%) cases. Prolonged menstruation of more than 6 days was reported in 7 (23.33%) cases. Dysmenorrhea, chronic pelvic pain, dyspareunia, and Secondary infertility were reported in 20 (66.67%), 11 (36.67%), 8 (26.67%) and 6 (20%) cases. This study proposed with Raimondo et al. **(Raimondo et al., 2015)** found that An isthmocele is related to atypical uterine hemorrhage and persistent suprapubic pelvic discomfort in women who have previously had a CS. Our results showed that AVF (80%) was significantly reported in cases with no detected CS niche and RVF (70%) was significantly reported in cases with detected CS niche. Our results agreement with **(Tang et al., 2019)** who evaluated uterine position; in 120 women affected by symptomatic isthmocele, 84 women (70%) had a retroflexed uterus.

Our results showed that clinical symptoms as menstrual duration, menstrual cycle, blood loss, dysmenorrhea, chronic pelvic pain, secondary infertility and dyspareunia were all significantly increased in cases with detected CS Niche. Our results agreement with Tulandi and Cohen **(Tulandi and Cohen, 2016b)** disagreed there was no significant difference in the incidence of dyspareunia and menstrual volume.

In current study, our results found that Age was significantly increased in cases with detected CS Niche (P<0.0001). There was no significant difference between the two groups regarding Maternal BMI. Number of Previous Cs and parity were significantly increased in cases with detected CS Niche.

Regarding indication for last CS, there was no significant difference between the two groups except for breech or transverse presentation was significantly increased in cases with detected CS niche and multiple CS was significantly increased in cases with no detected CS Niche.

All cases with no detected CS niche underwent elective CS when 30% of cases with detected CS niche underwent elective CS ad rest 70% cases underwent emergency CS. Our result disagreement with Antila-Långsjö **(Antila-Långsjö et al., 2018)** reported that there was non-

significant difference regarding age in cases with detected CS Niche (P<0.0001). There was no significant difference in the presence of isthmocele between the groups of elective and emergency CD (p=0.898).

The limitations of our research were the limited sample size and the fact that it was conducted at a single center. Therefore, we strongly advise the implementation of standardized diagnostic and treatment methods in response to the growing prevalence of large uterine niches, which carry a significant risk of severe health complications. It is advised to do more multicentre studies to compare and validate the effectiveness of alternative diagnostic modalities, such as Ultrasound. It is important to evaluate the scar in women experiencing secondary infertility and during the pre-ICSI assessment if they have a prior cesarean scar. We recommend that gynecologists consider the possibility of a niche when evaluating individuals who have postmenstrual spotting and have a history of CS. Subsequent investigations should enhance our understanding of the causation of a certain ecological habitat.

Conclusions

MRI shows promise in evaluating the thickness of uterine scars by reducing the reliance on the operator, which is a limitation of TVUS, and providing more precise measurements compared to TVUS.

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References

- **Antila-Långsjö RM, Mäenpää JU, Huhtala HS, Tomás EI, Staff SM. (2018)**. Cesarean scar defect: a prospective study on risk factors. American Journal of Obstetrics & Gynecology, 219(5): 80-92.
- **Betrán AP, Ye J, Moller AB, Zhang J, Gülmezoglu AM, Torloni MR. (2016)**. The Increasing Trend in Caesarean Section Rates: Global, Regional and National Estimates: 1990-2014. PLoS One, 11(2): e0148343.
- **Bij de Vaate AJ, van der Voet LF, Naji O, Witmer M, Veersema S, Brölmann HA, et al. (2014)**. Prevalence, potential risk factors for development and symptoms related to the presence of uterine niches following Cesarean section: systematic review. Ultrasound in Obstetrics & Gynecology, 43(4): 372-382.
- **Brook AJ, Clarke F, Bhatia K. (2020)**. Gynaecological morbidity associated with caesarean niche: increasing awareness, prevention and management. The Obstetrician & Gynaecologist, 22122 - 130.
- **Gao S, Tang G, Hua D, Xiong R, Han J, Jiang S, et al. (2019)**. Stimuli-responsive bio-based polymeric systems and their applications. Journal of Materials Chemistry B, 7(5): 709-729.
- **Gubbini G, Casadio P, Marra E. (2008)**. Resectoscopic correction of the “isthmocele” in women with postmenstrual abnormal uterine bleeding and secondary infertility. Journal of Minimally Invasive Gynecology, 15(2): 172-175.
- **Hamilton BE, Martin JA, Osterman MJ. (2016)**. Births: Preliminary Data for 2015. National Vital Statistics Reports, 65(3): 1-15.
- **Hellerstein S, Feldman S, Duan T. (2015)**. China's 50% caesarean delivery rate: is it too high? an international journal of obstetrics and gynaecology, 122(2): 160-164.
- **Jordans IPM, de Leeuw RA, Stegwee SI, Amso NN, Barri-Soldevila PN, van den Bosch T, et al. (2019)**. Sonographic examination of uterine niche in non-pregnant women: a modified Delphi procedure. Ultrasound in Obstetrics & Gynecology, 53(1): 107-115.
- **Kushtagi P, Garepalli S. (2011)**. Sonographic assessment of lower uterine segment at term in women with previous cesarean delivery. Archives

of Gynecology and Obstetrics, 283(3): 455-459.

- **Li HT, Luo S, Trasande L, Hellerstein S, Kang C, Li JX, et al. (2017)**. Geographic Variations and Temporal Trends in Cesarean Delivery Rates in China, 2008-2014. Jama, 317(1): 69-76.
- **Monteagudo A, Carreno C, Timor-Tritsch IE. (2001)**. Saline infusion sonohysterography in nonpregnant women with previous cesarean delivery: the "niche" in the scar. Journal of Ultrasound in Medicine, 20(10): 1105-1115.
- **Raimondo G, Grifone G, Raimondo D, Seracchioli R, Scambia G, Masciullo V. (2015)**. Hysteroscopic treatment of symptomatic cesarean-induced isthmocele: a prospective study. Journal of Minimally Invasive Gynecology, 22(2): 297-301.
- **Singh N, Tripathi R, Mala Y, Dixit R, Tyagi S, Batra A. (2013)**. Comparison of scar thickness measurements using trans-vaginal sonography and MRI in cases of pregnancy with previous caesarean section. Do they correlate with actual scar thickness? Obstetrics & Gynecology, 33(8): 810-813.
- **Sipahi S, Sasaki K, Miller CE. (2017)**. The minimally invasive approach to the symptomatic isthmocele - what does the literature say? A step-by-step primer on laparoscopic isthmocele - excision and repair. Current Opinion in Obstetrics and Gynecology, 29(4): 257-265.
- **Tang X, Wang J, Du Y, Xie M, Zhang H, Xu H, et al. (2019)**. Caesarean scar defect: Risk factors and comparison of evaluation efficacy between transvaginal sonography and magnetic resonance imaging. European Journal of Obstetrics & Gynecology and Reproductive Biology, 2421-6.
- **Tulandi T, Cohen A. (2016a)**. Emerging Manifestations of Cesarean Scar Defect in Reproductive-aged Women. Journal of Minimally Invasive Gynecology, 23(6): 893-902.
- **Tulandi T, Cohen A. (2016b)**. Emerging manifestations of cesarean scar defect in reproductive-aged women. J Minim Invasive Gynecol, 23(6): 893-902.
- **Vikhareva Osser O, Jokubkiene L, Valentin L. (2009)**. High prevalence of defects in Cesarean section scars at transvaginal ultrasound examination. Ultrasound in Obstetrics & Gynecology, 34(1): 90-97.