Research Article

2D saline sonohysterography versus 3D saline sonohysterography versus hysteroscopy in detecting the cesarean scar niche in women with previous cesarean section or more: A Prospective study at Minia Maternity and Children University Hospital

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Abstract

Background: Worldwide caesarean section rates have risen from around 7% in 1990 to 21% today, and are projected to continue increasing over this current decade. If this trend continues, by 2030 the highest rates are likely to be in Eastern Asia (63%), Latin America and the Caribbean (54%), Western Asia (50%), Northern Africa (48%) Southern Europe (47%) and Australia and New Zealand (45%), the research suggests. **Methods:** This prospective observational study was conducted on women with previous cesarean section or more at the department of Obstetrics and Gynecology at Minia Maternity and Children University Hospital through the period from March 2021 to March 2023.patient should be 18 to 40 years old aged non-pregnant females who had previous cesarean section or more with abnormal uterine bleeding, offensive vaginal discharge, pelvic pain and secondary infertility Patients were assessed post menstrual. All suspected women with scar niche are subjected first to Transvaginal ultrasonography 2D to detect if niche present or not but 25 cases are excluded because they haven't enough data about previous caesarean section then Transvaginal ultrasonography 2D saline sonohysterography then Transvaginal ultrasonography 3D saline sonohysterography followed by hysteroscopy as gold standard for detection scar niche in another appointment. **Results:** 2DSHG has 91.7% sensitivity and 94.4% specificity with 92.7% accuracy for detection of niche while 3DSHG has 98.9% sensitivity and 98.1% specificity with 98.7% accuracy for detection of niche.

Keywords: Transvaginal, caesarean, ultrasonography 3D saline sonohysterography

Introduction

A uterine diverticulum, pouch, sacculation, isthmocele, cesarean scar defect, or cesarean scar dehiscence is another name for a niche. According to Gubbini et al., (2008) [12], this condition was initially identified and is characterized by a pouch-like abnormality of the anterior uterine isthmus at the site of a previous cesarean section.

Any dimpling of the uterus that is 2 mm or larger at the location of the cesarean scar and can be seen by ultrasonography is considered a niche [13].

According to Gubbini et al., (2008)[13], gyneco-logic symptoms such as infertility, pelvic pain, abnormal uterine bleeding (AUB) caused by retained menstrual blood passing intermittently through the cesarean scar defect (CSD), and caesarean-induced isthmocele might develop. and[14] Stewart et al., 1975 [15] was the first publication to record a scar defect; they suggested that pelvic arteriography or preoperative historiography could aid in identification and that removing the lower segment scar could preserve the uterus.

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It is possible that the 19% to 84% global prevalence of post-cesarean scar niche, as a percentage of all cesarean sections, is under appreciated due to asymptomatic patients and a lack of clinical knowledge[7]. Compared to transvaginal ultrasonography, sonohysterography (SHG) detected isthmoceles in a greater percentage of patients (56%–78%)[17].

Globally, caesarean sections are becoming more common, which increases the risk of a number of obstetric problems, including placenta accreta, scar dehiscence, uterine rupture (particularly during the first post-caesarean section trial), and ectopic scar pregnancy as a result of improper healing.
According to a 2017 report by Robson et al.,, the World Health Organization expressed concern over the high number of caesarean sections and suggested limiting surgical intervention to no more than 15% of cases.

Regardless, among developed countries, the rate of caesarean sections increased by 50% between 1996 and 2007, with Brazil and other countries reporting rates as high as 45% [18].
The most current Egypt Demographic and Health Survey (EDHS) recorded a cesarean delivery rate of 52%, indicating that the practice may be overused or utilized for unsuitable purposes, given the dramatic increase in the prevalence of CS over the past decade. [19] published

While over 26% of babies are born this way in the UK, in other countries it's much higher: when focusing solely on institutional births in Egypt, the proportion rises to 63% and in the Dominican Republic, over 58% [20].

Many women who have uterine niche may not experience any symptoms at all, and it may take multiple visits to the doctor before the correct diagnosis is made.
Because the niche stores blood during menstruation, the most common complaint is irregular menstruation that lasts anywhere from two days to twelve days [21].

Several sources have pointed to sperm motility and implantation issues in the uterine niche as reasons for infertility. Many gynecologic conditions can produce generalized pain and dysmenorrhea [22].
Contractions induced by the uterus's continual efforts to empty the contents of the isthmocele may be associated with the uterine niche and pain, but the exact nature of this interaction is unclear. According to Wang et al.,, there is a strong correlation between dysmenorrhea, the size of the defect, and the frequency of irregular bleeding in infertile cases.[23]

Impaired fertility may result from isthmocele blood's potential effects on cervical mucus and sperm quality, obstruction of sperm transit, and difficulty implanting embryos. Isthmocele repair is associated with high rates of restoring fertility, according to multiple studies that investigated the reproductive results after therapy. [23]

Aim of the study

To evaluate the prevalence of post-caesarean scar niche and to compare the accuracy of two dimensional saline Sono hysterography (2D SHG) versus three dimensional saline Sono hysterography (3D SHG) in evaluating the uterine scar depth (D), base width (BW) and the residual myometrial thickness (RMT) in women complaining of abnormal uterine bleeding, offensive, vaginal discharge, pelvic pain & secondary infertilitywith previous one caesarean section or more in comparison with hysteroscopy which is the gold standard in diagnosis post-caesarean scar niche .

Patients and Methods

This prospective observational study was conducted on women with previous cesarean section or more at the department of Obstetrics and Gynecology at Minia Maternity and Children University Hospital through the period from March 2021 to March 2023.

Inclusion Criteria:
- 18 to 40 years old aged non-pregnant females who had previous cesarean section or more with abnormal uterine bleeding, offensive vaginal discharge, pelvic pain and secondary infertility
- Patients were assessed post menstrual.

Exclusion Criteria:
- Women with no previous sections
- Patients with any focal lesion and any cervical pathology as tumors such as

fibroids, adenomyosis, or endometrial hyperplasia
- Patients who had associated pathology in their ovaries
- Postmenopausal women
- Known anomaly of uterus
- History of previous myomectomy.

Methods

Patients were subjected to:

Complete history taking:
- Personal history including: Name, Age, marital state, address
- Menstrual history: including age of Menarche, menstrual disturbance, dysmenorrhea, related symptoms.
- History Parity
- History of infertility
- Present history: of chronic diseases and medication.
- Past history of HTN, DM.
- Family history of similar condition or diabetes.
- History of allergy to any medication.

- Gestational age of fetus at time of labor
- Birth weight
- Patient was in labour or not
- Augmentation of labour with oxytocin
- History of medical of disorders as:

✓ Diabetes Mellitus
✓ Pregnancy induced hypertension/ pre eclampsia
- History of postpartum hemorrhage
- History of sepsis, endometritis & wound infection
- History of any previous operations especially abdominal ones
- Any detailed history about cesarean section in the form of (type Of cesarean section, time consumed during cesarean section, its indication, clorure of myometrium single layer or double layer, any complication during cesarean section as angle extension or bladder injury and postpartum complication as hemorrhage or sepsis)

Examination:
  A. General examination:
🞧 Vital signs (Blood pressure, Temperature, Heart rate, Respiratory rate)
🞧 level of consciousness and O2 saturation
🞧 Signs of (Pallor, Cyanosis, Jaundice, and Lymph node enlargement).

Results
🞧 Results of the current study were expressed on the following tables and figures

Table (1): Sociodemographic data distribution of the studied population

	(N = 150)	
Age groups	N	%
< 20 years	9	6%
20-29 years	70	46.7%
30-39 years	71	47.3%
	Mean	SD
Age (years)	28.49	4.41
Weight	75.68	13.96
Height	167.49	7.21
BMI	26.57	3.74

The age of the studied population ranged between 19-37years with mean value of 28.49 years; most of them were in age group 30-39 years (47.3%) followed by 46.7% in age group 20-29 years and 6% in age group <20 years. Their mean weight value was 75.68 ±13.96 kg, their mean height value was 167.49 ±7.21 cm and Their mean BMI value was 26.57 ±3.74.
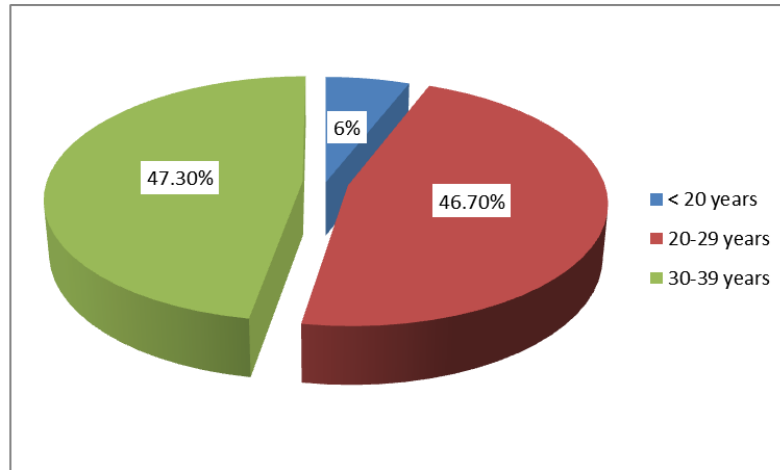
Figure (1): Age of the studied subjects

Table (2): Menstrual history of the subjects in the study

Items	Study cases n= 150	
	Number	Percent (%)
Regularity		
Regular	92	61.5
Irregular	58	38.5
Frequency (Every certain days)		
Mean ± SD	24.78 ± 3.36	
Median (Range)	24 (14- 30)	
Duration of menstruation (Days)		
Mean ± SD	4.98 ± 1.81	
Median (Range)	5 (3- 11)	
Post menstrual spotting		
No	104	69.3
Yes	46	30.6
Duration (Days)		
Mean ± SD	4.78 ± 2.49	
Median (Range)	5 (2- 15)	

✚ Regarding menstrual history of the included cases, regular menses were reported by 61.5%, while the remaining ladies had irregular menses (38.5%). Menses was reported to occur every 24.78 days (range, 14 – 30). The duration of menstruation ranged between three and eleven days (mean = 4.98 days). Post-menstrual spotting was reported by 30.6% of ladies. The duration of spotting ranged between two and 15 days (mean = five days)

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Table (3): Symptoms (Mode of presentation) of the subjects in the study

Items	Study cases n=150	
Symptoms	Number	Percent (%)
Pelvic pain		
No	111	74
Yes	39	26
Pain during micturition		
No	113	75.4
Yes	37	24.6
Infection (offensive vaginal discharge)		
No	70	46.6
Yes	80	53.3
Subfertility		
No	117	78
Yes	33	22
Pain during intercourse		
No	121	80.6
Yes	29	19.4
Abnormal uterine bleeding		
No	60	40
Yes	90	60

✚ Regarding the presentation of the included cases, painful intercourse was reported by19,4% of patients, while painful micturition was experienced by 24.6% of them. In addition, Infection was present in 53.3% of patients whereas 22% of them had subfertility and pelvic pain reported in 26% of patients while abnormal uterine bleeding presented in 60% of patients.

Table (4): Medical history of the studied population

		(N = 150)	
		Number	Precent %
Previous abortion		32	21.3%
previous vaginal delivery	**Primipara**	49	32.7%
	Multipara	101	67.3%
Parity	**P1**	49	32.7%
	P2	46	30.7%
	P3	50	33.3%
	P4 or more	5	3.3%
Type of CS	**Elective**	57	38%
	Urgent	93	62%
Women received induction		16	10.7%
Women received augmentation		8	5.3%
PROM prior to CS		45	30%
Post-operative Fever		31	20.7%
		Mean	SD
GA (weeks)		36.77	1.41
Birth weight (gm)		3233.98	252.13
Cervix dilatation during labor		2.17	1.21

✚ Elective CS was planned in (62%) of women before onset of labor pain .While, (38 %) of women had an urgent CS, of them 12.7 % received induction and 10.7% received augmentation which led to cervical dilatation of 0-6 cm at CS with mean value of 2.17 cm and others suffered from fetal/maternal distress. About one third had PROM and 20.7% developed postoperative fever..
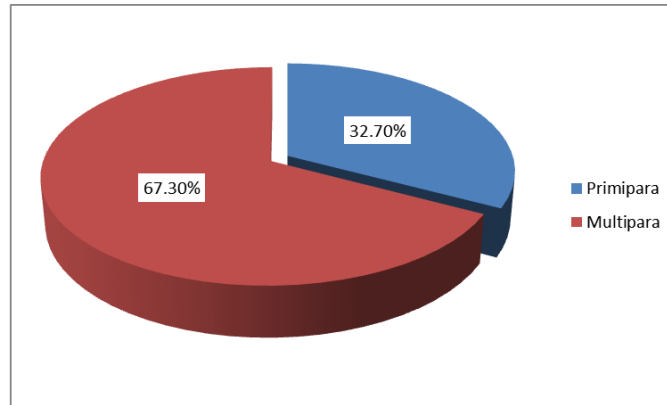
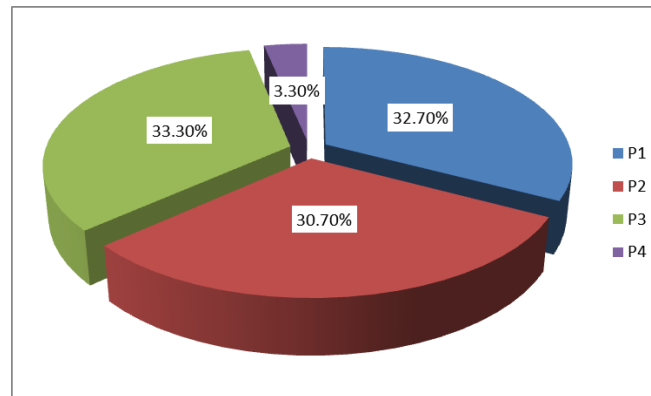**Figure (2): Previous vaginal delivery in the studied subjects**

Figure (3): parity in the studied subjects

Table(5): Hysteroscopy findings of the studied cases

		Number	Percent
Scar site	Above internal os	62	41.3
	Below internal os	88	58.6
Scar ballooning	Yes	96	64
	No	54	36
Scar continuity	Yes	54	36
	No	96	64
Scar vascularity	Yes	60	40
	No	90	60
Presence of intrauterine adhesions related to the scar	No	117	78
	Yes(thin adhesions)	27	18
	Yes (thick adhesions)	6	4
Presence of endometriotic nodule at site of scar	Yes	2	1.3
	No	148	98.6

Table (6): scar characteristic of the studied population as detected by hysteroscopy (gold slandered) vs 3DSHG vs 2DSHG

Scar defect (niche) (N=150)	Hysteroscopy		3DSHG		2DSHG	
	Number	Precent %	Number	precent	Number	Precent
No niche	54	36%	55	36.6	62	41.3
Has niche	96	64%	95	63.3	88	58.6

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Discussion

The percentage of births that require a caesarean section (25 percent in Europe at present) has increased from 6.7% to 19.1% globally in the last several decades [1].

Recent data from the Egypt Demographic and Health Survey (EDHS) shows that 52% of births in Egypt occur via cesarean section, which suggests that this method of childbirth may be used too frequently or for inappropriate reasons[2;3].

A variety of terminology are used to characterize the anomaly that is discovered by ultrasonography after a cesarean section, including scar defect, niche, isthmocele, uterine pouch, and diverticula. Abnormal uterine bleeding (AUB) is one of several symptoms associated with niches. In 30% of women with niches, this manifests as prolonged menstruation and postmenstrual spotting [4].

Possible causes of infertility after caesarean section have been suggested in the literature, including uterine illness, intra-abdominal adhesions, and women's reproductive choices. Although some niches do cause symptoms, there is a lack of direct evidence linking subfertility to niches in uterine scars, hence further study is needed to establish this link [5].

Ultrasound allows for a non-invasive examination of the uterus and any potential scars. The use of ultrasonography (US) to evaluate uterine scars during pregnancy is extensive, but its utility in evaluating uterine scars when the patient is not pregnant is restricted. Anechoic contrast media is infused into the uterine cavity during a saline infusion sonohysterography (SIS) examination to enhance the transvaginal ultrasound (7US) of the uterus. As a result, SIS brings together the benefits of both US and hysterosalpingography [6] & [16].

Recent advances in SIS have made it easier to evaluate the uterine cavity, including measuring the remaining myometrium thickness, the myometrium surrounding the scar, the depth of the filling defect in the scar (niche), and intrauterine adhesions connected to the scar [8].

Owing to its safety and minimally invasive nature, office hysteroscopy (OH) is considered the "gold standard" for diagnosing intrauterine abnormalities. It has also been shown to be an effective tool for directly observing uterine scars and intrauterine adhesions [9].

One method that has helped increase the use of office hysteroscopy and all its benefits is the vaginal speculum approach. This method has reduced patient pain and operator experience because it eliminates the need for a vaginal speculum or cervical instrumentation to grasp and steady the cervix [10]; [11].

Thus, the purpose of this study was to determine how common post-cesarean scar niches are and to compare the accuracy of two-dimensional saline sonohysterography (2D SHG) and three-dimensional saline sonohysterography (3D SHG) in assessing the depth of the uterine scar (D), the width of the base (BW), and the residual myometrial thickness (RMT) in women who have experienced secondary infertility and have had one or more cesarean sections. Additionally, we want to assess hysteroscopy's function in the post-cesarean scar niche diagnostic process.

From March 2021 through March 2023, researchers from Minia Maternity and Children University Hospital's Department of Obstetrics and Gynecology carried out a prospective observational study.

Women who had two or more caesarean sections in the past and were experiencing infertile symptoms were included in the study.

The age of the participants in the study varied from 19 to 37 years, with an average of 28.49 years. The largest age group was those between 30 and 39 years (47.3%), followed by those between 20 and 29 years (46.7%), and those younger than 20 years (6.6%). Their average body mass index (BMI) was 26.57 ±3.74, their average height was 167.49±7.21 cm, and their average weight was 75.68 ±13.96 kg. Before the start of labor pains, 62% of women planned to have an elective cesarean section. An urgent cesarean section was necessary for 38% of the women, with 12.7% undergoing induction and

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10.7% undergoing augmentation; this resulted in a cervical dilatation of 0-6 cm at the cesarean section, with a mean value of 2.17 cm, and other women experienced difficulty during pregnancy or during giving birth. Fever developed after surgery in 20.7% of patients, and approximately one-third suffered postoperative nausea and vomiting (PROM).

Conclusion

- It is concerning that the number of cesarean sections performed around the world is on the rise, which is leading to an increase in isthmocele and the gyneco-logical and obstetric difficulties it causes. Isthmocele should be considered as a possible diagnosis in women who have had previous cesarean sections, particularly in those who have risk factors for having numerous cesarean sections in the past and who also experience postmenstrual spotting, pelvic pain, and secondary infertility.

- The specificity and sensitivity of TVUS, and SIS in particular, for diagnosing isthmocele are high, and they are cost-effective.

- Regarding our results, 2DUS has 91.7% sensitivity and 94.4% specificity with 92.7% accuracy for detection of niche while 3D US has 98.9% sensitivity and 98.1% specificity with 98.7% accuracy for detection of niche.

- While hysteroscopy is still the gold standard for diagnosing various intra-uterine lesions, sonohysterography is a less invasive, less expensive alternative that may be done in a gynecologist's office without specialized training and with less side effects.

- Furthermore, we recommended further studies with larger scales for conforming our results.

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