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The Prevalence of Cesarean Scar Niche and Its Relation to Certain Gynecological and Obstetrical Issues

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: A cesarean section (CS) is a life-saving surgical procedure when certain complications arise during pregnancy and labor. However, it is a major surgery and is associated with immediate maternal and perinatal risks and may have implications for future pregnancies as well as long-term effects that are still being investigated. This study aims at determining the prevalence of isthmocele (niche) among those who gave birth through Cesarean section, and figure out how many of the women diagnosed with scar niche are symptomatic.
Methods: This observational cross-sectional study involved 300 women who gave birth by CS at the latest 6 months and they were recruited from the outpatient clinics of obstetrics and gynecology department, Tanta university hospital.
Results: The prevalence of the niche was 21.7%. And the most common shapes of niche documented were the semicircular defects followed by the triangular defects. The majority of cases were symptomatic while only 7.7% were asymptomatic and discovered accidentally by routine ultrasound examination. The most common symptoms documented were abnormal uterine bleeding (AUB), chronic pelvic pain, dysmenorrhea, and secondary infertility. There was a positive

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significant relationship between the number of CS, the size of the niche, and the severity or frequency of the presenting symptom (P value < 0.01).
Conclusion: Cesarean scar niche has a strong statistically significant association with symptoms such as AUB (especially inter-menstrual bleeding), chronic pelvic pain, and dysmenorrhea. In our study, the prevalence of cesarean niche was 21.7% and the common niche shapes documented were the semicircular and triangular niches.

Keywords: Cesarean section; isthmocele; scar niche; abnormal uterine bleeding; hysteroscopy; laparoscopy; laparotomy.

1. INTRODUCTION

A cesarean section (CS) is a life-saving surgical procedure when certain complications arise during pregnancy and labor. Yet, it's a main surgery that's associated with immediate maternal and perinatal risks and may have implications for future pregnancies as well as long-term effects that are still being investigated [1, 2].

Cesarean section is associated with complications in subsequent pregnancies, such as cesarean scar ectopic with life-threatening bleeding [3], placenta previa [4], placenta accreta, increta or percreta [5], dehiscence or uterine rupture [6]. One of the common complications of cesarean section we face nowadays is cesarean scar niche or isthmocele.

The isthmocele is a myometrial defect resembling a pouch on the anterior wall of the uterine isthmus, over a previous cesarean scar [7]. This defect contributes to pathologic changes that may predispose the emergence of symptoms like menorrhagia [8], abnormal uterine bleeding (AUB) [9], pelvic pain, dysmenorrhea, cesarean scar pregnancy and secondary infertility [9, 10]. However; some women suffering from cesarean scar niche may be asymptomatic.

The exact cause of CS scar niche is unknown however many theories have arisen in order to explain how a niche develops; these theories can be categorized into factors related to surgical techniques which include: the Ischemic and mal-apposition hypothesis, the non-closure of deep myometrial muscles, and the cervical location of cesarean incision, as well as the non-closure of the peritoneum after CS [4]. While other factors are patient-related such as dense adhesions and genetic predisposition, obesity, pre-eclampsia, and hypertension which are said to cause impaired wound healing and thus niche production.

We aimed to calculate the incidence and prevalence of isthmocele (niche) among those who gave birth through Cesarean section. And the study sought to figure out how many of the women diagnosed with scar niche are symptomatic and how many aren't.

2. PATIENTS AND METHODS

This study design is an observational cross-sectional study, involving 300 women who gave birth by CS in duration of not less than 6 months between March 2020 and February 2021. They were recruited from the outpatient clinics of obstetrics and gynecology department, Tanta university hospital.

The exclusion criteria included women with multiple gestations, uterine pathologies and diseases such as fibroids, polyps, and adenomyosis, as well as subjects suffering uterine anomalies such as didelphus, arcuate, unicornuate, bicornuate, and septate uteri.

All included cases had been informed about the aim of our study. There were adequate provisions to maintain privacy of the participants, and confidentiality of the data; the patient's name was replaced by serial number, and their address was confidential. There were no conflicts of interest, we did not receive any fund from any institute, and neither did we give any compensation to the participants. We did not represent any risk to the environment.

Afterwards, all pregnant women included in the study were subjected to detailed and careful history taking including personal history, obstetric history, contraceptive history, as well as history of present illness. Moreover, clinical examination was also conducted in addition to laboratory investigations and a number of specific investigations performed using diagnostic ultrasound system (Mindray DC 30) with 3D trans-vaginal probe for detecting niche.

The sample size was calculated using Epi Info 7. Based on the documented prevalence of cesarean scar niche as 50% and 5% confidence limits, the minimum required sample size at 95% confidence level was calculated to be 278; thiswas rounded to 300 subjects.

2.1 Statistical Analysis of the Data

The collected data was coded, revised, cleaned, tabulated, and analyzed through SPSS version 26 software using appropriate statistics. The descriptive statistics including percentages (%), arithmetic mean (X) and standard deviation (SD) were calculated for various qualitative and quantitative data to describe the study population. The analytic statistical tests comprised Chi-square, Fisher's exact, and independent t-test and a *p* value ≤ 0.05 was considered statistically significant.

3. RESULTS

The prevalence of CS scar niche in our study was 21.7%. The most common shapes were the semicircular and the triangular shapes, and the majority of cases had small sized niche (Table 1).

Table 2 illustrates the increase in the number of CS was associated with a higher prevalence of niche occurrence with calculated P value of less than 0.01 by Fisher's exact test.

Table 1. Prevalence and characteristics of NICHE

		Total (n=300)	
		N	**%**
Prevalence		65	21.7
		Total (n=65)	
		N	**%**
Size	Small	40	61.5
	Large	18	27.7
	Total	7	10.8
Shape	Droplet shape	6	9.2
	Inclusion cyst	5	7.7
	Oval	3	4.6
	Rectangular	2	3.1
	Semicircular	29	44.6
	Triangular	20	30.8

Table 2. Demographic characteristics of participants

	NICHE				Test of significance (P-value)	Total (n= 300)	
	No (n= 235)		**Yes (n= 65)**			**N**	**%**
Age							
Min – Max	21 – 48		20 – 45		t-test = 0.84	20 – 48	
Mean ± SD	29.81 ± 5.92		30.51 ± 6.05		(p= 0.402)	29.42 ± 5.64	
Parity	**N**	**%**	**N**	**%**			
1	152	82.2	33	17.8	Fisher's Exact =	185	61.7
2	72	82.8	15	17.2	23.137	87	29.0
3	9	40.9	13	59.1	(P< 0.01)	22	7.3
4	2	33.3	4	66.7		6	2.0
BMI							
Min – Max	18.76 – 48.78		19.14 – 49.85		t-test = 0.588	18.76 – 49.85	
Mean ± SD	29.54 ± 5.24		29.11 ± 5.12		(p= 0.557)	29.27 ± 5.53	
Contraception method	**N**	**%**	**N**	**%**			
IUDs	149	63.4	38	58.5	X^2 = 0.54	187	62.3
Hormonal	77	32.8	24	36.9	(P= 0.764)	101	33.7
Barriers	9	3.8	3	4.6		12	4.0

Table 3. Symptoms of NICHE and its prevalence

	Total (n=65)	
	N	%
Asymptomatic	5	7.7
Symptomatic	60	92.3
• **AUB**	37	56.9
• **Secondary Infertility**	6	9.2
• **Chronic pelvic pain**	35	53.8
• **Dysmenorrhea**	22	33.8

Table 3 calculates the number of symptomatic and asymptomatic patients; as well as the prevalence of different symptoms associated with niche. Among the total number of 65 CS niche patients, only 5 (7.7%) were asymptomatic, and remaining were symptomatic. The prevalence of symptoms in decreasing order are: abnormal uterine bleeding (AUB), chronic pelvic pain, dysmenorrheal, and secondary infertility.

It was found that the increase in niche size was associated with an increase in the presence of symptoms such as AUB, chronic pelvic pain, and dysmenorrhea with P value of less than 0.01 (Table 4).

It's noted in Table 5 that the increase in the number of CS was associated with an increase in the size of the niche. As to say that cases which gave birth four times by means of CS would have higher prevalence of large or total defects in comparison with other cases which gave birth one time, two times or three times. By the same concept cases which gave one birth through CS would have higher prevalence of small defects when compared with cases which gave birth two times, three times, and four times.

Table 4. Relation between symptoms and size of NICHE

	NICHE size						Fisher's Exact
	Small (n= 40)		Large (n= 18)		Total (n= 7)		(P-value)
AUB	**N**	**%**	**N**	**%**	**N**	**%**	
No (n= 28)	27	67.5	0	0.0	1	14.3	28.716
Yes (n= 37)	13	32.5	18	100.0	6	85.7	(P< 0.01)
Secondary infertility	**N**	**%**	**N**	**%**	**N**	**%**	
No (n= 59)	37	92.5	16	88.9	6	85.7	1.042
Yes (n= 6)	3	7.5	2	11.1	1	14.3	(P= 0.806)
Chronic pelvic pain	**N**	**%**	**N**	**%**	**N**	**%**	
No (n= 30)	29	72.5	1	5.6	0	0.0	30.951
Yes (n= 35)	11	27.5	17	94.4	7	100.0	(P< 0.01)
Dysmenorrhea	**N**	**%**	**N**	**%**	**N**	**%**	
No (n= 43)	33	82.5	5	27.8	5	71.4	15.961
Yes (n= 22)	7	17.5	13	72.2	2	28.6	(P< 0.01)

Table 5. Relation between parity and size of NICHE

	NICHE size						Fisher's Exact
	Small (n= 40)		Large (n= 18)		Total (n= 7)		(P-value)
Parity	**N**	**%**	**N**	**%**	**N**	**%**	
1 (n= 33)	28	84.8	4	12.1	1	3.1	
2 (n= 15)	8	53.3	5	33.3	2	13.4	20.826
3 (n= 13)	4	30.8	6	46.1	3	23.1	(P< 0.01)
4 (n= 4)	0	0.0	3	75.0	1	25.0	

4. DISCUSSION

Bij de Vaate et al. [11] conducted a prospective cohort study in 2011on 225 cases. The prevalence of CS scar niche was 24% by TVUS in agreement with the prevalence in our study. In agreement with our study the common shapes described by Bij de Vaate were the semicircular (prevalence of 50.4%) and the triangular (prevalence of 31.6%).

Vikhareva Osser et al. [12] conducted a case control study in 2009. It involved 287 women. A sum of 162 of these women gave birth by the means of CS, and 125 gave birth vaginally. In contrary to our study the prevalence of CS scar niche was 69%. In contrary to our study, the most common niche shape was the triangular shaped niche with a prevalence of 83% followed by the oval shaped 4% and then the round shaped 2%.

Wang et al. [13] conducted a cross sectional study in 2009 which involved 207 cases in contrary to our study the prevalence was 7%. Offili Yebovi et al. [14] conducted a prospective study in 2008 that involved 324 cases and found the prevalence of niche to be 19%. Armstrong et al. [15] conducted a case control study in 2003 involving 32 women who gave birth by CS and found the prevalence to be 42%. Uppal et al. [16] conducted a prospective cohort study in 2011 which involved 71 cases and found the prevalence of niche to be 40%. Fabres et al. [17] conducted a retrospective cohort study in 2003 and found that all defects were triangular in shape with their bases pointing towards the anterior wall of the isthmus.

In agreement with our study, Vikhareva Osser [12] conducted a case control study in 2009 and found a positive relation between the number of CS and the occurrence of niche; however the prevalence value was different. Ofiili Yebovi et al. [14] conducted a prospective study in 2008 and found that the prevalence of total defects was 10%. A study by Bij de Vaate [11] in 2011 was in contrary to our study; it showed that the prevalence of AUB was 34%. However, in the study also showed the presence of a positive co-relation between size of the niche and frequency of AUB, in agreement to our study.

Wang et al. [13] conducted a cross sectional study in 2009 and in agreement with our study, they found a positive relationship between niche size and appearance of symptoms as AUB, chronic pelvic pain, and dysmenorrhea. However, the prevalence was different. Uppal et al. [16] conducted a prospective cohort study in 2011 and found that the mean diameter of the defect was 6.5mm. They also found a positive relation between the niche size and the frequency of AUB, in agreement with our study.

A study by Florio P et al. [7] in 2012 didn't mention the prevalence of secondary infertility but they found that fertility was restored in those women whose niches were treated. A retrospective cohort study conducted in 2003 by Fabres et al. [17] stated that the prevalence of AUB was 76%. Others as Tulandi and Cohen [18] found the prevalence of AUB to be 63.8% while Vandervaat et al. [19] found a positive relation between AUB frequency and niche size.

5. CONCLUSION

Cesarean scar niche has a strong statistically significant association with symptoms such as AUB (especially inter-menstrual bleeding), chronic pelvic pain, and dysmenorrhea. In our study, the prevalence of cesarean niche was 21.7% and the common niche shapes documented were the semicircular and triangular niches. The majority of CS scar niche cases were symptomatic and only 7.7% of the cases were asymptomatic and discovered accidentally by routine ultrasound examination. Our study shows a positive significant co-relation between the number of CS, the size of the niche, and the severity or frequency of the presenting symptoms.

6. RECOMMENDATIONS

Implications of the current study for future research include: more researches should focus on the effect of single versus double layered closure techniques and their effect on development of CS scar niche; more cases of secondary infertility should be investigated thoroughly by the means of 3D TVUS in order to determine the exact prevalence of the symptom and to determine whether there is a relation between niche size and the appearance of secondary infertility. Other studies should involve comparing between niches in ante-verted and retro-verted uteri.

More studies should be carried on to link niche prevalence with other surgical techniques such as site of CS incision, and closure of visceral and parietal peritoneum.

More studies should be carried out to compare between the efficacy of different modalities of diagnosis of CS scar niche such as SHG, TVUS, hysteroscopy, MRI, and HSG.

7. STRENGTHS AND LIMITATIONS

There is a strong relation between the niche size, number of CS, and symptoms affecting women such as AUB, chronic pelvic pain, and dysmenorrhea. Secondary infertility remains a query due to a smaller number of cases presented, although fertility is restored by niche treatment.

In the presence of limitations, such as the time of appearance of symptoms and the time of diagnosis, the lack of information about the technique used in uterine closure (either single or double layered continuous suturing) along with limited knowledge of the medical degree of the operating surgeon, and by comparing the results of different papers, we find that the prevalence of CS scar niche differs from one study to another.

CONSENT

A written informed consent was taken from each participant patient after detailed explanation of the study nature and procedure.

ETHICAL APPROVAL

The study started after medical ethical committee approval.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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