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ORIGINAL ARTICLE

Post-Cesarean Section Niche-Related Impaired Fertility

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Abstract

A cesarean section (CS) is a common surgical operation all around the world. Postcesarean niches, sometimes called isthmoceles, are anechoic myometrial indentation at the cesarean scar site caused by improper healing. Our study aimed to examine the role of the postoperative niche in reducing fertility following a cesarean surgery. 50 cases were randomly recruited from those who visited the obstetrics and gynecology outpatient clinics at Al Azhar University Hospitals for this prospective observational, cross-sectional study. Our results revealed that the Mean age included 50 cases, mean duration of secondary infertility was 2.62 years, 76% of cases had elective CS, 24% had emergency CS, 24% had no complications, 24% had PPH, 40% had wound complications and 12% cases had a puerperal fever, as regard niche characteristics, 62% of cases had niche length less than 9 mm and 38% had length greater than or equal to 9 mm, depth (mm) less than 5 founded in 38% of cases and greater than or equal to 5 depth founded in 62%, as regard Gynecological symptoms in niche population prolonged menses was the highest percent 50% and Pregnancy rate was the highest percent in reproductive outcomes in a population with niche after treatment. Regarding our results we can conclude that there may be a connection between the presence of a niche and subfertility following a CS, however, this is not always the case. Several factors could contribute to the decreased fertility rates observed following a cesarean operation.

Keywords: Cesarean section, Impaired fertility, Post-cesarean section niche

1. Introduction

The usage of cesarean sections (CS), a potentially lifesaving procedure for both mother and child, has increased significantly during the past decade. According to the most recent Egypt Demographic and Health Survey (EDHS) (2014), the CS rate in Egypt has climbed by more than 100% since 2005, reaching 52% of all deliveries.

Not all niches result in signs and the relationship between a niche in the uterine scar and infertility remains unproven due to a lack of concrete data. In light of the scant data and conjunction with findings from sonographic hysteroscopy and laparoscopic niche repair.

By transvaginal ultrasonography, the European Niche Taskforce defines a niche as an indentation of the uterine myometrium of at least 2 mm at the site of the Cesarean scar (Jordans *et al.*, 2019). After a CS, 50–60% of women develop niches. At 6–12 months post-CS, women with a niche are more likely to be spotted than women without a niche, according to prospective cohort studies.

About 42% of cases with a big niche had fluid accumulation. Due to decreased implantation and potential embryotoxicity, this may negatively affect pregnancy outcomes. Additional research into the effectiveness of surgical procedures on reproductive outcomes, as well as the impact of intrauterine fluid related to a niche on implantation, is required. It is also unknown whether removing the fluid right before embryo transfer has any effect on pregnancy outcomes for women who have a niche.

Another theory suggests that irregular or impaired uterine contractions are responsible for the poor implantation that occurs after a CS. Another possible cause of mucus-filled niches is the local mucus development that occurs when a CS

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incision is made so shallowly through cervical tissue that contains mucus-producing glands.

There may be a connection between the presence of a niche and subfertility following a Caesarean section, however, this is not always the case. Not all niches cause signs, and the connection between a niche in the uterine scar and infertility has not been proven clearly. We believe that asymptomatic niches should not be treated.

The purpose of this research was to determine whether or not a post-CS niche is associated with reduced fertility.

2. Patients and methods

Fifty patients who regularly visit the obstetrics and gynecology clinics at Al Azhar University Hospitals were randomly selected for this prospective observational, cross-sectional study.

Written informed consents are sought from all participants after the study protocol has been reviewed and approved by the local ethics committee.

The study started in November 2021 and lasted for one year.

Inclusion criteria: age: 25–35 years, secondary infertile woman, Niche confirmed diagnosis due to previous CS, at least one previous delivery after a normal pregnancy, not a lactating woman, and not on oral contraceptive pills last 6 months.

Exclusion criteria: patients with primary infertility, lactating patients, patients receiving oral contraceptive pills last 6 months, and patients that have other causes of secondary infertility.

Sample Size: the research presented here relies heavily on prior work by Visser *et al.* The sample size was determined using Epi-Info STATCALC with the following assumptions in mind:- 80% power, and a 95% two-sided confidence interval. A 5% margin of error yields an odds ratio of 1.115. The Epi-Info output allowed for a maximum sample size of 46. As a result, the number of individuals in the sample was expanded to 50 to account for potential dropouts during the follow-up phase.[1]

3. Methods

Cases were subjected to a thorough history and physical examination, which included a general checkup as well as tests for things like intrauterine fluid accumulation, which can prevent implantation, mucus, and old blood, which can prevent successful implantation.

All cases were followed-up by fluorometry for three menstrual cycles.

3.1. Statistical analysis

IBM's statistical software, SPSS, version 20.0, was used to process and analyze the data. IBM Corp., Armonk, New York. Quantitative and percentage descriptions were used for qualitative information. To ensure a normally distributed sample, we employed the Shapiro–Wilk test. The minimum and maximum values, as well as the mean, standard deviation, median and interquartile range (IQR), were used to characterize the quantitative data. The obtained results were deemed significant at the 5% level.

4. Results

(Table 1).

This table showed that Mean age in the included 50 cases was 27.6 years and the mean BMI was 26.7 with a mean parity of 1.98 Fig. 1, Table 2.

This table showed that mean duration of secondary infertility was 2.62 years Table 3.

This table showed that 76% of cases had elective CS, 24% had emergency CS.

Regarding the History of postoperative complications, 24% had no complications, 24% had PPH, 40% had wound complications and 12% cases had puerperal fever Table 4.

The following table shows the methodology used to determine scar myometrial thickness relative to surrounding myometrium. Thickness of Adjacent Myometrium (TAM)=TRM (thickness of Remaining Myometrium) TRM/TAM = myometrial thickness at the scar as a percentage of adjacent myometrium. As regard niche characteristics, 62% of cases had

Table 1. Distribution of the studied cases regarding to demographic data (n=50).

	No. (%)
Age (y)	
Minimum–maximum	23.0–33.0
Mean±SD.	27.6±3.44
Median (IQR)	27.0 (23.0–33.0)
BMI (kg/m^2)	
Minimum–maximum	25.0–29.0
Mean±SD.	26.7±1.35
Median (IQR)	27.0 (25.0–39.0)
Parity	
Minimum–maximum	1–3
Mean±SD.	1.98±0.713
Median (IQR)	2 (1–3)

IQR, Inter quartile range; SD, Standard deviation.

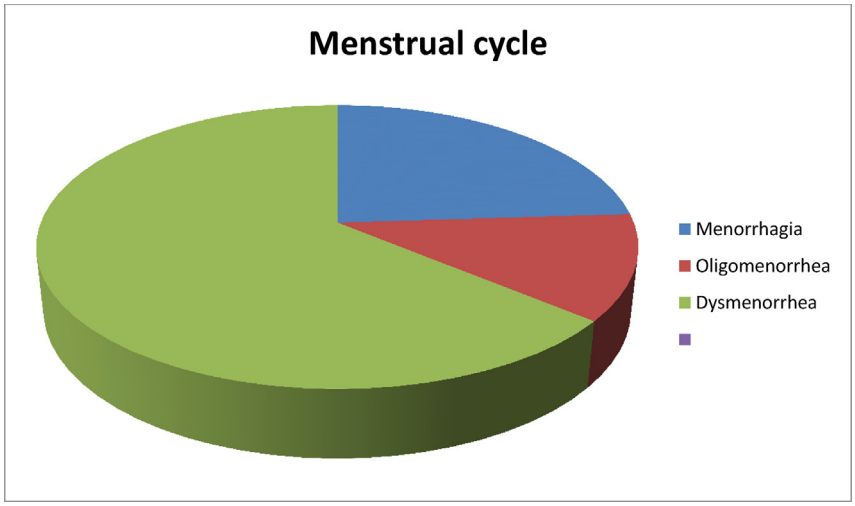

Fig. 1. Menstrual cycle distribution of the cases (n=50).

Table 2. Cases analyzed (n=50) distribution according to how long the secondary infertility lasted.

Duration of secondary infertility/yr	
Minimum–maximum	2–4
Mean±SD.	2.62±0.69
Median (IQR)	2.5

Table 3. Type of cesarean delivery, postoperative complication history distribution of cases analyzed (n=50).

	N (%)
Type of cesarean delivery (n50)	
Elective	38 (76.0)
Emergency	12 (24.0)
History of postoperative complications (n50)	
no	12 (24.0)
PPH	12 (24.0)
Wound complications	20 (40.0)
Puerperal fever	6 (12.0)

Table 4. Niche-based distribution (n=50) of the instances under study.

Variables (N50)	*N* (%)
Length (mm)	
<9	31 (62.0)
≥9	19 (38.0)
Depth (mm)	
<5	19 (38.0)
≥5	31 (62.0)
Width (mm)	
<12	37 (74.0)
12	13 (26.0)
TRM (mm)	
<2.2	13 (26.0)
≥2.2	37 (74.0)
TAM (mm)	
<9	19 (38.0)
≥9	31 (62.0)
The degree of severity of the defect (TRM/TAM)	
Mild (≥50%)	13 (26.0)
Severe (<50%)	37 (74.0)
Shape	
Linear	6 (12.0)
Triangle	12 (24.0)
Irregular rectangular	32 (64.0)

niche length less than 9 mm and 38% had length greater than or equal to 9 mm, Depth (mm) less than 5 founded in 38% of cases and greater than or equal to 5 depth founded in 62%, Width (mm) less than 12 in 74% of cases and greater than or equal to 12 in 26% of cases, TRM (mm) less than 2.2 in 26% of cases and ≥2.2 in 74% of cases, TAM (mm) less than 9 in 38% of cases and greater than or equal to 9 in 62% of cases, The degree of severity of the defect (TRM/TAM) was Mild (≥50%) in 26% of cases and Severe (<50%) in 74% of cases, as regard niche shape Irregular rectangular in 64% of cases, Triangle in 24% of cases and Linear in 12% of cases Fig. 2, Table 5.

This table showed that Gynecological signs in niche population Bleeding abnormalities in 20% of cases, Prolonged menses in 50% of cases, Post-menstrual spotting in 30% of cases, Abnormal uterine bleeding in 2% of cases, Dysmenorrhea in 32% of cases, Chronic pelvic pain in 24% of patients, Dyspareunia in 12% of cases, all cases failed to conceive.

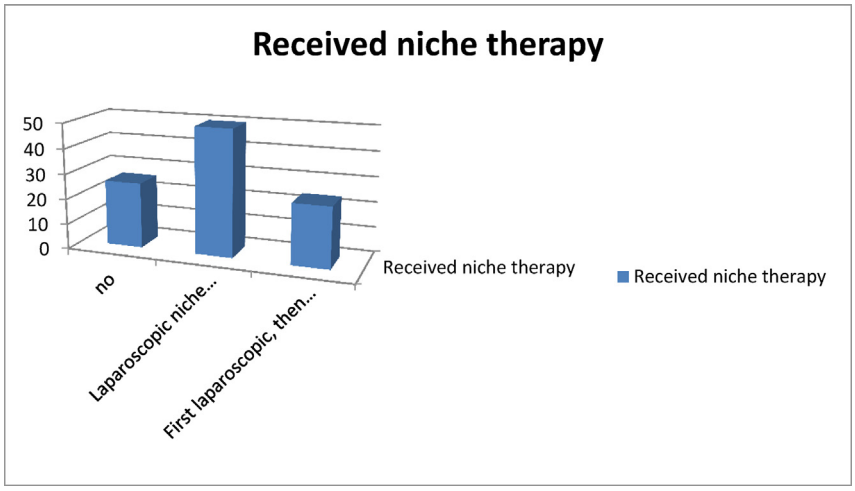

Fig. 2. Cases were divided into groups based on whether or not they had received niche therapy (n50; n=50).

Table 5. Niche population (n=50) distribution of cases evaluated by gynecological symptoms.

Gynecological symptoms in niche population	*N*=50 (%)
Bleeding abnormalities	10 (20.0)
Prolonged menses	25 (50.0)
Postmenstrual spotting	15 (30.0)
Abnormal uterine bleeding	1 (2.0)
Pain	
Dysmenorrhea	32 (64.0)
Chronic pelvic pain	12 (24.0)
Dyspareunia	6 (12.0)
Failed to conceive	50 (100.0)

5. Discussion

A typical complication of cesarean delivery is the formation of a myometrial depression (or 'niche') at the site of the cesarean scar. Symptoms include irregular uterine bleeding, dysmenorrhea, chronic pelvic pain, and dyspareunia have been associated with niches, which have been linked to infertility. Many factors, including as uterine illness, intra-abdominal adhesions, and women's reproductive desires, have been linked to subfertility after a C-section. Further study is required to demonstrate a causal link between a uterine scar with a niche and infertility, as not all niches cause symptoms.[2]

Analysis of our findings revealed that mean age in included 50 cases was 27.6 years and mean BMI was 26.7 with mean parity 1.98.

Diao *et al.* showed that mean age of the studied group was 35.11±3.97 years old, and mean BMI was 23.50±3.11.[3]

Approximately 75% of women with PAS were above the age of 35, according to a retrospective cross-sectional study by Cal M and colleagues the mean maternal age was 36.8 years [27–42 years; interquartile range (IQR) 34.5–40.5]. Median parity was 2 (IQR 1–2) in terms of obstetric history.[4]

As regards menstrual cycle abnormalities; in the present study; we found that about 64% of cases had Dysmenorrhea, 24% had Menorrhagia and 12% had Oligomenorrhea. The mean menstrual cycle duration/days was 7.28 days.

This comes in comparison with the study of Eraky and Seif El-Nasr, in which as regard relation to the history of menstruation Menstrual irregularities such as menorrhagia, dysmenorrheal hemorrhage, and intermenstrual bleeding each accounted for 13% of the women, whereas 52.5% of the women had irregular menstruation overall.[5]

As regard niche characteristics, 62% of cases had niche length less than 9 mm and 38% had length greater than or equal to 9 mm, Depth (mm) less than 5 founded in 38% of cases and greater than or equal to 5 depth founded in 62%, Width (mm) less than 12 in 74% of cases and greater than or equal to 12 in 26% of cases, TRM (mm) less than 2.2 in 26% of cases and greater than or equal to 2.2 in 74% of cases, TAM (mm) less than 9 in 38% of cases and greater than or equal to 9 in 62% of cases. The degree of severity of the defect (TRM/TAM) was Mild (≥50%) in 26% of cases and severe (<50%) in 74% of cases, as regard niche shape Irregular rectangular in 64% of cases, triangle in 24% of cases and linear in 12% of cases.

Bandry and colleagues found results that were very close to our own: they prospectively enrolled 65 patients with CS niche, and then split them into two groups based on whether or not they experienced postmenstrual spotting (group A: 34 patients who experienced spotting, and group B: 31 patients who did not experience spotting). A 1.5 T MRI was used

to analyze all of the patients. Compared with women who did not have spotting after menstruation, those who did had a substantially larger CS scar niche volume (0.57±0.07 vs. 0.07±0.05 (cm^3) P <0.001). Scar length (9.38±3.06 vs. 5.02±2.10 (mm); $P < 0.001$), scar depth (6.95±3.16 vs. 3.23±0.99 (mm); $P < 0.001$), and scar breadth 15.78±3.94 vs. 9.87±1.84 (mm); $P < 0.001$ are all considerably greater in women with postmenstrual spotting than in women without it.[6]

In addition to the above findings, we found that about 26% of cases did not received niche therapy but 50% had Laparoscopic niche resection, 24% had first laparoscopic, then hysteroscopy niche resection.

Verberkt *et al.* conducted a systematic review and meta-analysis of surgical procedures including niche resection via hysteroscopic (HNR; n=14), vaginal (VNR; n=7), laparoscopic (LSNR; n=7), and laparotomic (LTNR; n=2) techniques to assess the effect of uterine niche resection on fertility and pregnancy outcomes.[7]

As regard Gynecological symptoms in niche populations; in the current study we found that bleeding abnormalities in 20% of cases, prolonged menses in 50% of cases, postmenstrual spotting in 30% of cases, abnormal uterine bleeding in 2% of cases, dysmenorrhoea in 32% of cases, chronic pelvic pain in 24% of cases, dyspareunia in 12% of cases, all cases failed to conceive.

The niche was discovered inadvertently during routine ultrasonography in 76 (25.33%) of the participants in the study by Abdelfattah and colleagues who came with gynecological infections or pain due to a complex ovarian cyst. One hundred twenty-three (41.00%) patients reported experiencing unexplained pelvic pain; 24 (24.00%) patients reported experiencing AUB; 31 (10.33%) patients reported experiencing secondary infertility; four (1.33%) patients reported experiencing dyspareunia; two (0.67%) patients reported experiencing stress incontinence; and two (0.67%) patients reported experiencing oligo-menstruation.[8]

Moreover, about 37 of cases received niche therapy, and Gynecological symptoms after therapy improved than before therapy in the form of Bleeding abnormalities in 2% of cases, Prolonged menses in 4% of cases, postmenstrual spotting in 0% of cases, abnormal uterine bleeding in 0% of cases, ysmenorrhoea in 4% of cases, pelvic pain in 4% of cases, Dyspareunia in 0% of cases, Abdominal pain in 4% of cases.

Bandry *et al.* reported that multiple previous studies reported that there is a connection among multiple gynecological symptoms and the CS scar niche. Up to three quarters of females with CSD experience delayed menstrual bleeding and postmenstrual spotting; other common symptoms include dysmenorrhea (53.1% of women), pelvic discomfort (39.6%), dyspareunia (18.3% of women), and secondary infertility (less than 5% of women). Retention of blood products within the defect and poor contractility of the uterine wall due to decreased myometrial thickness and fibrosis explain the association between cesarean scar defects and postmenstrual spotting.[6]

5.1. Conclusion

Although the presence of a niche has been linked to infertility following a caesarean operation, this is not the only possible explanation. Not all niches result in symptoms and the connection between infertility and a niche in the uterine scar has not yet been established with absolute certainty. In our opinion, you should not treat a void if there are no symptoms present. The reported decrease in fertility following a CS could result from a number of factors.

5.2. Recommendation

Future studies are needed to assess the effect on implantation of intrauterine fluid related to a niche and the possible embryotoxicity of the intrauterine fluid, as well as the additional value of surgical interventions on fertility outcomes. Whether removal of the fluid immediately before embryo transfer in women with a niche affects pregnancy outcomes is not known either. More information on the underlying mechanisms is pivotal to the development of selective therapies and the identification of patients who may benefit from additional therapies. Further multicenter comparative and validating studies against other diagnostic methods such as Ultrasound are recommended. Apart from symptoms evaluated in the literature such as AUB, abdominal pain, and subfertility, clinicians and researchers should be more aware of sexual activity and self-esteem in this population.

Disclosure

The authors have no financial interest to declare about the content of this article.

Authorship

All authors have a substantial contribution to the article.

Conflicts of interest

The authors declared that there were NO conflicts of Interest.

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