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Research Article

Reproductive Outcome After Laparoscopic Caesarean Section Scar Repair, A Case Report Study

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Abstract

Study Objective: The uterine scar niche is a rising problem during the past decades because the increased incidence of caesarean section procedures all over the world. Caesarean scar niche correction, also known as niche resection or niche excision, is a surgical procedure aimed at repairing or removing the scar tissue to alleviate symptoms and improve reproductive outcomes.

Design: A case report study.

Setting: A private fertility centre.

Patients: Four cases were enrolled in this case report study with history of ICSI failure and diagnosed with transvaginal ultrasound to have a caesarean scar niche >2 mm in depth, were selected.

Intervention: Combined laparoscopic/hysteroscopic guided scar repair was done for all patients. Measurements and Main Results: A period of at least 2 months after the repair, all patients had undergone ICSI trials. three out of the four had got pregnant and one of the pregnant women showed early miscarriage. Conclusion: The study showed that repair of caesarean scar niche is associated with improved pregnancy rate and live birth rate (75% and 50%) respectively, in patient with recurrent implantation failure.

Keywords: Repair; Caesarean Scar; Niche; Laparoscopy; Hysteroscopy; ICSI

Introduction

The World Health Organization estimates that there are approximately 18.5 million women who undergo this procedure annually, with rates in the Western world increasing from 14.5% to27.2% between the years 2000 and 2017 [1].

Caesarean niche is also referred to as a caesarean scar defect, ischiocele, or a diverticulum. The presence of a caesarean scar niche is associated with gynaecological symptoms such as abnormal uterine bleeding, dysmenorrhea, and subfertility, as well as potential adverse obstetrical outcomes resulting from caesarean scar pregnancy (CSP), uterine rupture, and placenta accrete spectrum (PAS) disorders due to defects in uterine wall [2].

These defects can occur due to incomplete healing of the scar tissue after a caesarean section, leading to the formation of a divot in the uterine wall.

Women with caesarean section (CS) history may have higher risk of infection, haemorrhage, severe obstetric complications, and reduced subsequent fertility than normal delivery (Sandall., *et al*. 2018).

It can potentially impact endometrial implantation during pregnancy by altering the normal architecture of the uterine cavity [3].

Although CSNs may have an impact on endometrial implantation, not all women with niches will experience difficulties conceiving or maintaining a pregnancy. The severity of the niche, its location within the uterine cavity, and individual patient factors can all influence the extent to which it affects endometrial implantation and pregnancy outcomes [4].

Several studies have investigated the reproductive outcomes after caesarean scar niche correction. While results may vary, some findings suggest that niche correction can lead to improvements in symptoms such as abnormal bleeding and pain, which can positively impact a woman's quality of life [5].

In terms of reproductive outcomes, niche correction may potentially reduce the risk of complications in subsequent pregnancies, such as placenta previa, placenta accreta, or uterine rupture. It may also decrease the likelihood of miscarriage or preterm birth associated with caesarean scar defects.

In 2019, the European Niche Taskforce published a consensus definition of the niche in Jordans., *et al*. as; "an indentation of the uterine myometrium at the site of the SC scar with a depth of at least 2 mm" and classified the niche into: simple, simple with a branch and complex [6].

The impact of niche repair on reproductive outcomes, including subsequent pregnancies, is an area of ongoing research. Some studies suggest that correcting a CSN may improve reproductive outcomes, particularly in women experiencing symptoms such as abnormal uterine bleeding, pelvic pain, or infertility related to the niche [7-9].

The aim of that case report is to evaluate the reproductive outcome and effect of CSN repair and ICSI outcomes in patients who had showed previous implantation failure.

Patients' information

A case report study including 4 cases attending a private fertility center in Cairo, Egypt from the period of April 2021 to August 2023 with secondary infertility and seeking for pregnancy. All patients had showed implantation failure after previous ICSI trials in another fertility center. After investigations and scanning, uterine scar niche was diagnosed and combined hysteroscopic and laparoscopic guided repair was performed to all patients. Uterine niche was defined as an indentation at the site of a CS with a depth of ≥2 mm according to the European Niche Taskforce [7].

Clinical findings

The medians ± IQR for age, body mass index, durations of infertility are (33 ± 3, 30 ± 4 and 3.3 ± 1.8) respectively. One patient was with a history of one C/S and 3 patients with a history of three C/S. All patients enrolled in the study have a history of implantation failure, 2 after one ICSI trials and two after 2 ICSI trials. The causes of infertility were tubal factors and unexplained causes with semen analysis are fair in all patients. The patients showed normal anti-Mullerian hormones AMH, prolactin (PRL) and thyroid stimulating hormones (TSH) levels with medians ± IQR were 2.4 ± 2.05, 14.5 ± 10.5 and 2.05 ± 0.7 respectively (Table 1).

Age (Median ± IQR)	33 ± 3
BMI ((Median ± IQR)	30.0 ± 4
AMH	2.4 ± 2.05
PRL	14.5 ± 10.5
TSH	2.05 ± 0.7
Causes of infertility	
Male factor	0
Tubal factor	2
Unexplained	2
Fertility Duration in years (Median ± IQR)	3.3 ± 1.8
Family and medical history	Irrelevant
Patients Symptoms	
Bleeding	1
Excessive discharge	3
Previous C/S	
One c/s	1
Two c/s	3
Previous Failed ICSI trials	
One ICSI	2
Two ICSI	2
Dose of Stimulation IU (Median ± IQR)	3185 ± 960
Type of protocol prescribed	Flexible antagonist
Number of oocytes retrieved (Median ± IQR)	8.5 ± 4
Niche depth in mm (Median ± IQR)	2.25 ± 0.3
Number of embryos transferred (Median ± IQR)	2 ± 1
Clinical pregnancy rate (%)	75%
Implantation rate (%)	75%
Ectopic pregnancy rate %	0%
Miscarriage rate %	25%
Live birth rate %	50%

Table 1: Demographic characteristics and outcome of ICSI cycles.

Timelines

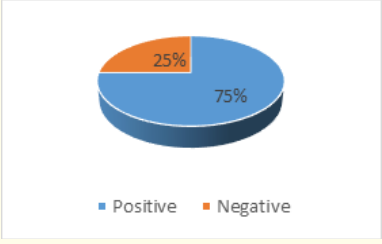

Figure 1: Clinical Pregnancy Rate

Diagnostic assessment

The need for high diagnostic tool for C/S niche is very important issue to avoid false positive or false negative results with undesired economic and interventional drawbacks. The study had approved ultrasound and sonohysterography (SHG) as combined diagnostic tool for CSN in all patients. The median and IQR for niche depth in all patients are 2.25 ± 0.3**.**

Van der Voet., *et al*. reported a prevalence of a niche of 49.6% using TVS versus 64.5% using (SHG) when the niche was defined with a depth of at least 2 mm. Thus, many niches are missed when using TVS without the installation of gel or saline. This is in line with the findings of recent studies [10].

Besides, SHG resulted in an increased niche depth and significantly smaller residual myometrium in comparison with TVS ($p < 0.05$) in various studies [10].

A review by Roberge., *et al*. showed that TVS and SHG are the most feasible, cost-effective methods requiring the least amount of training in diagnosis of uterine niche (Roberge., *et al*. 2012).

Both techniques are easily accessible and widely used non-invasive methods for imaging internal genitalia. It is possible to detect a niche by TVS and can be best evaluated in both the sagittal and transverse planes. Niches can be missed when only examined in the sagittal plane or the absence of intrauterine fluid (Antila., *et al*. 2018).

Therefore, 2 recommendations are made for performing niche evaluation using ultrasound. First, always evaluate the uterine scar in sagittal and transverse plane and search in both directions for the plane where the niche is the largest. The transversal plane is very important given the fact that the uterine incision is made horizontally, especially, laterally located niche can be missed if only the midsagittal plane is used. Second, the European Niche Taskforce recommends the use of intra-uterine saline contrast or gel infusion if no fluid is identified in the uterine niche, especially when patients present with symptoms after a CS [7].

Therapeutic interventions

The illegible patients had undergone combined laparoscopic repair with hysteroscopic assistance and evaluation after repair. The repair was performed by a single high skilled surgeon. Acourse of broad-spectrum antibiotics (Deoxmycine 100 mg was given 5 days before and 5 days after the procedure).

Removal of the scars were done by using a scissor to cut the fibrosed edges followed by suturing of healthy fresh tissues by vicryl-1 absorbable sutures. After, at least 2 months from the procedure the patient was prepared for ovulation induction ICSI. Flexible antagonist protocol was prescribed for all patients where they started HMG 300 IU (Fostimon 150 IU +Meriofert 150 IU) daily i.m. from the second day of the cycle. Antagonist (cetrotid 0.25, Merck Serono) s.c was started when at least one follicle was reaching an average diameter of 15 mm or Estimated serum Estradiol (E2) was reaching the level of 500 pg/dl or more. Triggering was done when at least 2 follicles reaching average diameter of 18 mm using Hcg (Choriomon 10000 IU) i.m Ovum pick up was performed 36 hours after triggering and embryo transfer was scheduled at day 5 for all patients. Luteal phase support was continued for 2 weeks after transfer and until serum pregnancy test was confirmed. The ongoing pregnancy rate was estimated by scanning the heart beated embryos intrauterine. All patients had signed for consent of enrollment in the study and all data was analyzed synonymously and blindly. Approval from the local medical ethical committee was obtained before the study was commenced.

Follow up and outcome

The study showed an increase in the ongoing pregnancy rate, implantation rate and live birth rate (75%,75% and 50%) respectively in patients with history of implantation failure (Table 1). Two cases with previous failed ICSI trials and with previous 2 C/S had pregnant after niche correction. Unfortunately, one of them showed an early miscarriage at 8 weeks gestation. One case with previous one C/S had pregnant with live birth rate of 100%. first trimestric miscarriage was recorded in one case with previous 2 C/S and terminated medically without the need for uterine curettage. The Medians and IQR for dose of stimulation, number of Oocytes retrieved, and number of embryos transferred were 3185 ± 960, 8.5 ± 4 and 2 ± 1 respectively (Table 1).

Discussion

Many studies have reported that women with a history of CS have reduced fertility capacity [9,10], whereas only a few studies have focused on the effect of uterine niche on subsequent fertility [8,11].

The underlying mechanisms for reduced fertility among women with niche are still unclear. Previous literature indicate that uterine niche may interfere with embryo implantation through many factors [12]. Accumulated intrauterine fluid, such as hydrosalpinx or blood, may affect the endometrium receptivity or hinder embryo implantation by covering the endometrium [13]. Besides, the accumulation of fluid in the niche may impair sperm penetration and be embryotoxic [14]. A histology study found fewer leucocytes and less vascularization at the CS scar, implying that niche may change the microenvironment, thus unfavourable for implantation [15].

Endometrial wave-like activity patterns of the uterus are important for successful pregnancy [16]. A uterine incision may lead to poor contractility of the uterine muscle around the niche and result in implantation failure or early miscarriage and the disturbed myometrium structure also increases the niche-related difficulty of embryo transfer [17]. Further research is needed to depict a full picture of mechanisms in the associations between niche and subsequent fertility.

The increased risk of adverse pregnancy outcomes such as miscarriage, preterm birth, and abnormal placentation can be partly attributed to the impact of the niche on endometrial implantation and subsequent pregnancy development [18].

Three out of four patients had got pregnant following ICSI that is preceded by combined laparoscopic/hysteroscopic repair of post C/S niche. The median of age, BMI and of all patients were 34 ± 3 and 31 ± 5 respectively. The median dose of stimulation, duration of infertility, niche thickness, number of oocytes retrieved, and number of embryos transferred were 3185 ± 960, 3.3 ± 1.8, 8.5 ± 4, 2.25 ± 0.3, 2 ± 1 respectively. All patients had a previous failed ICSI trials. Three patients had got pregnant by ICSI after the laparoscopic repair in contrary to one patient who had not.

This study showed the benefit of laparoscopic repair of C/S scar before ICSI. Laparoscopic repair of a cesarean section scar isn't a routine procedure before undergoing assisted reproduction techniques like in vitro fertilization (IVF). However, it might be recommended in certain cases where the scar is causing complications or there are concerns about its integrity affecting the success of the procedure.

Symptoms studied in the literature mainly focused on gynecological symptoms and reproductive outcome. The impact of a niche on IVF has been studied only in a limited number of studied patients. The relationship between various niche features and symptoms has not been elucidated fully, although both niche volume and the ratio between niche depth and thickness of the adjacent wall assessed by ultrasound are associated positively with abnormal uterine bleeding (Van Der Voet., *et al*. 2014).

In supporting of our results, Diao., *et al*. found reduced live birth rate and implantation rate among women with niche compared to those with vaginal delivery (VD) history. Nevertheless, there were only 74 cases in the niche group, and the statistical power to detect live birth differences between niche and VD groups was only 72% [18].

Wang,., *et al*. observed a lower clinical pregnancy rate among 8 niche women than 166 women with VD history (12.50% vs. 54.82%) [7]. Vissers., *et al*. also mentioned a 10.7% live birth rate in women with niche vs. 23.3% in women with VD history, but they also said the sample size is too small for effective statistical analysis and therefore data were not presented [12]. In a recent study, Wen., *et al*. had observed that uterine niche was associated with decreased implantation rate, clinical pregnancy rate, and live birth rate among women undergoing IVF/ICSI treatment. Additionally, they found the early miscarriage rate higher among women with uterine niche than those without niche in all cycles, cycles from women aged 20–45 years old, and cycles from women undergoing agonist protocol. These results suggest that uterine niche may exert a negative effect on fertility (Wen., *et al*. 2023).

Several studies reported that implantation close to or across a niche may associate with higher spontaneous miscarriages [18,19], although previous studies did not report a correlation between uterine niche and miscarriage in IVF/ICSI treatment to our knowledge (Donnez., *et al*. 2017).

Our results showed that the repair of CSN had significantly improved the implantation rate in patients with history of failed implantation during ICSI cycles. The application of this concept is not strongly accepted except after a large clinical trial taking in consideration the appropriate sample size.

In our study one patient showed early miscarriage which was terminated medically without the need for evacuation and two patients delivered at term by C/S with live birth rate of 50%.

The pregnancy rate after niche repair (also known as niche correction or niche resection) can vary depending on various factors, including the severity of the niche, the surgical technique used for repair, the woman's age and fertility status, and other individual factors. While niche repair surgery aims to improve reproductive outcomes for women with caesarean scar niches, there isn't a universally reported pregnancy rate following the procedure.

However, it's important to note that the success of niche correction and its impact on reproductive outcomes can depend on various factors, including the severity of the niche, the surgical technique used, the individual's medical history, and other obstetric factors. All patients in the study were presented with symptoms like heavy menstrual bleeding or vaginal discharge or both before repair. Fortunately, all patients showed improvement in these symptoms after the procedure.

However, the effectiveness of niche repair in improving reproductive outcomes can vary depending on factors such as the severity of the niche, the surgical technique used, and individual patient characteristics. Some studies have reported improvements in outcomes such as reduced menstrual bleeding, resolution of pelvic pain, and increased pregnancy rates following niche repair [18].

Overall, while niche repair may be a valuable option for addressing certain symptoms or concerns related to CSNs, more research is needed to fully understand its impact on reproductive outcomes, including subsequent pregnancies.

Before undergoing niche correction surgery, women were discussed their specific situation and expectations and to determine the potential benefits and risks associated with the procedure. Additionally, close monitoring during subsequent pregnancies is often recommended to ensure the best possible outcomes for both the mother and the baby.

Our results indicate that uterine niche may exert a detrimental effect on pregnancy outcomes that is proved by improved implantation rate after laparoscopic repair. Even niche depth has been reported to cause negative effects on fertility [20,21]. Despite the results of this study, still little do we know about the effect of niche depth on pregnancy outcome among IVF/ICSI population. Niche depth in our data ranged 2-2.5 mm. Prospective studies are warranted to confirm the casual relationship between uterine niche and reproductive outcomes. As an intervention, repairment of niche through hysteroscopy or laparoscopy seems attractive for women who with niche and planning to conception [22]. Studies regarding the role of niche repairment on reproductive outcomes in IVF/ICSI are needed [23].

Conclusion

The study showed that repair of caesarean scar niche may be associated with improved pregnancy rate, live birth rate and associated symptoms, in patient with recurrent implantation failure.

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